Shops at First Street
Cleanup Action Report

Prepared for

Benenson Bellevue Associates II

Prepared by

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FINAL

April 1, 2004

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1.0 Introduction

This report was prepared by Floyd Snider McCarthy, Inc. (FSM) for Benenson Bellevue Associates, II to document the investigation and cleanup action for the tetrachloroethylene (PCE) releases at the 100 108th Ave NE site, also known as the Shops at First Street, in Bellevue, Washington. A cleanup action related to the PCE releases was performed as an independent remedial action under the Voluntary Cleanup Program (VCP) of the Washington State Department of Ecology (Ecology).

1.1 PURPOSE

The cleanup action at the site was conducted as an independent remedial action. Therefore, a final report of the cleanup action is required by Ecology to be filed within 90 days of the completion of the cleanup action. The purpose of this report is to document the cleanup action in sufficient detail to allow Ecology to determine if the cleanup action meets the substantive requirements of the Model Toxics Control Act, Chapter 173-340 WAC (MTCA).

1.2 SITE LOCATION

The site is the location of a shopping center in downtown Bellevue (Figure 1). Storefronts are developed along the northern portion of the site, with paved parking to the south. The site slopes from north to southeast. The portion of the site that underwent the cleanup described in this report surrounds a storm sewer catch basin (manhole) in the parking lot located in front of Office Depot (Figure 2).

2.0 Site Background

2.1 SUMMARY OF PREVIOUS INVESTIGATIONS AND CLEANUP ACTIONS

2.1.1 Initial Discovery of PCE

PCE was first discovered on June 22, 1994 during construction work at the former location of Bellevue Cleaning Village, a dry cleaner located at 110 108th Ave. NE. The contractor, Turner Construction Company, halted construction and Environmental Management Resources, Inc. (EMR) initiated investigations to evaluate the nature and extent of soil contamination (Kennedy/Jenks 1994).

2.1.2 Excavation of PCE at the Former Dry Cleaner Location

A remedial action at the former dry cleaners was initiated by EMR in August 1994. This action consisted of excavating approximately 2,140 cubic yards (cy) of soil containing PCE. Soil was excavated to a depth of 15 feet. The soil was removed by West Pac Environmental, Inc. and disposed of at the Rabanco Regional Landfill in Roosevelt, Washington.

Samples were collected from the sidewalls and bottom of the excavation to ensure that the cleanup levels were reached. Concentrations of PCE remaining in the excavation base and sidewalls were appreciably less than the MTCA Method B Cleanup Level of 19.6 mg/kg.

In November 1994, Kennedy/Jenks conducted a Remedial Investigation (RI) that examined the extent of PCE remaining at the site following the cleanup action at the dry cleaners (Kennedy/Jenks 1994). Soil borings were advanced to a typical depth of 60 feet at and around the location of the excavation. Soil samples indicated low to non-detectable concentrations of PCE in soil (less than 19.6 mg/kg) underneath and adjacent to the excavation area, with a maximum detection of 4.6 mg/kg at a depth of 40 feet. Based on the results of the RI, it was determined that further remedial action was not necessary at the former dry cleaners portion of the site.

2.1.3 Discovery of PCE in the Vicinity of Storm Sewer Manhole

During the 1994 RI, Kennedy/Jenks advanced soil borings near the downgradient catch basin (manhole) and discovered PCE concentrations of 4,180 mg/kg in Soil Boring BB-15, located near the catch basin. Kennedy/Jenks also conducted a soil gas survey along the downstream storm sewer piping alignment to identify other areas where volatile organic compounds (VOCs) might have been released into the subsurface. Analytical results from the soil gas samples showed the greatest PCE concentrations (10.7 mg/L) in the area near the storm sewer manhole.

To identify other potential areas where PCE was disposed of or may have accumulated, Kennedy/Jenks collected and sampled sediment from six storm sewer catch basins. Samples were collected from five catch basins upgradient of the storm sewer manhole and one catch

basin downgradient of the storm sewer manhole. No VOCs were detected in any of the catch basin samples. Kennedy/Jenks concluded that the PCE release at the manhole was associated with the former dry cleaning operation at the Bellevue Cleaning Village.

Kennedy/Jenks estimated that the highest concentrations of PCE around the manhole were located in a 20-foot radius from the manhole and extending from 10 to 20 feet below ground surface (bgs). Kennedy/Jenks evaluated various remedial alternatives and suggested *in-situ* soil vapor extraction (SVE) as the preferred remedial action (Kennedy/Jenks 1994).

