AMENDED RECORD OF DECISION

West Side Corporation Site
Operable Unit No. 2 (Off-Site)
Jamaica, Queens County, New York
Site Number 241026

December 2013

Prepared by the:

Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT – AMENDED RECORD OF DECISION

West Side Corporation
Operable Unit Number: 2
State Superfund Project
Jamaica, Queens County
Site No. 241026
December 2013

Statement of Purpose and Basis

The Amended Record of Decision (AROD) presents the selected remedy for Operable Unit (OU) Number 2: Remedial Program Off-site Groundwater of the West Side Corporation site, a Class 2 inactive hazardous waste disposal site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for OU2 of the West Side Corporation site and the public's input to the Proposed Amendment to the ROD presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the AROD.

Description of Selected Remedy

The Department conducted an evaluation of groundwater monitoring data collected from Groundwater Extraction Treatment (GWET) system start-up operations completed in 2012. The evaluation did not support restarting the GWET for long-term operation in accordance with the original February 2002 ROD for OU2 (see Exhibit A). Instead, an in-situ chemical oxidation (ISCO) technology to treat the remaining plume has been selected.

The elements of the selected remedy are as follows:

- A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31;

- Permanent shutdown of the GWET;

- Installation of a network of permanganate injection wells within the 10 parts per billion (ppb) PCE plume in the shallow groundwater zone along 174th, 175th, 176th, and 177th Streets and within the 1,000 ppb tetrachloroethene, also known as perchloroethylene(PCE), plume in the intermediate groundwater zones on Sayres Avenue immediately east and west of Merrick Boulevard;

- Multiple rounds of injections of a permanganate solution into the shallow and intermediate groundwater zones;

- Installation of new monitoring well clusters south of Linden Avenue, downgradient of the leading edge of the PCE plume, to assist in plume delineation and assess the effectiveness of remediation. The leading edge of the plume will be determined following a synoptic round of groundwater level measurements collected during the design phase;

- A long-term monitoring program will be completed to evaluate the effectiveness of the remedy as part of the overall site management program for the site;

- The ongoing vapor intrusion mitigation program will continue to monitor soil gas levels at adjacent residences and assess the need for additional sub-slab depressurization system installations. Additional system installations will be conducted as necessary in the future to provide mitigation; and

- A Site Management plan is required, which will include the following:

    a. Monitoring Plan to assess the performance and effectiveness of the remedy. The plan will include, but may not be limited to:

        - Performance monitoring will be conducted at regular intervals following each injection event for: color and field parameters (pH, specific conductivity, dissolved oxygen, and oxidation/reduction potential) in all injection and monitoring wells in the vicinity of, or downgradient of, injection wells.

        - Following the first injection event, a round of groundwater samples will be collected and analyzed for volatile organic compounds (VOCs), metals, and alkalinity to determine the performance of the injection event and the need for revisions to subsequent injection events.

- Any subsequent injection events will follow a similar performance monitoring schedule. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

- With the extensive monitoring groundwater network already in place at the Site, water quality data and groundwater flow conditions will be closely monitored as part of the selected remedy. Implementation of the remedy and evaluation of the potential impacts of remedy implementing with groundwater supply well reactivation will be closely coordinated with New York State Department of Health (NYSDOH) and New York City Department of Environmental Protection (DEP) moving forward.

- An evaluation of the potential for soil vapor intrusion (SVI) to occur off-site including provisions for implementing actions recommended to address exposures related to SVI if needed.

- The operation and maintenance of the existing sub-slab vapor mitigation systems will be continued as determined necessary.

New York State Department of Health Acceptance

The NYSDOH concurs that the amendment to the ROD remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

December 13, 2013

Date

Robert W. Schick, P.E., Director
Division of Environmental Remediation

Amended Record of Decision
West Side Corporation Site
Operable Unit No. 2 (Off-Site)

City of Jamaica / Queens County / Site No. 241026 December 2013

Prepared by the New York State Department of Environmental Conservation
Division of Environmental Remediation

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (Department), in consultation with the New York State Department of Health (NYSDOH), has amended the Record of Decision (ROD) for the above-referenced site. The disposal of hazardous wastes at this site, as more fully described in the original ROD document and Section 6 of this document, has caused the contamination of various environmental media. This amendment to the ROD (AROD) remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment, and identifies the new information which has led to the AROD and discusses the reasons for the selected remedy.

In July 2000, the Department issued a ROD which selected a remedy for the West Side Corporation Operable Unit No. 1 (OU1) site to address on-site contamination. In February 2002, the Department issued a ROD for Operable Unit No. 2 (OU2) to address off-site contamination (*see Exhibit A*). This AROD pertains only to the West Side Corporation OU2 Site. The original 2002 ROD selected installation of a high capacity groundwater extraction well and treatment (GWET) system. The remedial plan addressed contaminated groundwater that had migrated from the OU1 site to the south-southwest in the direction of the New York City Department of Environmental Protection (DEP) Groundwater System Station 6 (Station 6) site, a former drinking water supply well proposed for reuse. The installation of two recovery wells was included in the remedy to hydraulically contain the tetrachloroethene, also known as perchloroethylene (PCE), plume migrating from the on-site source area. Collected water was to be treated on site prior to discharge to the local sewer system. In accordance with the original ROD, construction of the GWET was completed by DEP in 2012, and it was operated by the Department for approximately three months until November 2012.

During 2012 operations, representative groundwater samples were collected from each extraction well and also from the combined effluent from the carbon treatment system. Analytical data showed that PCE concentrations for the influent, untreated groundwater from extraction well No. 1 ranged from 89 parts per billion (ppb) to 230 ppb, and from 28 ppb to 47 ppb from extraction well No. 2. These influent concentrations were substantially lower than the originally anticipated influent concentrations of 2,400 ppb estimated during the remedial design which were based on plume concentrations at that time. In the intervening years since the design basis was established, the OU1 remedy was implemented. This resulted in the plume near the on-site source, which was to be addressed by the OU2 remedy, significantly attenuating due to the removal of the source by the OU1 remedy.

To hydraulically contain the PCE plume, the GWET system design estimated, through modeling, a stagnation point approximately 2,000 to 2,500 feet downgradient of the extraction wells. The stagnation point represents the location of the groundwater divide established and identified during operation of the GWET. North-northeast of the divide, groundwater flows towards the GWET. South-southwest of the divide, groundwater continues to flow towards Jamaica Bay and is not captured by the GWET. In 2012, groundwater level measurements were obtained during pumping operations. The inferred capture area was estimated to recover groundwater from between 900 and 1,300 feet south-southwest of the GWET, roughly half as far as had been originally predicted by the remedial design.

Based on the groundwater level measurements and analytical results within the aquifer following GWET system operations, the Department has issued this AROD to modify the original OU2 remedy for the site. The modification to the remedy generally includes in-situ chemical oxidation (ISCO) which will require the installation of a network of injection wells to inject a chemical solution known as permanganate within the shallow and intermediate groundwater zones. Focusing the injections into these particular zones will have the benefit of treating and controlling groundwater contaminant concentrations while simultaneously minimizing the potential for future vapor intrusion into overlying buildings. Since permanganate injection will now occur within the GWET system capture area, operation of the GWET system is no longer necessary and has not been included in the amended remedy. Groundwater monitoring as part of the AROD is included, albeit for a shorter time period than originally planned.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375 Environmental Remediation Programs. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies including this AROD. A public comment period was opened on October 21, 2013 in order to provide an opportunity for the public to comment on the proposed changes to the ROD remedy. The comment period was closed on December 6, 2013.

A public meeting on this site was held on Wednesday, November 13, 2013 at the Public School/Intermediate School 116 William C. Hughley, 107-25 Wren Place, Queens, New York. (**Please note that this activity was not sponsored or endorsed by the New York City Department of Education or the City of New York.*). At the meeting, a description of the original ROD document and the circumstances that have led to proposed changes in this ROD were presented. After the presentation, a question and answer period was prepared to be held as required. However, there were no verbal or written comments received on the proposal following the presentation at the meeting or during the public comment period (see Responsiveness Summary Appendix A).

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs using "*GovDelivery*" at https://public.govdelivery.com/accounts/NYSDEC/subscriber/new .

SECTION 3: SITE DESCRIPTION AND HISTORY

3.1 Location: The West Side Corporation site is located at 107-10 180th Street in Jamaica, Queens County, New York. See ***Figure 1***.

3.2 Site Features: This 4.5-acre site is owned by the now defunct West Side Corporation and includes a brick structure, approximately 21,600 square feet (sf) in size, currently leased by Atlantic Express Transportation, a school bus company for dispatching, repairing and maintaining school buses. Bus storage (approximately 200 buses) at the site is often observed to cover a majority of the open space. The site is bordered to the west and south by a DEP maintenance and storage yard (Groundwater System Station 24). The area around the site building is paved with asphalt. The site property is surrounded by chain link and corrugated metal fencing.

3.3 Historical Use(s): The site was used for the manufacture and distribution of ceramic pipes and fittings until 1969. From about 1969 to 1992, the site was used as a storage and distribution center for laundromat supplies, hangers, plastic garment bags, and most notably dry cleaning chemicals including large quantities of PCE. The property was operated as the West Side Corporation.

Five 10,000 gallon aboveground storage tanks were located outside the southeast portion of the site building and were used for the storage of PCE. These tanks were filled via truck tankers and via railroad tanker cars. Apparently, improper handling of the chemicals has resulted in the disposal of hazardous wastes at the site, primarily PCE, some of which were released or have migrated in groundwater from the site to surrounding areas, including the properties to the south and east.

Historical data indicate that contaminated groundwater from the site was drawn toward the former Jamaica Water Supply Company wells when they were in operation. Analytical data from that time is not available, but current and historical information suggests that the concentration of PCE that may have been introduced to the water distribution system was likely low due to dilution. Formerly, the Jamaica Water Supply Company occupied Groundwater System Station 24 (Station 24) and operated several production wells (Nos. 24, 24A, 24B, and 24C). Well 24 was taken out of service by DEP in 1975. Wells 24A, 24B, and 24C were taken out of service by DEP in 1982 when contaminants were detected in these wells during routine monitoring.

3.4 Operable Units: The site was divided into two operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

3.4.1 Operable Unit No. 1 (OU1): OU1 addresses on-site soils and groundwater. A July 2000 ROD selected an on-site remedy to clean up the soil and groundwater utilizing groundwater recovery and treatment, hydraulic containment, soil vapor extraction (SVE) and treatment, chemical oxidation, and institutional controls. In September 2002, an Explanation of Significant Differences was issued revising the remedy to incorporate thermal technology in lieu of chemical oxidation. Thermal treatment, soil vapor extraction, and implementation of an in-situ biological treatment pilot study have since remediated on-site groundwater and the soil previously determined to be the source of the VOC contamination.

3.4.2 Operable Unit No. 2 (OU2): OU2 is the subject of this decision document, and addresses off-site groundwater and soil vapor intrusion (SVI). To define the extent of off-site contamination and develop a remedy, OU2 was established in 2000. An off-site remedial investigation/feasibility study (RI/FS) for the West Side Corp Site (OU2) was conducted. The February 2002 ROD addresses contaminated groundwater that has moved from the site to the south-southwest beneath Station 24 and a residential area. The plume is also migrating in the direction of the Station 6 Site. The OU2 remedy included installation of a high capacity GWET system (750 to 1,100 gallons per minute (gpm)) with on-site treatment and discharge to the local storm sewer system.

Since May 2005, the Department and the NYSDOH have tested the air and soil vapor in over 170 homes near the Site. The State has also installed, and maintains, 30 vapor mitigation systems to reduce existing or potential exposures.

3.5 Site Geology and Hydrogeology: The soil deposits encountered at the site generally consist of fill materials, glacial outwash, and clay soil. The fill material encountered at the site ranges in thickness from approximately 0.5 feet to 10 feet below ground surface (bgs) and is comprised of brown sandy silt, brown silty sands, and gravelly sands with fragments of ceramic, glass, plastic pellets, and metal debris.

An unconfined sand and gravel aquifer is present consisting of medium to coarse grained sands of Pleistocene age locally known as the Upper Glacial Aquifer. Soil samples collected showed the aquifer material to be very consistent throughout the OU2 study area. The depth to the top of the underlying Gardiner's clay layer, which is an undulating surface throughout the study area, increases southward from OU1 to OU2 and ranges from 62 feet to 105 feet bgs.

The regional direction of groundwater flow is south-southwest from the site toward Jamaica Bay, located approximately 3 miles south of the site. The depth to groundwater was found to be approximately 10 to 14 feet bgs throughout the study area. Water table elevations range from 22 feet above mean sea level (amsl) at OU1 to 15 feet amsl at the south edge of OU2.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department considered the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating the amended remedy for soil and/or groundwater remediation. Since this operable unit only addresses off-site groundwater, land use considerations were not applicable.

The DEP's Queens Groundwater Reactivation project involves the reactivation of their existing groundwater supply system in southeast Queens, which withdraws water from three underground aquifers. The Queens groundwater system may be needed in the near future as the DEP prepares to make repairs to one of its most-active aqueducts that brings water from upstate reservoirs. Most of the system has not operated in more than 10 years, but the Queens groundwater system did provide water to a limited portion of the city's distribution system until 2007. To maximize potable supply from the existing well systems, reactivation of wells in the vicinity of the Station 24 by DEP may be necessary.

Potential water quality issues are a concern with re-activating and operating the Queens groundwater system, in part due to the presence of VOCs. With the extensive monitoring groundwater network already in place at the Site, water quality data and groundwater flow conditions will be closely monitored as part of the remedy. Implementation of the remedy and evaluation of the potential impacts of remedy implementing with groundwater supply well reactivation will be closely coordinated with NYSDOH and DEP moving forward.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The current owner of the site is the West Side Corporation and Sheldon Schiff. Other PRPs currently identified include:

Dow Chemical
PPG Industries
Ethyl Corporation

SECTION 6: SITE CONTAMINATION

6.1 Summary of Environmental Assessment

6.1.1 OU1: Remediation of on-site soils is complete and under site management. Prior to remediation, the primary contaminant of concern was PCE in soil and groundwater.

6.1.2 OU2: Based upon investigations conducted to date, and as depicted in *Figures 4, 5, and 6* and summarized in *Table 1* of this AROD, the main categories of contaminants that exceed their SCGs are VOCs, specifically PCE and its breakdown products. For comparison purposes, where applicable, SCGs are provided for groundwater.

Soil - Soil contamination was not identified in OU2.

Groundwater - November 2012 groundwater data demonstrated that influent, untreated groundwater PCE concentrations were substantially lower than originally estimated during remedial design. In the intervening years since the remedy was selected and designed, the plume near the source has attenuated due to the removal of the on-site source (i.e., the OU1 remedy). The recent data also indicated that the dissolved PCE plume is currently present across a greater areal extent and farther south from the site, with the most significant remaining contamination now beyond the identified capture zone of the GWET system.

The direction of plume movement remains consistent with the southwesterly regional flow direction. Groundwater samples collected from the monitoring well network in 2012 were consistent in showing that PCE contamination extends deeper into the aquifer with increasing distance from OU1, with the most widespread contamination in the intermediate zone. Water quality data obtained from existing monitoring wells continue to indicate that shallow and intermediate PCE contamination predominates to the north of 174th Street, while deeper contamination predominates southward to 166th Street.

Soil Vapor and Indoor Air – Soil vapor was found to be impacted by site-related contamination. Since May 2005, the Department and the NYSDOH have tested the indoor air and sub-slab soil vapor in over 170 buildings near the Site. Based on several years of testing, the extent of the SVI study area has been well-established. Periodic monitoring will continue until the Department, in consultation with NYSDOH, determines that further testing is not needed.

6.2 Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as exposure.

People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of overlying buildings, is referred to as SVI. Sub-slab depressurization systems (systems that ventilate/remove the air beneath the building) have been installed in both the on-site building and off-site buildings to prevent the indoor air quality from being affected by the contamination in soil vapor beneath the buildings. A monitoring program is in place to further evaluate the potential for exposure via SVI in off-site buildings.

SECTION 7: SUMMARY OF ORIGINAL REMEDY

7.1 Original Remedy

The remedy originally selected in the February 2002 ROD for West Side Corporation OU2 site included:

1. The installation of a high capacity (750 to 1,100 gpm) groundwater extraction well and treatment system. The extraction well would be located on property owned by the DEP. This well would prevent the further migration of contaminated groundwater and would reduce the concentration of contaminants in groundwater around the site. Collected water would be treated to remove contamination and disposed in the local storm sewer system. The treatment system would consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), and a granular activated carbon system or other acceptable components would be determined during the design phase.

2. Modification of the on-site OU1 remedy as necessary by deleting the downgradient groundwater extraction wells and containment system (with Well 24 New, these wells would be redundant) and possibly adding a well(s) in the source area for the extraction and containment of highly contaminated groundwater from OU1. Modification of the on-site treatment system as necessary.

3. A long-term monitoring program would be undertaken to evaluate the effectiveness of the remedy as part of the overall site management program for the site.

SECTION 8: DESCRIPTION OF CHANGES

8.1 New Information

In accordance with the OU2 ROD, a GWET system was constructed and was operated by the Department for approximately three months from August 2012 until November 2012. During operations, each recovery well extracted groundwater at the design rate of approximately 750 to 770 gpm.

Since issuance of the original ROD, and following operation of the GWET system, new site information has been obtained as follows: 1) a significant decrease in VOC contaminant concentrations in groundwater was identified in the area to be addressed by the GWET; 2) the actual, as compared to an estimated, capture zone area for the GWET system was determined during the operational period; and 3) a change in the areal extent of the PCE plume was identified. Based on this new information, a Focused Feasibility Study (FFS) was completed by the Department in March 2013 which re-evaluated viable remedial options. Alternatives evaluated included the continued operation of the constructed GWET system and the use of ISCO using permanganate, which is a common

oxidant demonstrated to have significant effectiveness in oxidizing chlorinated ethenes such as PCE. The FFS evaluation supports the ISCO alternative.

8.1.1 Decrease in PCE Groundwater Concentrations

During GWET system operations in 2012, groundwater samples from the two extraction wells and the effluent from the carbon treatment system following treatment were collected. Analytical data revealed that PCE concentrations for the influent, untreated groundwater from extraction well No. 1 ranged from 89 ppb to 230 ppb and from 28 ppb to 47 ppb from extraction well No. 2. These influent concentrations were substantially lower than the originally anticipated influent concentrations of 2,400 ppb estimated during the design (which were based on plume concentrations at that time).

The current contaminant concentrations correspond to a unit treatment cost of about $2,800 per pound of contaminant removed at an estimated annual cost of $2 million to operate the GWET system. At the design influent concentration, the unit treatment cost would have been much lower, at about $125 per pound of contaminant removed. However, in the intervening years since the design basis was established, the plume near the source has attenuated primarily due to the remediation of the PCE source at OU1.

8.1.2 GWET System Capture Zone Area

Figure 2 depicts the actual groundwater elevation contours observed during system operation and the groundwater elevation contours estimated during engineering modeling. The inferred capture area, shown in ***Figure 3***, is estimated to recover groundwater from between 900 and 1,300 feet south-southwest of the extraction wells, roughly half as far as had been originally predicted by modeling conducted during remedial design of the original remedy.

8.1.3 Current PCE Plume Location

Fifty-one groundwater monitoring wells were sampled three times during the GWET system operation period, in August, September, and November, 2012. ***Figures 4 through Figure 6*** provide PCE contaminant contour lines in the shallow, intermediate and deep groundwater zones. These figures, based on 2012 data, were compared to the 2008 PCE data that was used for the GWET system design.

- <u>OU1 Groundwater:</u> An in-situ biological treatment pilot study was initiated in February 2012 to treat residual groundwater contamination near the former source area. The most recent in-situ treatment occurred in October 2012. In contrast to PCE concentrations existing at the time of the RI (210,000 ppb), PCE concentrations were found to have been significantly reduced by remediating the source and by in-situ treatment to the range of non-detect to 91 ppb based upon groundwater sampling most recently conducted by the Department in September 2013.

- Shallow Groundwater Zone: In contrast to the results of the 2008 sampling event, there is no longer a 1,000 ppb PCE contaminant contour line since the maximum detected concentration was 670 ppb in monitoring well W-04S. The areal extent of the 100 ppb PCE contour line is also much smaller, and approximately in the location of the previous 1,000 ppb contour line. The 10 ppb PCE contour line has approximately the same areal extent. All of this shallow groundwater contamination is still within the capture zone of the GWET system.

- Intermediate Groundwater Zone: In contrast to the results of the 2008 sampling, the highest PCE concentrations in 2012 were detected in this depth zone and no longer were present near the recovery wells. The highest concentrations of PCE have migrated downgradient as evidenced by the 1,000 ppb contour line. This portion of the intermediate depth plume, containing PCE at up to 3,900 ppb, was determined to be beyond the capture zone of the GWET system. ***Figure 5*** shows that the 100 ppb PCE contour line also extends farther south.

- Deep Groundwater Zone: PCE concentrations appear to be lower near the former on-site source area with the exception of monitoring well W-01D (420 ppb in 2012 as compared to 7.4 ppb in 2008). There still is no 1,000 ppb PCE contour line. The 100 ppb PCE contour line incorporates the small area around monitoring well W-01D, and south of the source area incorporating monitoring well W-08D (120 ppb) and monitoring well W-10D (160 ppb). The 2012 100 ppb contour has shifted to the south and east of the similar 2008 100 ppb contour. The 10 ppb PCE contour line has expanded to the west and south as PCE was detected in monitoring wells where it was previously not detected (monitoring wells W-12D and W-13D). The location of the southernmost edge of the 10 ppb contour is estimated as depicted on ***Figure 6***. Less than half of the deep portion of the plume is now within the GWET system capture zone.

This new information is the primary basis for the Department's decision to amend the February 2002 OU2 ROD document for the West Side Corporation Site.

8.2 Changes

The primary change to the remedy, compared to the remedy selected in the February 2002 OU2 ROD, is the approach to address the VOC contamination in groundwater. This is a fundamental change to the original remedy selected in the previous ROD, but is a more streamlined and effective approach to removing the remaining contaminant mass in the groundwater. The following section describes the elements of the AROD relative to the original OU2 ROD document.

Based on the evaluation in the FFS, the Department has amended the OU2 ROD to eliminate operation and permanently shutdown the GWET system and include permanganate injection in the shallow and intermediate groundwater zones. To achieve the goals of bulk reduction in groundwater contaminant concentrations and preventing the potential for vapor intrusion, injection wells will be installed within the shallow groundwater 10 ppb PCE plume, and within the intermediate zone 1,000 ppb PCE plume.

The amended remedy offers the following advantages: 1) it addresses groundwater contamination both within the capture zone of the GWET system as well as downgradient of the groundwater divide that will be created by the GWET system; 2) it reduces the timeframe required for remediation to reduce contaminant concentrations in groundwater; 3) it reduces the timeframe required to address the source of the SVI exposure pathway; and 4) it reduces the cost of site remediation.

The potential for vapor intrusion into overlying buildings is possible from PCE in the shallow groundwater zone at the concentrations detected in 2012. Property owners in the vicinity of the shallow plume area were contacted by the Department and NYSDOH to have their homes tested for vapor intrusion. Not all allowed sampling. Based on the analytical results, the Department and NYSDOH have made recommendations for over 170 residences in the zone overlying the shallow groundwater plume. In total, 40 residences were offered mitigation systems, 10 residences are receiving additional ongoing vapor intrusion monitoring, 22 residences will be re-sampled to evaluate whether site-related contamination is present, 16 new residential structures will be offered to be sampled, 109 residences require no further action, and 30 residences currently have mitigation systems in place, requiring no further action. Although never sampled, an additional 6 residences were offered mitigation systems based upon their location over the shallow zone of the groundwater plume.

To provide for long-term protection of human health and to meet the remedial goal of preventing the potential for vapor intrusion, remediation of groundwater within the 10 ppb PCE plume in the shallow groundwater zone is included in the permanganate injection remedy.

In summary, changes to the February 2002 ROD remedy include the following:

- Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31;

- Permanent shutdown of the GWET system operation;

- The installation of a network of ISCO injection wells located within the shallow and intermediate groundwater zones;

- Multiple rounds of injections of a permanganate solution into the shallow and intermediate groundwater zones;

- The installation of additional monitoring wells within the shallow, intermediate and deep groundwater zones to assist in future plume delineation, allow further evaluation of SVI off-site, and monitor the effectiveness of the ISCO treatment as well as natural attenuation outside the treatment area;

- The ongoing vapor intrusion mitigation program will continue to monitor soil gas levels at adjacent residences and assess the need for additional sub-slab depressurization system installations. Additional system installations will be conducted as necessary in the future to provide mitigation; and

- Development of a Site Management plan.

SECTION 9: EVALUATION OF CHANGES

9.1 Remedial Goals

Goals for the cleanup of the site were originally established in the February 2002 OU2 ROD.

9.2 Evaluation Criteria

The criteria used to compare the remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each criterion, a brief description is provided. A detailed discussion of the evaluation criteria and comparative analysis is presented in the 2013 FFS.

The first two evaluation criteria are called threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. **Protection of Human Health and the Environment.** This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

   The original GWET system remedy would be protective of public health and the environment, but only for that portion of the PCE plume within the capture zone which extends about 900 to 1,300 feet downgradient from the GWET recovery wells, to approximately 111th Avenue and 174th Street (i.e., the groundwater divide). However, the amended remedy of permanganate injection will extend over the entire PCE plume area within the shallow overburden zone and the highest concentrations of the intermediate plume on both sides of the groundwater divide, thus providing a remedy more protective of public health and the environment since it addresses the currently defined plume.

2. **Compliance with New York State Standards, Criteria, and Guidance (SCGs).**

   Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards and guidance. The original remedy would not be effective in meeting SCGs downgradient of the GWET capture zone. Groundwater SCGs will be met in the shallow groundwater zone for the amended remedy and will significantly reduce the higher concentrations of the intermediate plume. The amended remedy is expected to achieve SCGs in a wider area of the plume.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. **Short-term Effectiveness.** The potential short-term adverse impacts of the remedial action upon the community, workers, and the environment during construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

   The original remedy is already constructed. Therefore, it poses no additional construction impacts. It would pose limited adverse impacts to the community, workers and the environment during the anticipated twenty-year operation period. The amended remedy will pose relatively minor adverse impacts to the community throughout the construction period for the well installation (e.g., noise, traffic impacts) during injection and multiple sampling events scheduled over an anticipated five-year period. These will be managed through an appropriate health and safety program, a spill control program, and community air monitoring. The amended remedy also provides protection in a shorter time period (estimated at five years versus twenty years) for both groundwater remediation and the potential for SVI. The original remedy would result in the potential for fewer short-term impacts.

4. **Long-term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks; 2) the adequacy of the engineering and/or institutional controls intended to limit the risk; and 3) the reliability of these controls.

   Since remediation of source soils at OU1 is complete and on-site groundwater contaminant concentrations have been significantly reduced, additional aquifer contamination from source material is expected not to occur. Therefore, groundwater remediation is considered effective and permanent for the original remedy, but only for that portion of the PCE plume within the effective capture zone and considered effective and permanent for the amended remedy upgradient and downgradient of the capture zone. For the original remedy, PCE contamination beyond the groundwater divide would remain untreated and continue to migrate downgradient. The amended remedy includes remediation of the entire PCE plume in the shallow overburden and within the higher concentration areas of the intermediate groundwater zone. PCE contamination in the remaining portion of the intermediate plume and in the deep groundwater zone will attenuate naturally. The amended remedy will provide a greater degree of long-term permanence and effectiveness.

5. **Reduction of Toxicity, Mobility or Volume.** Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

The original remedy uses extraction wells to hydraulically contain a portion of the PCE plume, thereby limiting its mobility in the aquifer. However, downgradient of the capture zone, the PCE plume would continue to migrate horizontally and vertically. Both the original and amended remedies provide groundwater remediation and reduce the toxicity and volume of contaminants through treatment; the original remedy through above-ground treatment and the amended remedy through in-situ treatment. The original remedy remediates the shallow and potentially the intermediate groundwater zones within the groundwater divide; the amended remedy remediates the shallow groundwater and highest concentrations within the intermediate zone within the 10 ppb and 1,000 ppb PCE plumes, respectively. The amended remedy will provide a greater reduction of toxicity, mobility and volume.

6. **Implementability.** The technical feasibility and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor the effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

   Since there are no additional construction activities and the system was previously operated for three months, there aren't any construction related or operation issues for the implementability of the original remedy. All approvals and permits are already in place. Implementation of the amended remedy will be more arduous as it includes installation of an estimated 84 injection wells within public right of ways (i.e., sidewalks, roads, etc.) to an approximate depth of between 30 to 60 feet bgs within the remediation zone. The amended remedy also includes multiple injection and sampling events to monitor the effectiveness of the remedy. Since well installation to a depth of 60 feet is relatively shallow, and permanganate is a commonly used oxidant, there are no major vendor or implementation difficulties anticipated. While the original remedy, now in place, is more implementable, no significant implementability issues are anticipated with the amended remedy.