2.1.4 SVE Around the Manhole

In 1996, a one-well SVE system was installed to reduce PCE concentrations in soil around the manhole. The system operated until April 2000. During the period of operation, the SVE system removed an estimated 200 pounds of PCE (Kennedy/Jenks 2002).

2.1.5 Soil Borings and Well Around the Manhole

Following suspension of the SVE operation, Kennedy/Jenks developed a work plan to evaluate the effectiveness of the SVE system. In May 2002, five soil borings, B-1 through B-5, were advanced near the manhole to evaluate PCE concentrations in soils surrounding the manhole. One of the borings, B-1, was converted to a groundwater monitoring well. Groundwater first occurs at an approximate depth of 100 feet bgs. Samples were taken from the soil borings and well and analyzed for PCE. Analytical results identified concentrations of PCE remaining in the soil up to a maximum concentration of 710 mg/kg. Below a depth of 20 feet, PCE concentrations decreased significantly to a maximum concentration of 1.9 mg/kg at 45 feet. PCE was detected in the monitoring well at a concentration of 99 ug/L. Kennedy/Jenks concluded that the SVE system had been effective in removing PCE in the immediate vicinity of the manhole, but that elevated concentrations remained within a 15-foot radius of the manhole, and that the PCE in soil presented a pathway for migration to the underlying groundwater.

3.0 Cleanup Action

3.1 CLEANUP ACTION OBJECTIVE

The objective of the cleanup action was to perform a timely and cost-effective cleanup for protection of human health and the environment. More specifically, the cleanup objective was to excavate the bulk of the PCE source material that could pose a threat to area groundwater. This objective was met by removing all soil that exceeded Method B cleanup levels, and continuing excavation to a depth of approximately 20 feet, where borings indicated that PCE concentrations dropped off dramatically. By excavating to a depth of 20 feet, the bulk of the PCE was removed, significantly mitigating the threat to groundwater under the manhole. However, excavation to remove all soil containing PCE to achieve the stringent MTCA Method A cleanup level was not possible. PCE occurs at levels slightly greater than the Method A cleanup level from 20 feet down to at least 50 feet bgs. Figure 2 shows the extent of the remedial action. The cleanup action was conducted according to the VCP with technical assistance provided by Ecology. Ecology reviewed and approved the work plan for the cleanup action. A copy of the work plan is provided as Appendix A. Cleanup consisted of the following:

- Preparation of bid documents and selection of a contractor.
- Acquisition of proper permits as required by the City of Bellevue (COB).
- Dismantling the existing SVE system and abandoning the existing vapor wells.
- Excavation of PCE-contaminated soil with concentrations exceeding the MTCA Method B Cleanup Level in the vicinity of the manhole.
- Characterization, segregation, and disposal of excavated soil in accordance with the work plan approved by Ecology.
- Removal of the existing manhole and installation of a new manhole.
- Reconnection of the new manhole to the existing storm sewer system.
- Restoration of the site to its original use as a parking area.

3.2 SOIL CLEANUP

Permits for cleanup action at the site included a Clearing and Grading Permit with State Environmental Policy Act (SEPA) Review, a Storm Connection Permit, and a Right of Way Use Permit (to allow truck traffic to access/leave the site). All permits were obtained prior to initiation of the remedial action.

The cleanup contractor, Wilder Construction Company (Wilder) of Everett, WA, was selected based on experience, ability to meet schedule, fee estimate, and approach to the work. Wilder prepared a Health and Safety Plan (HASP) to ensure that site safety requirements were met throughout the duration of the work. The plan also included the provision for daily safety meetings at the beginning of each workday. All site work was completed in adherence with this plan.

The excavation of the site was conducted in two phases:

- Phase 1 was focused on removing the bulk of contaminated soil posing a risk to groundwater as defined by Kennedy/Jenks 2002 soil borings (excavation to 20 feet bgs). This was also the practical depth limit for excavation in the limited operational area. Phase 1 began on September 23, 2003 when Wilder dismantled the existing SVE system, installed catch basin inserts to divert stormwater from entering the manhole, and began mobilization of their equipment.
- Phase 2 provided for additional excavation as necessary to remove contaminated soil remaining after Phase 1.

The limits of the Phase 1 and Phase 2 excavations are shown in Figure 3. Phases 1 and 2 are described further in Sections 3.2.2 and 3.2.3.

3.2.1 Soil Segregation and Handling

In an effort to minimize soil disposal costs, a soil segregation plan was developed and implemented during the cleanup action to aggressively segregate and classify soils. The protocols for soil segregation are detailed in the work plan (Appendix A). Soil segregation consisted of a rigorous screening process using a photo-ionization detector (PID) on all soil excavated from the site. The PID used was a MiniRAE Classic Plus® with a 10.2 EV lamp calibrated to isobutylene.