7. **Cost-Effectiveness.** Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

   Implementation of the amended remedy will decrease the present worth cost of remediation by an estimated $17,765,000. The estimated present worth cost for the original GWET remedy is $24,987,000. This does not include the cost for construction of the GWET remedy since it is already constructed. It includes a $2,005,000 annual present worth cost for implementation of operation, maintenance, and monitoring activities for the remedy over a 20-year period. The estimated present worth cost of the amended remedy is $7,222,000. This cost includes $7,200,000 for construction of the remedy and a $22,000 average annual present worth cost for implementation of operation, maintenance, and monitoring activities for the remedy based on annual $5,000

monitoring costs over a five-year period. The amended remedy is a significantly more cost-effective remedy. See *Table 2*.

This final criterion is considered a modifying criterion and is considered after evaluating those above. It is focused upon after public comments on the proposed ROD amendment have been received.

8. **Community Acceptance.** Concerns of the community regarding the changes were evaluated. There were no public comments received. As a result, a responsiveness summary has been prepared that indicates that there were no public comments received (Appendix A).

SECTION 10: SUMMARY OF THE AMENDED ROD REMEDY

The Department has amended the ROD for the West Side Corporation OU2 site. The elements of the amended remedy are as follows:

- A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31;

- Permanent shutdown of the GWET;

- Installation of a network of permanganate injection wells within the 10 ppb PCE plume in the shallow groundwater zone along 174th, 175th, 176th, and 177th Streets and within the 1,000 ppb PCE plume in the intermediate groundwater zones on Sayres Avenue immediately east and west of Merrick Boulevard;

- Multiple rounds of injections of a permanganate solution into the shallow and intermediate groundwater zones;

- Installation of new monitoring well clusters south of Linden Avenue downgradient of the leading edge of the PCE plume to assist in plume delineation and assess the effectiveness of remediation. The leading edge of the plume will be determined following a synoptic round of groundwater level measurements during the design phase;

- A long-term monitoring program will be completed to evaluate the effectiveness of the remedy as part of the overall site management program for the site;

- The ongoing vapor intrusion mitigation program will continue to monitor soil gas levels at adjacent residences and assess the need for additional sub-slab depressurization system installations. Additional system installations will be conducted as necessary in the future to provide mitigation; and

- A Site Management plan is required, which will include the following:

    a. Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

        - Performance monitoring will be conducted at regular intervals following each injection event for: color and field parameters (pH, specific conductivity, dissolved oxygen, and oxidation/reduction potential) in all injection and monitoring wells in the vicinity of, or downgradient of, injection wells.

        - Following the first injection event, a round of groundwater samples will be collected and analyzed for VOCs, metals, and alkalinity to determine the performance of the injection event and the need for revisions to subsequent injection events.

        - Any subsequent injection events will follow a similar performance monitoring schedule. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible;

        - With the extensive monitoring groundwater network already in place at the Site, water quality data and groundwater flow conditions will be closely monitored as part of the remedy. Implementation of the remedy and evaluation of the potential impacts of remedy implementing with groundwater supply well reactivation will be closely coordinated with NYSDOH and DEP moving forward.

        - An evaluation of the potential for SVI will occur off-site including provisions for implementing actions recommended to address exposures related to SVI if needed.

        - The operation and maintenance of the existing sub-slab vapor mitigation systems will be continued as determined necessary.

TABLE 1
Nature and Extent of Contamination 2012

OFF-SITE SHALLOW GROUNDWATER[c]	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Organic Compounds	Tetrachloroethene	ND to 670	5	22 of 29
	Chloroform	ND to 30	7	2 of 11
	cis-1,2-Dichloroethene	ND to 340	5	8 of 15
	Trichloroethene	ND to 76	5	5 of 19
	Vinyl Chloride	ND to 3.8	2	1 of 3

OFF-SITE INTERMEDIATE GROUNDWATER[c]	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Organic Compounds	Tetrachloroethene	ND to 3,900	5	42 of 49
	Chloroform	ND to 0.39	7	0 of 2
	1,1-Dichloroethane	ND to 2.9	5	0 of 7
	cis-1,2-Dichloroethene	ND to 780	5	33 of 37
	Trichloroethene	ND to 530	5	32 of 41
	1,1-Dichloroethene	ND to 1.7	5	0 of 4
	trans-1,2-Dichloroethene	ND to 12	5	1 of 3

OFF-SITE DEEP GROUNDWATER[c]	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Organic Compounds	1,1-Dichloroethane	ND to 15	5	3 of 27
	1,1-Dichloroethene	ND to 6.5	5	2 of 20
	Tetrachloroethene	ND to 420	5	31 of 41
	cis-1,2-Dichloroethene	ND to 520	5	35 of 39
	Trichloroethene	ND to 350	5	18 of 36
	trans-1,2-Dichloroethene	ND to 1.9	5	1 of 3
	Vinyl Chloride	ND to 0.93	2	0 of 2

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
[b] SCG = standards, criteria, and guidance values. NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, April 2000.
[c] Shallow Groundwater Zone = 10 feet bgs to 30 feet bgs;
Intermediate Groundwater Zone = 30 feet bgs to 60 feet bgs;
Deep Groundwater Zone = 60 feet bgs to 90 feet bgs;
ND = non-detect

TABLE 2
Estimated Present Worth Cost Comparison

REMEDY	*Groundwater (Million)
Original OU2 ROD Remedy	$25.0
Amended OU2 ROD Remedy	$7.2

* For original OU2 ROD remedy the cost estimate includes on-site and off-site collection and treatment of contaminant plume as currently defined along with long term operation and maintenance.

FIGURE 1

SITE LOCATION

500 0 500 Feet

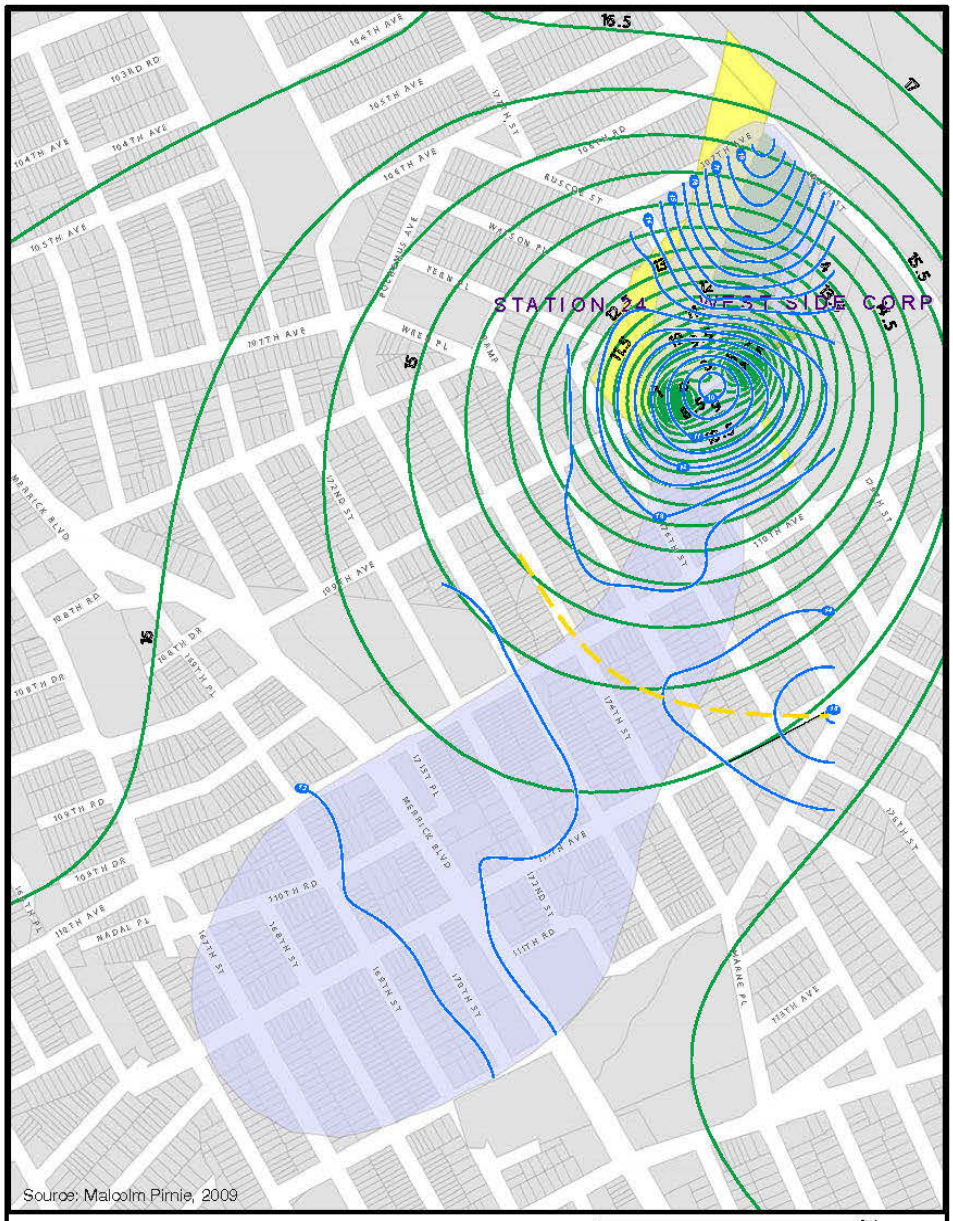
Source: Bing Maps Aerial © 2010 Microsoft Corporation

N:\11173144.00000\DB\GIS\ROD Amendment\01 SITE LOCATION rev1.mxd 6/13/2013

URS	WEST SIDE CORPORATION JAMAICA, NEW YORK SITE LOCATION	FIGURE 1

FIGURE 2

STATION 24 PREDICTED GROUNDWATER CONTOURS FOLLOWING 1-YEAR OF PUMPING AND ACTUAL CONTOURS FOLLOWING 3 MONTHS OF PUMPING



West Side Corp

Station 24 (based on 2006 PLUTO)

PCE (ppb) Plan-View depiction of plume, representative of highest PCE concentrations obtained from all sampled depths by Malcolm Pirnie, 2009

Predicted head (groundwater elevation) contour (ft) after 12 months of pumping

Actual head (groundwater elevation) contour (ft) after 3 months of pumping

Approximate Groundwater Divide

0 250 500 1,000 Feet

URS

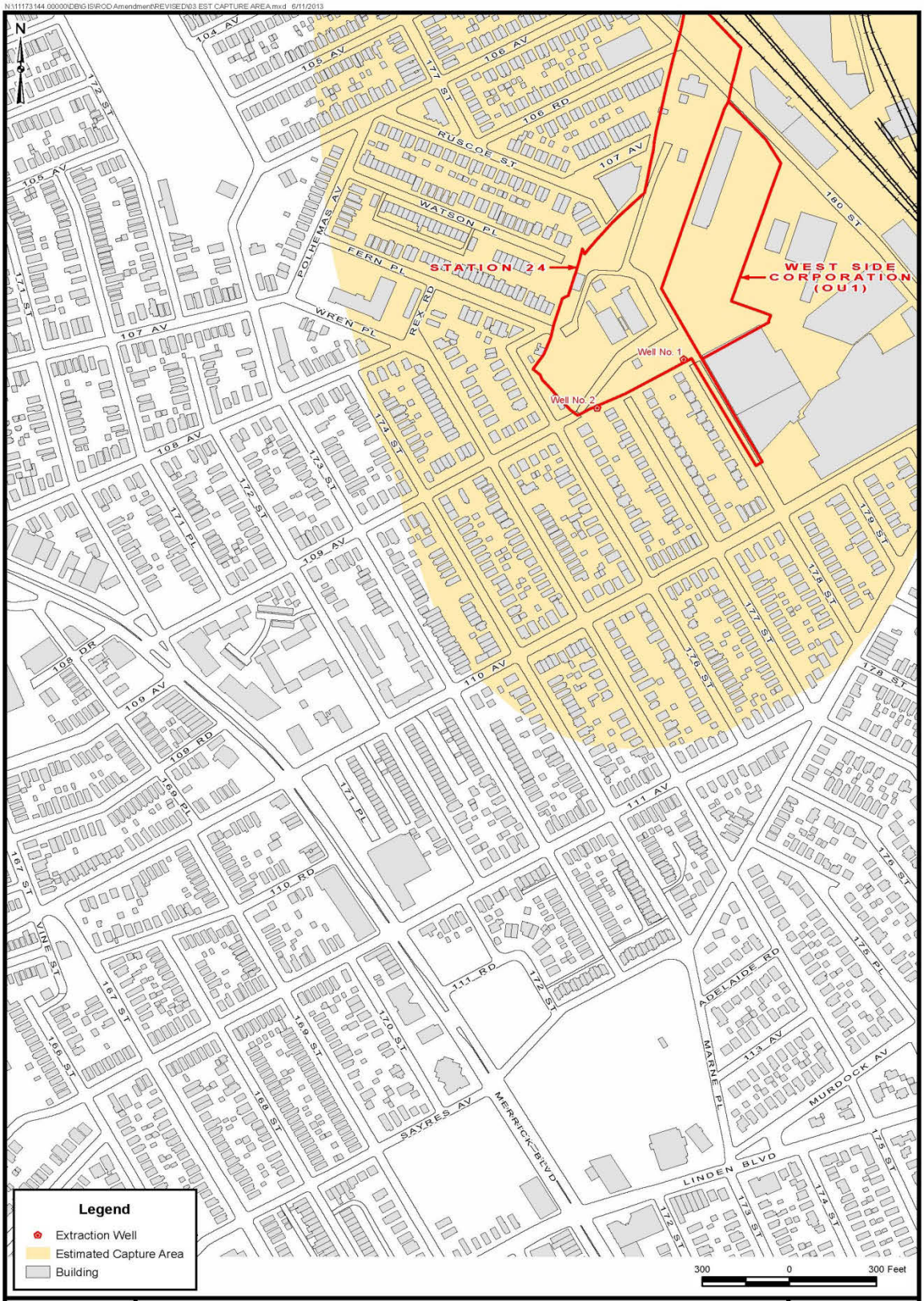
STATION 24 PREDICTED GROUNDWATER CONTOURS FOLLOWING 1-YEAR OF PUMPING AND ACTUAL CONTOURS FOLLOWING 3 MONTHS OF PUMPING