Each bucket of excavated soil was screened by FSM personnel and then classified. Screening was performed by creating 5 to 10 vapor "holes" in each bucket load of soil. Each "hole" was then screened with a PID. The soil was classified based on the highest PID reading recorded from each bucket. Soil was segregated according to the following table.

Soil Segregation

PID Reading (ppm)	Preliminary Classification
<10	Clean (PCE potentially under 0.5 mg/kg)
10 to 300	Subtitle D Soil (PCE potentially less than 19.6 mg/kg)
>300	Subtitle C Soil (PCE potentially greater than 19.6 mg/kg)

Soil that was classified as "clean" was placed in a stockpile at the southern end of the site. Subtitle D soil was stockpiled in an area north of the excavation. In accordance with the Temporary Erosion and Sedimentation Control Plan, stockpiled soil was placed on two layers of 6-mil thick plastic sheeting and surrounded with hay bales and sandbags to prevent stormwater runoff from entering the stockpile. At the end of each workday and during periods of wet weather the stockpiles were covered with plastic and secured with sandbags.

Soil identified by the PID as potentially hazardous (requiring transport to a Subtitle C hazardous waste landfill) was placed in plastic-lined metal "roll-off" containers provided by Waste Management Inc. Roll-off containers were used to avoid rehandling of soil, prevent run-off of contaminated soil or rainwater, and to allow for easy transport off-site. Each roll-off was covered and secured at the end of each workday and during periods of wet weather.

3.2.2 Phase 1 – Initial Excavation

The 2002 soil boring data indicated that the bulk of the PCE in soil lay within a cubic area measuring 15 feet wide (east-west) by 15 feet long (north-south) by 20 feet deep, beginning at a depth of approximately 10 feet, or the base of the manhole. Soil within 5 feet of the surface was anticipated to be clean. On September 24, 2003, Wilder began removing the asphalt and soil atop this area. As soil was excavated, it was screened and segregated as previously described. In order to provide stable slopes for the installation of the new catch basin, Wilder enlarged the footprint to slope the top 10 feet of the excavation to a 1:1 (H:V) gradient.

During the excavation the existing manhole, constructed of concrete bricks and mortar, was destroyed in place and removed from the excavation. Below a depth of 5 feet bgs, PID readings of the manhole itself escalated to above 10 ppm. Pieces of the manhole from below 5 feet bgs were removed and placed in a metal roll-off container to be disposed of at a Subtitle C Landfill. The storm sewer pipes were removed to the limits of the excavation and segregated appropriately.

PID readings from soil surrounding the manhole remained below 10 ppm until a depth of approximately 9 feet bgs. As the excavation deepened, PID readings ranged from 100 to 600 ppm with spikes as great as 2000 ppm at approximately 10 ft bgs. Soil excavated from this area was placed into the Subtitle C roll-offs. At this depth, ambient air concentrations exceeded 50 ppm and Level C protection protocols were was established on the project site in accordance with the HASP. This level of protection was continued until the end of Phase 2. However, PID readings began to decrease again at a depth of approximately 15 feet bgs.

Phase 1 was completed on September 26, 2003 when a depth of 20 feet bgs was reached. At this point approximately 300 cy of soil had been excavated. Confirmation samples were then collected from the excavation sidewalls and bottom as described in Section 3.3. Sample results indicated that soil with concentrations of PCE exceeding 19.6 mg/kg remained in the south and west sidewalls, requiring a Phase 2 excavation.

3.2.3 Phase 2 – Additional Excavation

On October 2, 2003, Wilder and FSM returned to the site and began additional excavation. Excavation continued approximately 4 feet in the westerly direction and 7 to 8 feet in the southerly direction until PID readings below 100 ppm were reached. Once PID readings from excavated soil were consistently less than 100 ppm, a second round of confirmation samples were collected. At the conclusion of Phase 2 approximately 350 cy of soil had been excavated. Photographs of the excavation activities are provided as Appendix B.

3.3 CONFIRMATION SAMPLING

3.3.1 Confirmation Sampling Collection and Handling Procedures

Samples were collected and analyzed from each sidewall at the following depth intervals: 5 to 10 feet bgs, 10 to 15 feet bgs and 15 to 20 feet bgs. The sidewalls from 0 to 5 feet bgs were not tested as this depth is well above the depth in which PCE was released to soil from the storm pipes entering the manhole, as indicated by PID readings.