Figure 2

FIGURE 3

ESTIMATED CAPTURE AREA

N:\11173144.00000\DBIGIS\ROD Amendment\REVISED\03 EST CAPTURE AREA.mxd 6/11/2013

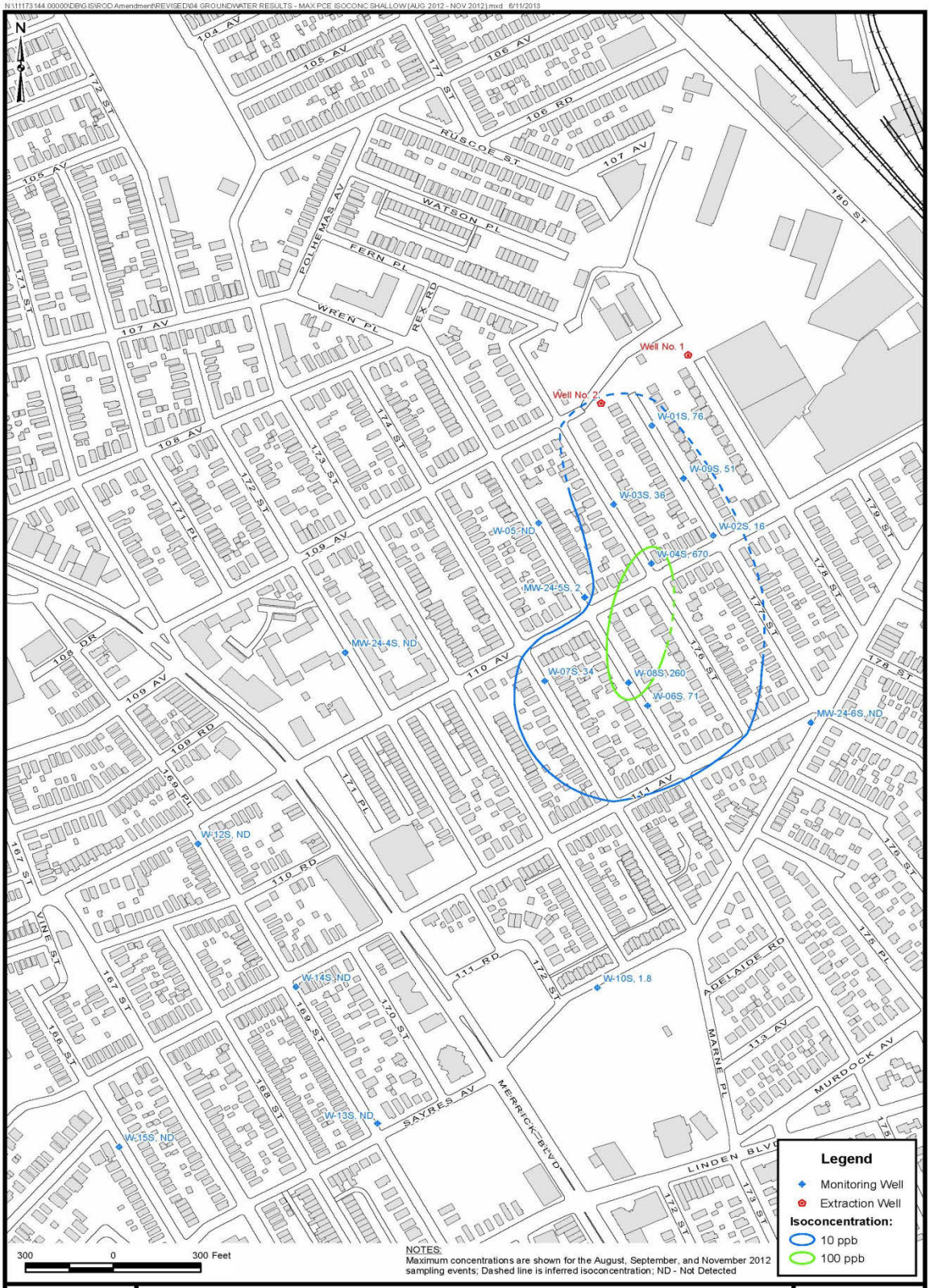


URS	WEST SIDE CORPORATION JAMAICA, NEW YORK ESTIMATED CAPTURE AREA	FIGURE 3

FIGURE 4

GROUNDWATER SAMPLING RESULTS FOR PCE IN SHALLOW MONITORING WELLS

N:\11173144.00000\DEIGIS\ROD Amendment\REVISED\04 GROUNDWATER RESULTS - MAX PCE ISOCONC SHALLOW (AUG 2012 - NOV 2012).mxd 6/11/2013



NOTES:
Maximum concentrations are shown for the August, September, and November 2012 sampling events; Dashed line is inferred isoconcentration; ND - Not Detected

URS

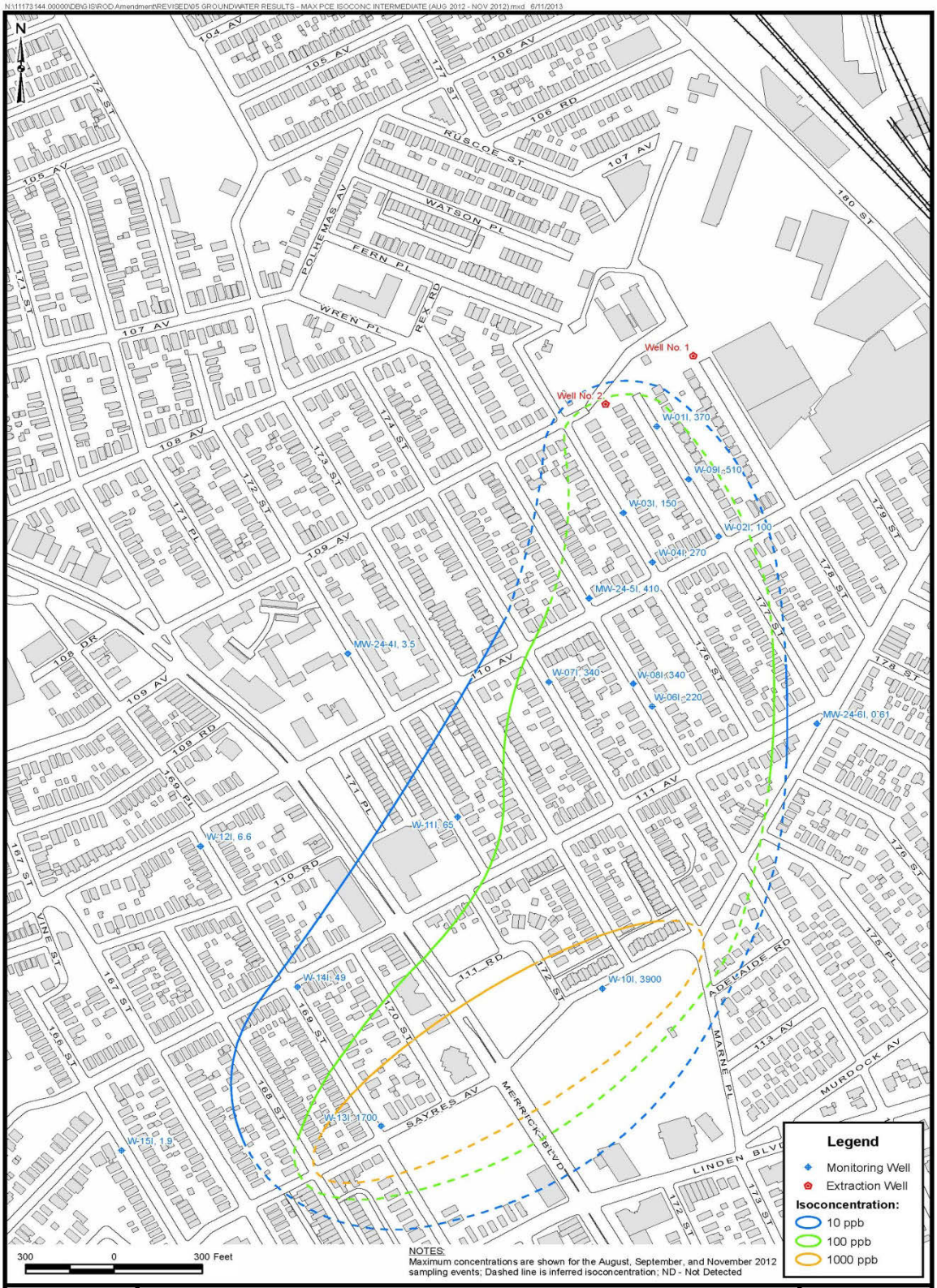
WEST SIDE CORPORATION
JAMAICA, NEW YORK
GROUNDWATER SAMPLING RESULTS FOR PCE IN SHALLOW MONITORING WELLS

FIGURE 4

FIGURE 5

GROUNDWATER SAMPLING RESULTS FOR PCE IN INTERMEDIATE MONITORING WELLS

N:\11173144.00000\DEIS\ROD Amendment\REVISED\05.GROUNDWATER RESULTS - MAX PCE ISOCONC INTERMEDIATE (AUG 2012 - NOV 2012).mxd 6/11/2013



NOTES:
Maximum concentrations are shown for the August, September, and November 2012 sampling events; Dashed line is inferred isoconcentration; ND - Not Detected

URS

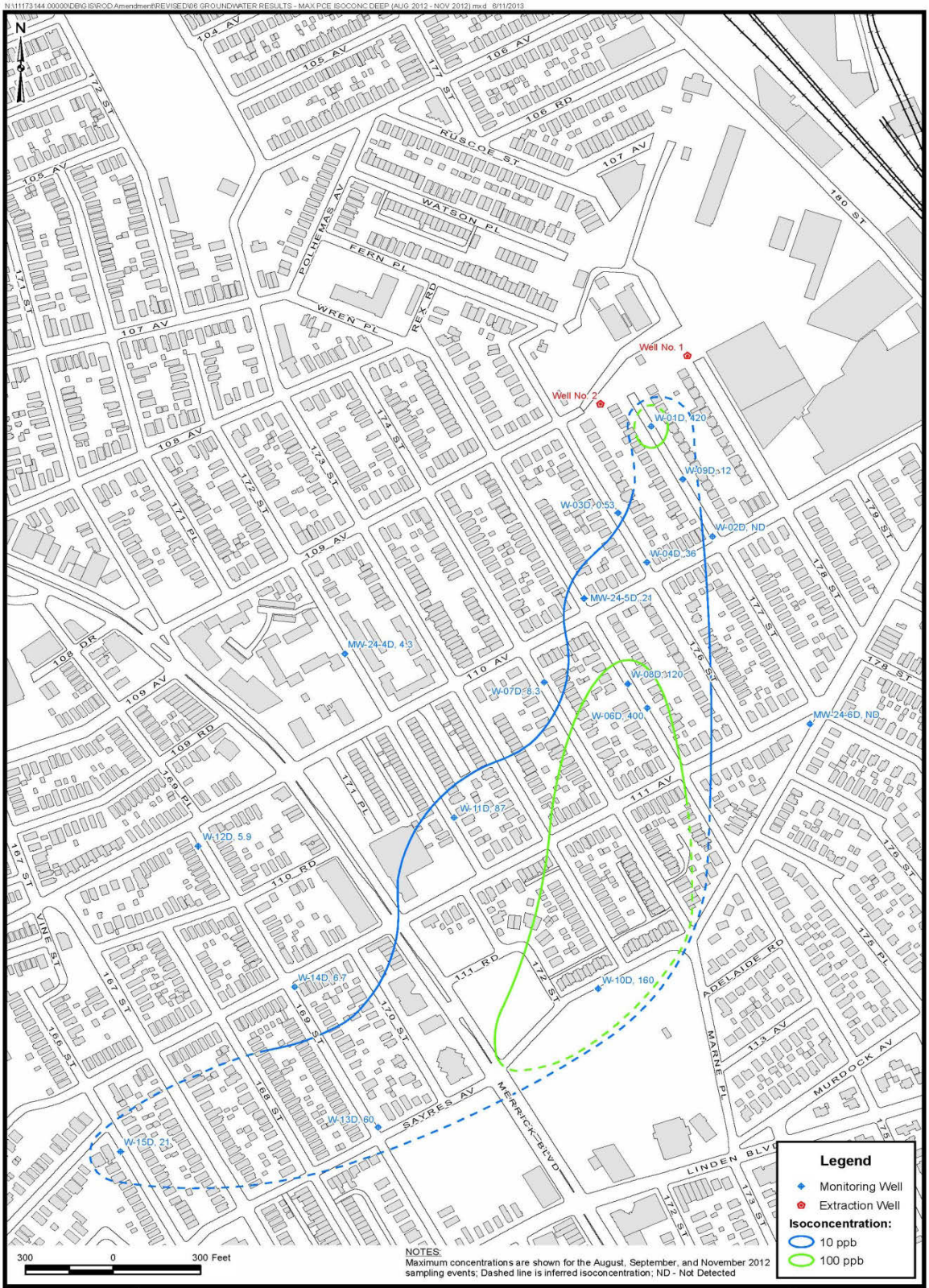
WEST SIDE CORPORATION
JAMAICA, NEW YORK
GROUNDWATER SAMPLING RESULTS FOR PCE IN INTERMEDIATE MONITORING WELLS

FIGURE 5

FIGURE 6

GROUNDWATER SAMPLING RESULTS FOR PCE IN DEEP MONITORING WELLS

N:\11173144.00000\DEIGIS\ROD Amendment\REVISED\06 GROUNDWATER RESULTS - MAX PCE ISOCONC DEEP (AUG 2012 - NOV 2012).mxd 6/11/2013



NOTES:
Maximum concentrations are shown for the August, September, and November 2012 sampling events; Dashed line is inferred isoconcentration; ND - Not Detected

URS

WEST SIDE CORPORATION
JAMAICA, NEW YORK
GROUNDWATER SAMPLING RESULTS FOR PCE IN DEEP MONITORING WELLS

FIGURE 6

APPENDIX A

Responsiveness Summary

West Side Corporation
Operable Unit Number 2: Remedial Program Offsite Groundwater
State Superfund Project
Jamaica, Queens County
Site No. 241026

The Proposed Amendment to the Record of Decision (PAROD) for the West Side Corporation Site Operable Unit No. 2 was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on October 21, 2013. The PAROD outlined the amended remedial measure proposed for the contaminated off-site groundwater at the West Side Corporation Site Operable Unit No. 2.

The release of the PAROD was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed amendment to the ROD remedy.

A public meeting was held on Wednesday, November 13, 2013, which included a presentation of the original ROD remedy, the circumstances that have led to proposed changes in the February 2002 ROD remedy, as well as a discussion of the proposed amendment to the ROD remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed amendment to the ROD remedy. The public comment period for the PAROD ended on Friday, December 6, 2013.

This responsiveness summary responds to all questions and comments raised during the public comment period. There were no comments received at that meeting or during the public comment period.

APPENDIX B

Administrative Record

Administrative Record

West Side Corporation
Operable Unit Number 2: Remedial Program Offsite Groundwater
State Superfund Project
Jamaica, Queens County
Site No. 241026

1. Proposed Amendment to the Record of Decision for the West Side Corporation Site Operable Unit Number 2, dated October 2013, prepared by the Department.

2. Fact Sheet-Proposed Record of Decision Amendment for the West Side Corporation-Operable Unit No.2 (OU2) Site, dated October 2013, prepared by the Department.

3. Focused Feasibility Study Report, dated March 2013, prepared by URS Corporation.

4. Station 24 Treatment System Operations Report, dated March 2013, prepared by URS Corporation.

5. Record of Decision Operable Unit No. 2 (Off-Site) - February 2002, prepared by the Department.

6. Fact Sheets dated November 2001 and February 2002, prepared by the Department.

7. Off-Site Feasibility Study (FS) Report dated January 2002, prepared by TAMs & GZA GeoEnvironmental, for the Department.

8. Proposed Remedial Action Plan (PRAP) Operable Unit No. 2 (Off-Site), dated November 2001, prepared by the Department.

9. Final Off-Site Remedial Investigation (RI) Report dated May 2001, prepared by TAMs & GZA GeoEnvironmental, for the Department (Volume 1).

10. Final Off-Site Remedial Investigation (RI) Report dated May 2001, prepared by TAMs & GZA GeoEnvironmental, for the Department (Volume 2).

11. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for the Department(Volume 1).

12. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for the Department (Volume 2).

13. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for the Department (Volume 3).

14. Final Feasibility Study (FS) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for the Department.

15. Record of Decision, Operable Unit No. 1 (On-Site) - July 2000, prepared by the Department.

16. Work Plan Addendum - dated May 2000.

17. Proposed Remedial Action Plan (PRAP), Operable Unit No. 1 (On-Site) dated February 2000, prepared by the Department.

18. Citizen's Participation Plan prepared by the Department- May 1999.

19. RI/FS Project Management Plan - Dated January 1999, prepared by TAMs Consultants.

20. RI/FS Health and Safety Plan - Dated December 1998, prepared by TAMs Consultants.

21. RI/FS Field Activity Plan - Dated December 1998, prepared by TAMs Consultants.

22. RI/FS Quality Assurance Project Plan - Dated December 1998, prepared by TAMs Consultants.

23. Notice of site classification dated August 11, 1997, and Inactive Hazardous Waste Disposal Report Form.

24. Phase II Subsurface Report February 1992, prepared by EEA, Inc.

EXHIBIT A
FEBRUARY 2002 RECORD OF DECISION

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

West Side Corporation Site

Operable Unit No. 2 (Off Site)

Jamaica, Queens County

Site Number 2-41-026

February 2002

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* ERIN M. CROTTY, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

West Side Corporation Inactive Hazardous Waste Site
Operable Unit No. 2 (Off Site)
Jamaica, Queens County, New York
Site No. 2-41-026

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the West Side Corporation Class 2 inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law. The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the West Side Corporation inactive hazardous waste site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and the environment.

Description of Selected Remedy

Based on the results of the Off-site Remedial Investigation/Feasibility Study (RI/FS) for the West Side Corporation Site (OU-2) and the criteria identified for evaluation of alternatives, the NYSDEC has selected **Groundwater Extraction and Treatment** to address contaminated groundwater in the off-site study area. The components of the remedy are as follows:

- The installation of a high capacity (750 to 1,100 gallon per minute) groundwater extraction well and treatment system. The extraction well will be located on property owned by the New York City Department of Environmental Protection (NYCDEP). This well will prevent the further migration of contaminated groundwater and will reduce the concentration of contaminants in groundwater around the site. Collected water will be treated to remove contamination and disposed in the local storm sewer system. The treatment system will consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), and a granular activated carbon system or other acceptable components to be determined during the design phase.

- Modification of the on-site remedy (Operable Unit No.- 1) as necessary by deleting the downgradient groundwater extraction wells and containment system (with Well 24New, these wells would be redundant) and possibly adding a well(s) in the source area for the extraction and

containment of highly contaminated groundwater from Source Area 1. Modification of the on-site treatment system as necessary.

- A long-term monitoring program will be completed to evaluate the effectiveness of the remedy as part of the overall Operation, Maintenance, and Monitoring (OM&M) program for the site.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

_____ _____

Date

Susan Taluto, Deputy Commissioner
Office of Water and Environmental Remediation

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RECORD OF DECISION

WEST SIDE CORPORATION SITE
Operable Unit No. 2 (Off Site)
Jamaica, Queens County, New York
Site No. 2-41-026
February 2002

SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) has selected this remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the West Side Corporation Site, a Class 2 inactive hazardous waste disposal site. As discussed below, the investigation of this site has been divided into two "Operable Units" (OU). Operable Unit No. 1 addresses on-site contamination. Operable Unit No. 2 addresses off-site contamination and is the subject of this document.

As more fully described in Sections 3 and 4 of this document, the site was used as a storage and distribution center for dry-cleaning chemicals from the early 1970s to 1992. Perchloroethylene (PCE), a chemical commonly used in dry cleaning, was unloaded from trucks and railroad cars into aboveground tanks on site. PCE was then transferred to 55-gallon drums for distribution to dry cleaning facilities. Apparently, improper handling of the chemicals has resulted in the disposal of PCE (a hazardous waste) at the site. Soil and groundwater at the site are contaminated with PCE and contaminated groundwater has migrated from the site to the south and east. These disposal activities have resulted in the following significant threats to the public health and/or the environment:

- a significant threat to human health associated with migration of contaminated groundwater off site in an aquifer used elsewhere as a source of potable water.

- a significant environmental threat associated with the contamination of groundwater.

In order to eliminate or mitigate the significant threats to the public health and/or the environment caused by the contamination of off-site groundwater from the West Side Corporation Site, the following remedy was selected:

- The installation of a high capacity (750 to 1,100 gallon per minute) groundwater extraction well and treatment system. The extraction well will be located on property owned by the New York City Department of Environmental Protection (NYCDEP). This well will prevent the further migration of contaminated groundwater and will reduce the concentration of contaminants in groundwater around the site. Collected water will be treated to remove contamination and disposed in the local sewer system. The treatment system will consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), and a granular activated carbon system or other acceptable components to be refined during the design phase.

- Modification of the on-site remedy (Operable Unit No.- 1) as necessary by deleting the downgradient groundwater extraction wells and containment system (with Well 24New, these wells would be redundant) and possibly adding a well(s) in the source area for the extraction and containment of highly contaminated groundwater from source area 1. Modification of the on-site treatment system as necessary.

- A long-term monitoring program will be completed to evaluate the effectiveness of the remedy as part of the overall Operation, Maintenance, and Monitoring (OM&M) program for the site.

The selected remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for this site in Section 6 of this Record of Decision (ROD), in conformity with applicable standards, criteria, and guidance (SCGs).

SECTION 2: SITE LOCATION AND DESCRIPTION

The site consists of approximately 4.5 acres of land, located at 107-10 180th Street in Jamaica, New York (see Figures 1 & 2). The Site is owned by West Side Corporation, and includes a brick structure, approximately 21,600 square feet (sf), currently leased by Atlantic Express Transportation (Atlantic), a school bus company. Contamination at the site does not present a threat to people driving the buses or to children riding in the buses. Atlantic has been using the facility for dispatching, repairing, and maintaining school buses.

The surrounding area is mixed commercial and residential. The Site is bordered to the west and south by a NYCDEP maintenance and storage yard. Formerly, the Jamaica Water Supply Company occupied this property west and south of the Site. Several production wells (Nos. 24, 24A, 24B, and 24C) owned by NYCDEP (formerly owned and operated by the Jamaica Water Supply Company) were located to the north, southeast and west of the site and not directly in line with the flow of groundwater from the site (see Figure 2).

These wells were used during periods of high demand, particularly during summer months. Historical data indicate that contaminated groundwater from the site was drawn toward these production wells when they were in operation. When contaminants were detected in these wells during routine monitoring, the wells were taken out of service. This allowed natural groundwater flow patterns to reestablish until the wells were restarted. Well 24 was taken out of service in 1975. Wells 24A, 24B, and 24C were taken out of service in 1982. The natural groundwater flow is toward the south. The contaminated groundwater has migrated off-site toward the south.

Since the early 1980s, public water for the area around the site has come from the NYCDEP public water supply. According to the NYCDEP, over 90% of the public water comes from the New York City upstate water supply system. The remaining water distributed in the Jamaica area comes from groundwater supply wells. However, none of the currently active production wells are located in the area impacted by contamination from the West Side Corporation Site. As with all public water throughout the state, the water from the public water supply is routinely tested to ensure that it is safe for drinking and all other uses.

Operable Unit No. 2, which addresses off-site contamination, is the subject of this ROD. An Operable Unit represents a portion of a site which for technical or administrative reasons is addressed separately from other

Operable Units. The West Side Corporation Site project is divided into two operable units. Operable Unit No. 1 addresses on-site contamination and is described in Section 3.2 below.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The Site was used for the manufacture and distribution of ceramic pipes and fittings until 1969. From about 1969 to 1992, the Site was used as a storage and distribution center for laundromat supplies, hangers, plastic garment bags, and most notably dry cleaning chemicals including large quantities of perchloroethylene (also known as tetrachloroethylene, perc or PCE). The property was operated as the West Side Corporation.

Five 10,000 gallon aboveground storage tanks (ASTs) were located outside the southeast portion of the Site building and were used for the storage of PCE. These tanks were filled via truck tankers and via railroad tanker cars. Railroad tracks were located between the building and the ASTs. The piping from the ASTs extended into the southern portion of the building where PCE was dispensed into 55-gallon drums for distribution to dry-cleaning establishments. Apparently, improper handling of the chemicals has resulted in the disposal of hazardous wastes, primarily PCE, at the site, some of which were released or have migrated in groundwater from the site to surrounding areas, including the properties to the south and east.

Several underground storage tanks (USTs) were reportedly located around the Site building. These tanks were reported as containing diesel and gasoline fuel for delivery and Site vehicles.

3.2: Remedial History

The site was first listed in the Registry in August 1997, on the basis of information contained in a subsurface investigation report provided to the NYSDEC by the New York City Corporation Counsel. The report was prepared by EEA, Inc., apparently for a potential purchaser. Groundwater was found to contain up to 50,000 parts per billion (ppb) of PCE and soil up to 3,100 parts per million (ppm) of PCE according to the report prepared by EEA.

The current owner(s) of the site declined to undertake the remediation of the site. Therefore, a remedial investigation/feasibility study (RI/FS) was initiated by NYSDEC in July 1998 under the NYS superfund program.

During the investigation of Operable Unit No. 1 (on-site), it was determined that groundwater contamination extends downgradient (the direction of groundwater flow) of the site to the south-southwest. A Proposed Remedial Action Plan (PRAP) for Operable Unit No. 1 was released for public comment in February 2000 and a Record of Decision (ROD) was signed on July 31, 2000. The ROD specified groundwater extraction and treatment, hydraulic containment, soil vapor extraction and treatment, and chemical oxidation for soils in the highly contaminated source area for the on-site remedy. The NYSDEC will also seek to impose restrictions on the use of the site to ensure the long-term effectiveness of the on-site remedy. To define the extent of off-site contamination and develop a remedy, Operable Unit No. 2 was established.

SECTION 4: SITE CONTAMINATION

To evaluate the contamination present in the study area surrounding the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, the NYSDEC has recently conducted a Remedial Investigation/Feasibility Study (RI/FS).

4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

The RI was conducted during 2000. A report entitled Off-Site Remedial Investigation, West Side Corporation Site, dated May 2001 has been prepared which describes the field activities and findings of the RI in detail.

The RI included the following activities:

Soil Vapor Survey to detect the presence of contaminants in the soil.

Installation of Geoprobe® soil borings to obtain samples of soils and groundwater for analysis.

Installation of monitoring wells to obtain samples of groundwater for analysis and for gathering information about groundwater depth and flow.

Completion of indoor and ambient (outdoor) air sampling.

Completion of a survey of commercial wells/sumps in the area.

To determine which media (soil, groundwater, etc.) are contaminated at levels of concern, the RI analytical data was compared to environmental standards, criteria, and guidance values (SCGs). Groundwater, drinking water, and surface water SCGs identified for the West Side Corporation Site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of the New York State Sanitary Code. For soils, NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 provides soil cleanup guidelines for the protection of groundwater, background conditions, and health-based exposure scenarios. In addition, for soils, site-specific background concentration levels can be considered for certain classes of contaminants. For indoor and ambient air sampling, guidance prepared by the NYSDOH was considered.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb), parts per million (ppm), and micrograms per cubic meter (ug/m^3) for air samples. For comparison purposes, where applicable, SCGs are provided for each medium.

4.1.1: Site Geology and Hydrogeology

The soil deposits encountered at the Site generally consist of fill materials, glacial outwash, and clay soil. The fill material encountered at the site range in thickness from approximately 0.5 feet to 10 feet below ground surface and are comprised of brown sandy silt, brown silty sands, and gravelly sands with fragments of ceramic, glass, plastic pellets, and metal debris.

Glacial outwash deposits consisting primarily of gravelly sand underlie the fill and/or the silt at the Site. This glacial sediment was observed up to depths of approximately 70 feet below ground surface (bgs). The groundwater table is approximately 12 feet bgs.

The Gardiners Clay was encountered underneath the upper glacial sands at the Site at an average depth of about 65 feet bgs. The clay layer is believed to be approximately 30 feet thick.

Based on regional topography, the general flow of groundwater in the Jamaica area is southerly toward Jamaica Bay, located approximately 3 miles south of the Site.

The NYCDEP has informed the NYSDEC of a proposal to collect large amounts of groundwater downgradient of the West Side Study area. Beyond the area of groundwater contamination from the Site, there has been basement flooding problems created by a gradually rising water table. The NYCDEP proposes to restart production wells at Stations 6 and 33, (located about a mile southwest of the site) to lower the water table in that area. The NYCDEP has indicated that pumping at Stations 6 and 33 would draw the West Side plume toward Stations 6 and 33, greatly expanding the size of the plume and complicating efforts to remediate contaminated groundwater from the Site. The NYCDEP and the NYSDEC have been working together to develop remedial alternatives that take into account this proposal. These are described below in Section 7.1.

4.1.2: Nature of Contamination

As described in the RI report, many soil and groundwater samples were collected at the site and surrounding off-site locations to characterize the nature and extent of contamination. The main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs). The VOCs of concern are PCE, trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), acetone, and xylenes.

4.1.3: Extent of Contamination

The off-site study area surrounds the West Side Corporation Site to the north, east and south as shown on Figure 2. Three areas were investigated during the off-site remedial investigation, referred to as the Upgradient Study Area; the Eastern Study Area, and the Downgradient Study Area.

Table 1 summarizes the extent of contamination for the contaminants of concern in overburden groundwater and subsurface soil and compares the data with the SCGs for the site. The following discussion summarizes the media investigated and a summary of the findings.

Subsurface Soil

Twenty soil samples were collected from the three off-site areas identified above. An area of VOC subsurface soil contamination was found along 180th Street in the Upgradient Study Area, away from the residential neighborhoods. These subsurface soil samples were found to contain PCE, 1,2-DCE, 2-butanone, ethylbenzene, and xylenes. The highest concentration of PCE in the upgradient area was12 ppm at a depth of 4 to 6 feet below ground surface (bgs). Xylene (total) was found at concentrations as high as 22 ppm at depth of 10 to 12 feet bgs.

The PCE contamination is presumed to be associated with on-site source area #2. The BTEX compounds are presumed to be associated with a potential off-site source. Any groundwater contaminated by soils in this area should be captured by the on-site remedy.

Groundwater

Twelve VOC compounds were detected in the 69 groundwater samples collected from the off-site study areas during the on-site and off-site investigations. Eight compounds were identified at concentrations exceeding the groundwater standards. These compounds include PCE, TCE, 1,2-DCE, vinyl chloride, toluene, acetone, ethylbenzene and xylene (total). The water table was encountered at 10 feet to 12 feet bgs in off-site study area. The shallow groundwater samples were collected from a depth of 20 feet bgs and deep groundwater samples were collected from depths ranging between 50 to 62 feet bgs.

PCE in groundwater exceeded the Class GA groundwater standard (5 ppb) over much of the downgradient study area. The maximum concentration of PCE in the off-site study area was reported at location GP-94S at 8,800 ppb, with decreasing concentrations identified downgradient. GP-94S (shallow) is located on the NYCDEP property immediately downgradient of the site.

Elevated concentrations of PCE, higher than the groundwater standards, are also evident in the deep water samples collected. The highest concentration of contaminants in deep groundwater was identified at GP-71D at 2,300 ppb. The data suggests that the bulk of the PCE contamination is in the upper 15 to 20 feet of the aquifer. The PCE concentrations contour map for the shallow and the deep groundwater are shown in Figures 3 and 4 respectively. Degradation compounds of PCE (TCE, 1,2-DCE and vinyl chloride) at concentrations exceeding their respective groundwater standards, were detected in both shallow and deep locations throughout the study area.

Air

Indoor and ambient (outdoor) air samples were collected at the West Side Corporation Site and at two residential properties located downgradient of the site using passive air monitors. PCE was detected at concentrations below the NYSDOH Guideline of 100 micrograms per cubic meter (ug/m^3) for PCE in indoor and outdoor air at the sampled indoor and outdoor residential locations. The concentration of PCE in the indoor air samples was equivalent to the outdoor air sample indicating no site-related impacts.

4.2: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 6.0 of the RI report.

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events. Therefore, exposure pathways that could exist in the future include:

- ingestion, inhalation of vapors, or dermal contact associated with the use of contaminated groundwater for potable water.

- ingestion, inhalation, or dermal contact with contaminated subsurface soils by maintenance workers or construction workers.

Currently, there are no completed human exposure pathways in the study area. Subsurface soils and groundwater are contaminated but the groundwater is not used and soil excavation would be necessary to expose people to contaminated soils.

4.3: Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures and ecological risks that may be presented by the site.

The West Side Site and the areas surrounding the Site are primarily urban with commercial and industrial land use. As discussed above, groundwater is contaminated with PCE and degradation by-products. There are no surface waters (lakes, ponds, streams etc.) or wetlands in the vicinity of the site, which could be impacted by the contamination from the site. Therefore, there are no fish and wildlife concerns at this site.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The Potential Responsible Party (PRP) for the site, documented to date, is the West Side Corporation. The site is currently owned by West Side Corporation and was operated by West Side Corporation during the handling and disposal of PCE. The PRP declined to implement the RI/FS at the site when requested by the NYSDEC. Therefore, the RI/FS is being conducted under the State Superfund program. After a remedy is selected, the PRP will again be contacted to determine if it will assume responsibility for the remedial program. If an agreement cannot be reached with the PRP, the NYSDEC will evaluate the site for further action under the State Superfund. The PRP is subject to legal actions by the State for recovery of all response costs the State has incurred.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all SCGs and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

Eliminate, to the extent practicable, further migration of contaminated overburden groundwater.

Reduce, to the extent practicable, the level of contamination in the groundwater.

Attain, to the extent practicable, the cleanup goals for groundwater quality (groundwater standards).

Prevent, to the extent practicable, the potential for exposure through inhalation to organic vapors that could migrate from the water table into off-site residences.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the West Side Corporation Site were identified, screened and evaluated in the report entitled Off-Site Feasibility Study Report; West Side Corporation Site, dated January 2001.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to construct and begin any long-term operation of the remedy, and does not include the time required to design the remedy, procure contracts for design and construction, or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Remedial Alternatives

The potential remedies are intended to address the contaminants of concern in groundwater at the study areas.

Alternative 1. ***No Action***

Present Worth: *$174,000*
Capital Cost: *$34,000*
Annual O&M: . . . . . *$ 9,000*
Time to Implement . . . . . *1 to 2 months*

The No Action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the off-site study area to remain in an unremediated state. This alternative would leave the study area in its present condition and would not provide any additional protection to human health or the environment. Six downgradient monitoring wells (three deep and three shallow) would be installed to monitor groundwater quality. This alternative assumes that annual groundwater monitoring would be conducted in the nine existing and proposed off-site wells for 30 years. During each monitoring event, nine wells would be purged and sampled, and water levels in the off-site wells would be measured. Groundwater samples would be analyzed for VOCs.

Alternative 2. ***Off-Site Groundwater Extraction (using Well 24 New) and Ex-Situ Treatment***

Present Worth: . . . . . *$ 4,432,000*
Capital Cost: . . . . . *$ 1,327,000*
Annual O&M: . . . . . *$ 402,000*
Time to Implement . . . . . *6 months - 9 months*

Groundwater extraction and ex-situ treatment are components of this alternative. One extraction well, referred to as Well 24 New, would be located immediately downgradient of the Site boundary and within NYCDEP property (see Figure 5). The extraction well would capture groundwater contaminated with PCE at concentrations above the groundwater standard of 5 ppb. It would prevent further migration of contaminated groundwater and would lower the depth of the water table. A deeper water table would reduce the potential for PCE vapors from the water table to rise to shallow depths that could create exposures in residences. The groundwater would be treated ex-situ in a treatment system also located on the NYCDEP property, prior to discharge to the stormwater sewer system. It is estimated that the well would operate for approximately 10 years at a flow rate of 750 to 1,100 gallons per minute (gpm).

The time estimate is based on a calculation of the time required to extract 10 aquifer volumes at the design flow rate. The well would extend to the top of clay (approximately 65 feet bgs). Existing hydrogeologic information would be used to assess the optimum pump rate and location of Well 24 New. The groundwater extraction system would be designed to capture the downgradient plume containing PCE concentrations of 5 ppb and above. Results of the treatability study conducted for the on-site groundwater extraction and treatment system would be used to assess the applicability of treatment technology. The treatment system would consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), and a granular activated carbon system or other acceptable components to be refined during the design phase.

Groundwater from Well 24 New would be treated to meet the discharge criteria required for release into the local storm water sewer. Well 24 New would eliminate the need for extraction wells at the southern boundary of the site but may create the need to install extraction wells immediately downgradient of the main source of contamination (Area 1) on site. Without containment of groundwater from the source area, the more highly contaminated groundwater from the source area could be drawn toward Well 24 New and would increase the time needed to operate Well 24 New.

Alternative 3. ***Off-Site Low Flow Groundwater Extraction (using a series of Wells) and Ex-Situ Treatment***

Present Worth: . . . . . *$ 1,439,000*
Capital Cost: . . . . . *$ 641,000*
Annual O&M: . . . . . *$ 103,000*
Time to Implement . . . . . *6 months - 9 months*

As in Alternative No. 2, groundwater extraction and ex-situ treatment are components of this alternative. A series of six (comparatively low-flow) extraction wells would be located within the public right of way along 177th Street and Brinkerhoff Avenue (110th Avenue), downgradient of the Site boundary (see Figure 6). The extraction wells would be designed and operated with the goal of capturing the most significantly contaminated groundwater (PCE concentration greater than one ppm). The remaining contaminations would be allowed to naturally attenuate. The wells would lower the depth of the water table but not to the same extent as Alternative No. 2.

The extracted off-site and on-site groundwater would be combined for treatment in an expanded treatment system located on-site, prior to discharge to the stormwater sewer system. It is estimated that these wells would operate for approximately 10 years at a flow rate of 10 to 15 gpm each for a total extraction flow rate of 60 to 90 gpm. The time estimate is based on a calculation of the time required to extract 10 aquifer volumes. Extraction wells would extend to approximately 35 feet below ground surface (bgs). Existing hydrogeologic information would be used to assess the optimum pump rate and location of the wells. The treatment system would consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), a granular activated carbon system, and an effluent holding tank. Groundwater would be treated to meet the discharge criteria required for release into the local storm water sewer. A treatability study would be conducted to provide the information needed to design the treatment system.

Alternative 4. ***Off-Site High Flow Groundwater Extraction (using a series of Wells) and Ex-Situ Treatment***

Present Worth: . . . . . *$ 3,687,000*
Capital Cost: . . . . . *$ 1,381,000*
Annual O&M: . . . . . *$ 299,000*
Time to Implement . . . . . *9 months - 12 months*

As Alternatives 2 and 3, groundwater extraction and ex-situ treatment are components of this alternative. A series of six (relatively high-flow) extraction wells would be located within the public right of way along 177th Street and Brinkerhoff Avenue, downgradient of the Site boundary (see Figure 7). The extraction wells would be designed and operated with the goal of capturing groundwater with PCE contamination above the groundwater standard of 5 ppb. The water table would be lowered more than under Alternative No. 3, but not as much as with Alternative No. 2. The extracted off-site and on-site groundwater would be combined for treatment in an expanded treatment system located on-site, prior to discharge to the stormwater sewer system. It is estimated that the wells would operate for approximately 10 years at a flow rate of 40 to 60 gpm for a total extraction flow rate of 240 to 360 gpm. The estimate of time is based on a calculation of the time required to extract 10 aquifer volumes. The screened portion of the wells would extend through the saturated portion of the aquifer, to the top of the Gardiner clay unit

(approximately 65 feet bgs). Existing hydrogeologic information would be used to assess the optimum pump rate and location of the wells. The treatment system would consist of an equalization/aeration tank, an air stripper (with associated off-gas treatment via vapor phase carbon), a granular activated carbon system, and an effluent holding tank. Groundwater would be treated to meet the discharge criteria required for release into the local storm water sewer. A treatability study would be conducted to provide the information needed to design the treatment system.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste disposal sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

Chemical specific and Action-Specific SCGs are identified in Tables 3-1 through 3-5 of the FS report. The main SCGs identified for this study are: NYSDEC Class GA Groundwater standards as promulgated in 6 NYCRR 703, dated June 1998; TAGM 4046: "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels;" NYSDEC Part 212 (air emission controls), and Air Guide-1 ("Guidelines for the Control of Toxic Ambient Air Contaminants").

Alternatives 1 and 3 would not achieve compliance with the chemical-specific SCGs (i.e., groundwater standards). Alternatives 2 and 4 would eventually achieve compliance with the chemical-specific SCGs. Since Alternative No. 2 would more aggressively remove contaminated groundwater from off-site study area, it would have a better chance of achieving SCGs in a reasonable period of time.

Under Alternative 3, the most significantly contaminated shallow groundwater would be removed and the remaining contamination would be allowed to naturally attenuate.

Each alternative evaluated would comply with action-specific SCGs. Approvals necessary for implementing these alternatives would be obtained before initiating the remedial action. No location-specific SCGs were identified.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

Alternative No. 1 would not be protective of public health and the environment. Contaminated groundwater would continue to spread and would remain at current concentrations for many decades. If the water table were to rise significantly in the area next to the site, there would be an increased threat of exposure to PCE vapors rising from the water table into the residences.

Alternatives No. 2 and 4 would be protective of human health and the environment because implementation of these alternatives would result in containment and remediation of essentially all contaminated off-site groundwater.

Alternative No. 3 would be somewhat less protective of human health and the environment than Alternatives 2 and 4 because this alternative would not result in the removal of PCE to groundwater standards and would not lower the water table as much. However, Alternative No. 3 would contain and remediate the most significantly contaminated shallow groundwater downgradient of the Site and would reduce the level of the water table, thus reducing the potential for human exposures to PCE vapors in downgradient areas. Remaining contamination would be allowed to naturally attenuate.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternative No. 1 would not present significant short-term impacts but would not achieve remedial objectives in a reasonable amount of time.

Alternatives 3 and 4 would involve intrusive trenching work in the neighborhood south of the site. Although the trenching would not extend into contaminated groundwater, there would be an increased risk of exposure to VOC vapors, especially for workers. Residents would not be at a significantly increased threat of exposure from trenching.

Alternatives 3 and 4 would be somewhat disruptive to the neighborhood to the south of the site during the installation of the piping and recovery wells. This would primarily be an inconvenience with the presence of construction equipment in the streets.

Alternative No. 2 would include some trenching closer to the site and would present some increased risk of exposure to VOC vapors by workers, but these potential impacts could be effectively addressed with engineering controls and personal protective equipment.

The time to achieve remedial goals would be similar (about 10 years) for Alternatives 2, 3, and 4 with the understanding that Alternative No. 3 would achieve the one ppm goal in about 10 years but would not achieve groundwater standards for decades.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative No. 1 would rely upon natural attenuation as the only mechanism for achieving the remedial goals. Since this would not occur in a reasonable amount of time, and releases of contaminated groundwater to off-site areas would continue, it is not considered effective.

Alternatives 2, 3, and 4 employ a combination of containment and permanent treatment to achieve the remedial goals and are considered to be adequate, reliable, and permanent remedies for the remediation of the off-site groundwater. Alternative 2 would be the most aggressive approach to reducing off-site groundwater contamination. Alternative 4 would be the next most aggressive approach followed by Alternative 3. Given an unlimited amount of time, however, the amount of PCE removed from the aquifer by Alternative 3 could approach the amount removed under Alternatives 2 and 4.

For any of the off-site remedial alternatives, the ability to completely remove contamination from off-site groundwater depends in large part upon the effectiveness of the on-site remedy. Since it is technically impracticable to remove all contamination from the on-site source areas (especially from deep zones), the on-site soils will remain a source of residual off-site contamination for a long time. Therefore, cleaning up off-site groundwater depends upon both removing contamination from off-site groundwater and from preventing groundwater with residual contamination from moving off-site.

Alternatives 2, 3, and 4 rely, in part, upon the long-term operation of the groundwater containment system to achieve the remedial action objectives. Although these systems are reliable, they can break down and require regular inspection and maintenance. Long-term operation and maintenance also depend upon the availability of adequate finances to fund the project.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative No. 1 would not reduce the toxicity, mobility and volume of off-site contaminants, except as occurs through natural attenuation.

Alternatives 2 and 4 provide for the greatest reduction of toxicity, mobility and volume of contaminants in off-site groundwater, as the alternatives would reduce contaminant concentrations in groundwater to a target level of 5 ppb.

Alternative No. 3 would provide a lesser reduction of toxicity, mobility and volume of off-site contaminants in groundwater with a target level of 1 ppm.

If the NYCDEP production wells at Stations 6 and 33 are restarted, Alternatives 3 and 4 would not be effective in controlling the mobility of the off-site groundwater plume. The pumping rate at Stations 6 and 33 would overcome the influence of the extraction wells in Alternatives 3 and 4. This would result in the off-site plume being eventually drawn to the southwest into the wells at Station 6 and possibly Station 33. The high capacity of Well 24 New proposed as part of Alternative No. 2 would prevent the pumping from Stations 6 and 33 from drawing contaminated groundwater from the site and expanding the off-site plume to the west.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the

effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternatives No. 1, 2, 3, and 4 are technically implementable with available methods, equipment, materials and services. Alternatives 2, 3, and 4 would require the use of standard construction methods and equipment for the installation of the groundwater extraction systems and the ex-situ treatment systems.

Alternatives 1, 2, 3, and 4 are administratively implementable with the assumption that adequate funding is available. Alternative No. 2 depends in part on the creation of a cooperative agreement between the NYSDEC and the NYCDEP.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. **Community Acceptance** - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan have been evaluated. The "Responsiveness Summary" included as Appendix A presents the public comments received and the Department's response to the concerns raised. In general the public comments received were supportive of the selected remedy. Several comments were raised pertaining to the availability of money to clean up the site and the time it will take to clean up the site.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is selecting **Alternative 2: Off-Site Groundwater Extraction (using Well 24 New) and Ex-Situ Treatment** as the remedy for this site.

This selection is based on the evaluation of the four alternatives developed for the study area and takes into account the remedy already selected for the on-site Operable Unit. The on-site area is highly contaminated with VOCs (PCE in particular) and a significant release of contaminants to the groundwater has occurred. Contaminated groundwater has migrated into the off-site study area. The on-site remedy will address the remediation of on-site soils and groundwater.

To be considered effective, the selected remedy for the off-site area must accomplish the following general goals: 1) it must prevent significant public exposure to contaminants from contact with either contaminated groundwater or vapors from groundwater; 2) it must reduce groundwater contamination so that it no longer presents a significant threat; 3) it should prevent further expansion of the plume of contaminated groundwater and the associated environmental damage.

Although there are no known exposures to contaminated off-site groundwater or vapors from off-site groundwater, Alternative No. 1 (no action) will not reduce contaminant levels in a reasonable amount of time. Also, it will not prevent expansion of the plume. Therefore, the "No Action" alternative was not proposed.

Alternatives 3 and 4 both provide for the extraction and treatment of contaminated groundwater from the study area and provide for hydraulic containment through groundwater pumping. However, Alternatives 3 and 4 will not provide hydraulic containment if NYCDEP decides to restart the production wells at Stations 6 and 33. If restarted to address flooding problems downgradient of the off-site study area, these wells will pull the plume of contaminated groundwater from the study area into the wells at Stations 6 and 33, significantly expanding the size of the plume.

Alternative 2 will provide for the extraction and treatment of contaminated groundwater from the study area. It will also prevent further migration of contaminated groundwater even if NYCDEP decides to restart the production wells at Stations 6 and 33.

Based upon information from the NYCDEP, the NYSDEC expects that the production wells at Stations 6 and 33 will be restarted. Therefore, Alternative No. 2 presents the best approach to the remediation of off-site groundwater.

The use of groundwater for drinking water or other purposes in the area of the site is controlled by regulations of the New York City Department of Health. This control will help to prevent unintentional exposures to contaminated groundwater from the site.

The estimated present worth cost to implement the remedy is $4,432,000. The cost to construct the remedy is estimated to be $1,327,000 and the estimated average annual operation and maintenance cost for 10 years is $402,000.

The elements of the selected remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS will be resolved.

2. Review of the existing hydrogeologic information regarding the Upper Glacial Aquifer to assess the optimum pumping rate and location for Well 24 New and to provide information to efficiently design the groundwater extraction and treatment system.

3. Modification of the on-site remedy (Operable Unit No.- 1) as necessary by deleting the downgradient groundwater extraction wells and containment system (with Well 24New, these wells would be redundant) and possibly adding a well(s) in the source area for the extraction and containment of highly contaminated groundwater from Source Area 1. Modification of the on-site treatment system as necessary.

4. Installation of a groundwater extraction and treatment system, including extraction well (Well 24 New) to a depth of 65 feet bgs, associated piping, and the groundwater treatment system.

5. Construction of a treatment building. The building will house the Well 24 New groundwater extraction and treatment system and support equipment.

6. Implementing a long-term monitoring program. Groundwater samples will be collected and analyzed regularly. This program will allow the effectiveness of the groundwater extraction and treatment system to be monitored and will be a component of the operation and maintenance program for the site.

7. This selected remedy will be completed in conjunction with the elements of the on-site remedy as described in Section 3.2 above.

SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- A repository for documents pertaining to the site was established.

- A site mailing list was established which included nearby property owners, local political officials, local media and other interested parties.

- A fact sheet was mailed in September 2000.

- A public meeting was held on September 19, 2000.

- A fact sheet and a notice of the public meeting to present the proposed remedial action plan was mailed in November 2001.

- A public meeting to present the proposed remedy was held on December 13, 2001.

- A public meeting to present the findings of the investigation of cancer incidence in the vicinity of the site was held by the NYSDOH on January 7, 2002.

Table 1
Nature and Extent of Contamination

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE	FREQUENCY of EXCEEDING SCGs	SCG
Groundwater	Volatile Organic Compounds (VOCs)	Tetrachloroethene (PCE)	2 to 8,800 ppb	54 of 69	5 ppb
		1,2-Dichloroethene (total DCE)	1 to 2,300 ppb	27 of 69	5 ppb
		Trichloroethene (TCE)	1 to 200 ppb	21 of 69	5 ppb
		Xylene (total)	6 to 74 ppb	4 of 69	5 ppb
		Vinyl Chloride	1 to 4 ppb	1 of 69	2 ppb
Subsurface Soil	Volatile Organic Compounds (VOCs)	Tetrachloroethene (PCE)	0.001 to 12 ppm	1 of 20	1.4 ppm
		1,2-Dichloroethene (total)	0.001 to0.37 ppm	1 of 20	0.3 ppm
		2-Butanone	0.008 to 0.4 ppm	1 of 20	0.3 ppm
		Ethylbenzene	0.002 to 11ppm	2 of 20	5.5 ppm
		Xylene (total)	0.003 to 22 ppm	2 of 20	1.2 ppm

Notes: SCGs are based on either NYSDEC Class GA groundwater standards as promulgated in 6 NYCRR 703, dated June 1998 or TAGM 4046 (Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, January 24, 1994) values.

ppm - parts per million

ppb - parts per billion

Table 2
Remedial Alternative Costs [1]

Remedial Alternative	Capital Cost	Average Annual O&M [2]	Total Present Worth
Alt. 1- No Action [3]	$34,000	$9,000	$174,000
Alt. 2 - Off-Site Groundwater Extraction (using Well 24 New)and Ex-Situ Treatment	$1,327,000	$402,000	$4,432,000
Alt. 3 - Off-Site Low-Flow Groundwater Extraction (using a series of wells) and Ex-Situ Treatment	$641,000	$103,000	$1,439,000
Alt. 4- Off-Site High-Flow Groundwater Extraction (using a series of wells) and Ex-Situ Treatment	$1,381,000	$299,000	$3,687,000

NOTES:

(1) Costs are rounded to the nearest $1,000. Cost estimate assumptions are presented in the "Draft Final Off-Site Feasibility Study, West Side Corporation Site, Site No. 2-41-026", prepared by TAMS Consultants, Inc. and GZA GeoEnvironmental of New York, dated August 2001.

(2) Average Annual O&M Cost Estimates are based on the estimated total present worth of O&M costs, calculated as an annual cost for a 10- or 30-year time frame and a 5% discount rate.

(3) The No Action alternative includes installation of six additional off-site wells and off-site groundwater monitoring for 30 years.

Appendix A

RESPONSIVENESS SUMMARY

West Side Corporation Site - Operable Unit No. 2 (Off Site)
Proposed Remedial Action Plan
Jamaica, Queens County
Site No. 2-41-026

The Proposed Remedial Action Plan (PRAP) for Operable Unit No. 2 (OU-2) of the West Side Corporation Site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on November 27, 2001. This Plan outlined the preferred remedial measure proposed for the remediation of contaminated groundwater in the off site study area of the West Side Corporation Site. The preferred remedy included the installation of a groundwater extraction and treatment system to remove contaminated groundwater for treatment and discharge to the storm water sewer system, and a long-term operation, maintenance, and monitoring program.

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on December13, 2001which included a presentation of the results of the off site Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. Comments received at that meeting and in writing have become part of the Administrative Record for this site. The public comment period for the PRAP began on November 30, 2001 and ended on December 31, 2001.

This Responsiveness Summary responds to all questions and comments raised at the December 13, 2001 public meeting and to the written comments received.

The following comments were received at the public meeting.

<u>Comments from Elected Officials:</u>

1. Q. PCE (perc) is heavier than water. How can you be sure that all the PCE will be removed during the remediation process all the way to bedrock?

   A. The proposed remedy is intended to capture all of the contaminated groundwater, including deep contamination. Testing will be completed to verify that the off-site "plume" of PCE contaminated groundwater is completely collected. The concern of PCE sinking in the aquifer is more of an issue on site than it is off site. The chemical PCE is approximately 1.6 times more dense than water and will sink if spilled in water. It is one of a class of chemicals referred to as Dense Non-Aqueous Phase Liquids (DNAPLs). Chemicals that are less dense than water, like oils, tend to float on water and are classified as Light Non-Aqueous Phase Liquids (LNAPLs). Although not very soluble, some PCE will dissolve in water. Groundwater containing dissolved PCE does not tend to sink in an aquifer as will the

undissolved "pure" phase. Off site, the PCE is dissolved in groundwater; the data does not indicate the presence of PCE in the form of a DNAPL.

On site, the presence of DNAPL was indicated by dye testing, although direct observation of free product was not noted in the soil samples. The remedy already selected for the on site area will permanently remove PCE from soil and groundwater by chemically and physically treating the soil and groundwater. Treatment will continue until testing shows that PCE has been removed to acceptable levels. Below the site, the soil is sandy to about 65 feet below grade where a thick layer of clay is encountered. Testing indicates that the PCE does not extend into or below the clay. The bedrock in the vicinity of the site is more than 1000 feet below the surface.

2. Q. The results of the investigation show concentrations of PCE in off site groundwater as high as 8,800 ppb. Does this create exposures that residents should be concerned about?

   A. The off-site investigation indicates that there are no known exposures to PCE contaminated groundwater or to PCE vapors from the groundwater. Off-site soils to the south of the site are not contaminated. To be exposed, people would have to dig down to the water table which is approximately 10 feet below grade.

3. Q. It has been stated that NYSDEC will partner with NYCDEP to complete the off-site remedy. Proper co-ordination between the two agencies is very important for the successful implementation of the remedy. The NYC administration will change soon and the administration at the NYCDEP level may also change. What assurance is there that the new administration will continue with the proposed remedy and the partnership?

   A. The NYSDEC and NYCDEP are developing a formal agreement between the agencies that will commit the NYCDEP to the installation and operation of well 24New and the associated treatment system. The Commissioner of the NYCDEP has expressed to the NYSDEC and to the public the NYCDEP's intent to carry out this part of the project. Ultimately, the NYSDEC bears the authority and responsibility to complete the project. If for any reason, the NYCDEP is unable to complete their work associated with well 24New, this work will revert to the NYSDEC.

4. Q. If workers excavate into the soil in the area of the off-site plume to construct a new building, will there be a problem with exposures to PCE?

   A. This is much more of an issue on-site than it is off-site. On-site, the contaminated soil is below the surface and mainly in Source Areas 1, 2 and 3. Any excavation work within the site boundary will be done under the requirements of the approved health and safety plan to protect workers from exposures. Off-site (to the south), the soils are not contaminated, but groundwater is contaminated with PCE. Excavation to and below the water table in these areas (approximately ten feet below the ground surface) should require proper precautions to avoid contact with contaminated groundwater.

5. Q. It was stated that once Stations 6 and well 24New are fully operational, groundwater flow will be divided between the two stations. Where will this divide occur?

A. Based upon the expected pumping rates for the two systems, it is expected that the divide will develop approximately 1200 feet from Station 24 toward Station 6 (In the vicinity of 174th Street). North and east of the divide, groundwater will move to well 24New. South and west of the divide, groundwater will move to Station 6.

7. Q. What is the time table for the clean up?

A. The remedial design for the on-site remedy is likely to be completed by fall of 2002. The bidding and contract award process usually takes approximately four months to complete. Depending upon the weather, the on-site treatment of soil and groundwater will begin in winter 2002 or spring 2003. The NYCDEP expects to also complete the design and installation of well 24New by spring 2003.

8. Q. It was stated that the contaminated groundwater from well 24 New will be treated and discharged to the storm water sewer system. Is this a combined sewer? Is the sewer large enough to receive this additional water? Will there be any adverse impact on the storm sewer (infrastructure) or the quality of the receiving water?

A. The extracted groundwater will be treated to the discharge criteria before being released to the storm sewer. The discharge criteria are provided by the NYSDEC Division of Water consistent with protecting the quality of the receiving water, in this case, Jamaica Bay. In most cases the discharge criteria meets or exceeds the surface water standards. The NYCDEP indicates that the sewer is a storm sewer and not a combined storm-sanitary sewer. The sewer system is maintained by the NYCDEP. The NYCDEP has indicated that the sewer system in question has the capacity to accept the additional water and is in fairly good condition.

9. Q. It was stated that it may take up to ten years to clean up the site. It was also stated that any remaining NYS bond act money has been allocated. Will there be any money available to complete the cleanup?

A. Although funds are available to complete the design of the remedy, there are no funds available from the 1986 Environmental Quality Bond Act to complete construction. Governor Pataki has proposed legislation to refinance and reform the state superfund program which is now under consideration by the NYS Legislature. If legislation is passed before the design process is completed, there will be no delay in proceeding with construction. The NYCDEP has indicated that funding is available for them to proceed with the design and construction of well 24New and the associated treatment system.

<u>Comments Related to the Off-site Investigation and Remedy:</u>

10. Q. How much money will be needed for both the on-site and off-site Remedy?

A. The on-site remedy is estimated to cost $4.57 million ($2.15M in capital cost and $2.42M for long-term operation, maintenance, and monitoring (OM&M)) and the off-site remedy is estimated to cost $4.43 million ($1.32M in capital cost and $3.11M for OM&M) for a total cost of $9 million.

12. Q. It was stated that the remediation of the site will take approximately ten years. How long will construction take and when will the remedy be complete?

A. Construction of the off-site remedy may take six to nine months. It is estimated that it may take 10 years for off-site groundwater quality to approach groundwater standards.

13. Q. The groundwater table is 10 feet below ground surface at the site. 180th street dips down. Does that mean the groundwater is much closer to surface as we go down the street?

A. In the off-site study area, the point where groundwater is closest to the surface is at well MW-11S (located on 176th Street north of 110th Avenue) where it was measured to be 8 feet below the ground surface.

14. Q. My kids go to Public School (PS) 116. PS 116 is located very close to the West Side Corporation site. Was any testing done at or close to this public school?

A. Public school 116 is located about 1/3 mile to the west of the site. The groundwater flow direction is towards the south. The contaminated groundwater from the site has migrated to the south in the direction of the groundwater flow. The extent of contamination is shown in figures 3 and 4. PS 116 is located outside of the limits of the contaminated plume. Therefore, there is no threat or reason for testing to be done at or near PS 116.

15. Q. Was the contamination going under the homes tested? Why were only two homes included in the testing? Identify the street on which these two homes were located.

A. The highest concentration of PCE in the off-site groundwater is immediately south of the southern property line. PCE in groundwater may volatilize into the vadose zone. Therefore, during the remedial investigation, 16 soil gas samples were collected from 177th and 178th Street. The results were insignificant to non-detect. In addition, two households on 177th and 178th Street (which were closest to the site) were selected for testing of indoor air quality. The observed concentration of PCE ranged from 5 micrograms per cubic meter to 9 micrograms per cubic meter. These levels were consistent with the background air quality and much below the NYSDOH ambient air quality guideline of 100 micrograms per cubic meter. Therefore, it was concluded that since there were no impacts over the areas of highest groundwater contamination, there was no need to test any more houses farther away from the site.

16. Q. Will the discharge of water from the site into the sewer harm the water quality of Jamaica Bay?

A. Before the water is discharged to the sewer, it will be treated to remove contaminants to levels low enough to ensure that there will be no harm to Jamaica Bay.

17. Q. NYCDEP is planning to pump from 8 to 9 million gallons per day (mgd) of water from Station 6 by the year 2006. However, the West Side plume may not be cleaned until the year 2011. Please explain the gap.

A. Well 24New will be designed to capture all of the contaminated plume, whether Station 6 is operating or not. When Station 6 becomes operational, it will not draw in any contaminated groundwater from the West Side Site as long as Well 24New is operational. It is not necessary for the whole plume to be cleaned up before Station 6 is used for pumping groundwater.

18. Q. The highest concentration of PCE in groundwater was said to be 8,800 ppb. Where is this well located? Where is well MW-8S located?

A. The highest off-site concentration of PCE in groundwater (at 8,800 ppb) was observed in sampling location GP-94. GP-94 is located on the Jamaica Water Supply property about 100 feet south-southwest from the property line. The highest on-site concentration of PCE (at 210,000 ppb) was observed in well MW-8S. Well MW-8S is located in Source Area 1.

19. Q. Will the water from well 24New be introduced into the drinking water system after 10 years when the plume is cleaned up?

A. NYCDEP has stated that they have no plans to use water from well 24New as a source of potable water. Well 24New will be designed to remove contaminated groundwater from shallow and deep zones. The well will be screened from the water table to about 60 feet below the ground surface.

20. Q. The two other sites in the area, the Amoco Service Station site and Metropolitan Transit Authority (MTA) Bus Station site, are much closer to Stations 6 and 33. Will these sites be cleaned up before Stations 6 and 33 are restarted?

A. The remedial work at the Amoco Service Station site and the MTA site is ongoing. The NYSDEC is taking steps to ensure that pumping at Stations 6 and 33 will not interfere adversely with the remediation of these two sites.

<u>Questions Regarding the On-Site Remedy:</u>

Note: Although the on-site remedy was selected in July 2000 after significant public discussion and is currently in design, there were several questions about the on-site work that were addressed in the December 13, 2001 public meeting to help increase understanding of the off-site proposal and the overall project. For additional information

regarding the on-site remedy, the reader is referred to the on-site Record of Decision (ROD) and administrative record for the site.

21. Q. What is in-situ chemical oxidation? What are the chemicals used? Are there any other chemicals used for oxidation?

A. In-situ chemical oxidation (ISCO) is an innovative technology that involves injection of chemicals (oxidants) into the soil below the ground surface to destroy contaminants in-place (in-situ). The oxidants chemically break down organic compounds such as PCE upon contact to inert materials such as carbon dioxide, chloride, and water. It is an aggressive and rapid approach to site cleanup with several advantages for sites like the West Side Site. In particular, the depth of contamination at the West Side Site (up to approximately 50 feet) makes it impractical to excavate the contaminated soil for treatment at the surface. ISCO brings the treatment chemicals to the contamination rather than require excavation. Several oxidants are available including, for example, ozone, potassium permanganate, sodium permanganate, and Fenton's reagent, the oxidant currently being tested at the West Side site. Fenton's reagent is created by mixing a common household oxidizer (hydrogen peroxide) with iron to produce a strong oxidizer (hydroxyl radical). Heat is generated in the process.

22. Q. Are the chemicals and byproducts harmful to the aquifer?

A. Some of the oxidants can increase the concentrations of iron and manganese in the aquifer which are present naturally but in higher concentrations can cause quality problems depending upon how the water is to be used (e.g., potable, irrigation, industrial, etc.). Whereas some other types of in-situ treatment tend to produce by-products with similar or greater environmental concern, these have not been observed with ISCO. The main challenge of ISCO is to adequately deliver the oxidant to the contaminated soil so that enough mixing occurs to allow the reactions to proceed.

23. Q. How long has this technology been used? Has this technology been used successfully in New York or it is still in the experimental stage? Is it effective?

A. ISCO has been commercially practiced for the last 7-8 years. It has been tested at several New York sites. The effectiveness of ISCO depends upon the soil and groundwater conditions, the distribution of contaminants, the types of oxidants used, and the ability to effectively deliver the oxidants to the contamination. The NYSDEC is currently completing a pilot test of Fenton's reagent at the West Side Site to determine its effectiveness at this site.

24. Q. Are there enough safety measures in place for using chemical oxidation?

A. The use of ISCO does present safety concerns. The oxidants are corrosive and can present a hazard to workers using the materials. Special precautions are needed to protect the workers, especially from skin contact. The chemical reactions generate heat that can volatilize contaminants. In some cases,

these vapors should be collected to prevent exposures. Each of these concerns can be addressed through the health and safety plans for the site.

Written Comments:

The following questions dated December 26, 2001 were received from Warren C. McCain, President, Queens Community Council & Development Association, Inc., Queens, New York:

Question #1: Regarding drainage coefficient:

What is the drainage coefficient (numerical value), taken from the Geoprobe® Soil sample, above and below the ground water table (gwt) at site #2-41-026?

Response:

A drainage coefficient is the design rate at which water is to be removed from a drainage area. The term drainage coefficient is generally considered synonymous with dewatering coefficient, storage coefficient and specific yield. Considering that the proposed off-Site remedy (Alternative No. 2 – High Volume Groundwater Extraction Using Well 24New) involves the removal of groundwater from below the groundwater table, the expected specific yield (or storage coefficient for an unconfined aquifer) is expected to range from 0.1 to 0.3 (10% to 30%). This specific yield value range is based on published data for aquifers similar to the Upper Glacial Aquifer and soil conditions observed from the Geoprobe® soil samples. Natural soil samples collected from above the groundwater table are similar to those collected below the water table (primarily sand with varying amounts of silt and gravel).

Soils located above the groundwater table are not expected to yield significant amounts of water, since a considerable amount of the Site is covered with buildings or is paved. The off-Site areas are a mix of commercial and residential areas, which also have a significant amount of paved areas or areas covered by buildings. The runoff coefficient for commercial/high density residential areas is expected to range from about 0.5 to 0.9.

According to available published information from USGS, the average hydraulic conductivity (which is the measure of the capacity of a soil deposit to transmit water) for the Upper Glacial Aquifer ranges from approximately 200 feet per day (fpd) to 270 fpd (see Off-Site Remedial Investigation Report, Section 3.6 - Regional Hydrogeology).

Question #2: Regarding water contamination:

Your tests reveal that PCE, TCE, DCE and chlorides are present below ground surface (bgs), as high as 22 ppm and greater. In your presentation on 12/13/2001, you suggested the use of Hydrogen peroxide (H2O2) plus (+) iron (Fe) as a compound mixture to aid in the cleanup

effort(s). Can you provide these elements in a chemical equation showing the yield results under a balanced condition?

Response:

Based on information from the contractors who have developed this cleanup approach, the chlorinated solvents in the subsurface (primarily PCE with low levels of TCE and DCE) are essentially destroyed instantly when the chemical oxidant encounters the solvent. Iron is added to the mixture to create hydroxyl radicals. The iron precipitates to ferric iron and remains in the subsurface. Heat is also generated during the reaction.

In a laboratory setting, chemical oxidants are very effective at destroying these solvents to non-harmful compounds. The difficulty in implementing this approach is getting the chemical oxidant to directly encounter or contact the solvent. The conditions in the subsurface are not uniform, so delivering the oxidant to the solvent can be challenging. Therefore, the chemical oxidation work will be completed in a phased approach and the progress monitored.

The basic reactions between hydrogen peroxide (H_2O_2), metal catalyst (iron - Fe) and tetrachloroethene (PCE) can be shown as:

$$H_2O_2 + Fe^{+2} \div Fe^{+3} + OH- + OH\bullet$$

$$C_2Cl_4 + 4\ OH\bullet \div 2CO_2 + 4HCl$$

The hydroxyl radical (OH•) serves as very powerful and effective oxidizing agent. Information provided by vendors indicates that when hydrogen peroxide (H_2O_2) reacts with tetrachloroethene (C_2Cl_4), intermediates such as dichloroacetyl chloride (DCAC), dichloroacetic acid (DCAA) and formic acid may be produced. The final end products include carbon dioxide, water, and acids at low concentrations that do not affect the aquifer.

Question #3: Regarding water quality:

After the cleanup, assuming it is feasible, can you provide water (H2O) quality of .05 ppm or less? If not why? Provide the closest ppm number.

Response:

The remedial goals for the project are described in Sections 6 and Section 7 of the ROD. It is expected that PCE concentrations in off-site groundwater will eventually be remediated to less than 0.05 ppm (50 ppb). A long-term monitoring program will be initiated to evaluate the effectiveness of the remedy as part of the overall Operation, Maintenance, and Monitoring (OM&M) program for the site. Cleanup of the on-Site groundwater is more complicated due to the presence of source areas of contamination (highly contaminated areas above and below the water table). The cleanup of the on-Site groundwater is

also dependent on the success of the chemical oxidation treatments in the source area. Any on-Site contaminated groundwater with PCE concentrations above 0.05 ppm (50 ppb) will be collected by the groundwater extraction well (24New).

Appendix B
Administrative Record
Remedial Investigation/Feasibility Study
West Side Corporation Site
Operable Unit No. 2 (Off-Site)
Site I.D. No. 2-41-026

1. File Index
2. Record of Decision Operable Unit No. 2 (Off-Site) - February 2002, prepared by NYSDEC.
3. Proposed Remedial Action Plan (PRAP) Operable Unit No. 2 (Off-Site), dated November 2001, prepared by NYSDEC.
4. Notice of site classification dated August 11, 1997, and Inactive Hazardous Waste Disposal Report Form.
5. Phase II Subsurface Report February 1992, prepared by EEA, Inc.
6. RI/FS Health and Safety Plan - Dated December 1998, prepared by TAMs Consultants.
7. RI/FS Field Activity Plan - Dated December 1998, prepared by TAMs Consultants.
8. RI/FS Quality Assurance Project Plan - Dated December 1998, prepared by TAMs Consultants.
9. RI/FS Project Management Plan - Dated January 1999, prepared by TAMs Consultants.
10. Work Plan Addendum - dated May 2000.
11. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC (Volume 1).
12. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC (Volume 2).
13. Final Remedial Investigation (RI) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC (Volume 3).
14. Final Feasibility Study (FS) Report dated July 2000, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC.
15. Citizen's Participation Plan prepared by NYSDEC - May 1999.
16. Record of Decision, Operable Unit No. 1 (On-Site) - July 2000, prepared by NYSDEC.
17. Proposed Remedial Action Plan (PRAP), Operable Unit No. 1 (On-Site) dated February 2000, prepared by NYSDEC.
18. Final Off-Site Remedial Investigation (RI) Report dated May 2001, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC (Volume 1).
19. Final Off-Site Remedial Investigation (RI) Report dated May 2001, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC (Volume 2).
20. Off-Site Feasibility Study (FS) Report dated January 2002, prepared by TAMs & GZA GeoEnvironmental, for NYSDEC.
21. Fact Sheets dated November 2001 and February 2002, prepared by NYSDEC.