To collect samples the excavator operator scraped the sidewall with the excavator bucket at the designated depth interval and brought the soil to the surface. FSM then screened the soil with a PID and collected a sample with the highest reading from within the bucket. At each depth interval, two to three soil samples were collected per sidewall, or one for every approximately 8 to 10 lineal feet of excavation perimeter. The sample with the highest PID reading per sidewall depth was then submitted for analysis. In Phase 1, this process was conducted for each of the four sidewalls. In Phase 2, samples were only collected from the southern and western sidewalls.

At the base of the excavation at 20 feet bgs, the base was divided into quadrants and four samples were collected. One sample was collected from each quadrant, or one for every approximately 60 square feet of excavation base.

Samples were collected using stainless steel trowels and 4-oz. glass jars with Teflon lined caps. Soil was collected and packed firmly to minimize the amount of headspace. Samples were then placed in a field cooler and packed with ice. The stainless steel trowels were decontaminated with an Alconox solution and rinsed with deionized water prior to each use. The sample containers were clearly labeled using a unique sample number, and standard chain-of-custody procedures were followed for all sampling events. The samples were then submitted to CCI Analytical, Inc. for analysis.

3.3.2 Analytical Results

Samples were analyzed for halogenated volatile organic compounds (HVOCs) using USEPA Method 8260. Lab reports are provided as Appendix C. Except for common lab contaminants, PCE was the only HVOC detected. Table 1 shows the results of confirmation sampling from the sidewalls and Table 2 shows results from the sampling of the base of the excavation. Except for samples taken from the southern and western walls, labeled "South (1) " and "West (1)", all other sidewalls and base samples contained PCE concentrations less than 19.6 mg/kg. After Phase 2 samples were taken from the expanded south and west sidewalls, final results verified that PCE remaining in site soil is at concentrations significantly less than the MTCA Method B cleanup level. The greatest concentration remaining in site soil is 5 mg/kg in the east sidewall. The greatest concentration detected in soil at the base of the excavation at 20 feet bgs is 0.055 mg/kg, indicating that the cleanup objective of removing the majority of the source material posing a threat to groundwater was achieved.

3.4 EXCAVATED SOIL SAMPLING

After initial segregation of the excavated soil via the PID, sampling was conducted to verify the classification of the soil to ensure proper disposal. Sampling was conducted in accordance with the work plan approved by Ecology.

3.4.1 Sample Collection and Handling Procedures

Stockpiled soil (clean soil and Subtitle D soil) was subdivided into sampling zones. Each zone contained roughly 30 tons of soil, or the approximate capacity of a single truck and trailer. Ten samples were collected from the clean soil stockpile and five samples were collected from the Subtitle D soil stockpile. For Subtitle C soil placed directly in roll-offs, one sample was collected per roll-off, which have a capacity of approximately 15 tons.

A PID reading was used to select the location of the sample. For each sample, 10 to 15 vapor "holes" were created using a 3 to 4 foot long rod. Each "hole" was screened with a PID. At the "hole" with the highest PID reading, soil was collected from a minimum 1-foot depth into the stockpile. Samples were then sent to CCI Analytical Inc. for HVOC analysis.

Samples were collected using stainless steel trowels and 4-oz. glass jars with Teflon lined caps. Soil was collected and packed firmly in the jars to minimize the amount of headspace. Samples were placed in a field cooler and packed with ice. The stainless steel trowels were decontaminated with an Alconox solution and rinsed with deionized water prior to each use. The sample containers were clearly labeled using a unique sample number, and standard chain-of-custody procedures were followed for all sampling events.

3.4.2 Analytical Results

Results of soil sampling for excavated soil in stockpiles and roll-offs are shown in Table 3. The soil stockpile results verified that the "clean" stockpile contained soil with PCE concentrations less than 0.05 mg/kg (the MTCA Method A Cleanup Level).

Analytical results verified that the Subtitle D soil stockpile contained PCE concentrations less than 19.6 mg/kg. Two samples (2-E and 2-W) from the Subtitle D soil stockpile were also tested for leachable organics using the toxicity characteristic leaching procedure (TCLP) methodology (performed for landfill profiling purposes). Leachable PCE was not detected.

Four of the seven roll-offs (3-2, 4-3, 4-4, and 4-5) that contained soil classified as Subtitle C soil based on PID readings actually contained soil with concentrations of PCE less than 19.6 mg/kg and were re-characterized as Subtitle D soil. The remaining three roll-offs contained soil with PCE concentrations greater than 19.6 mg/kg, confirming that their initial characterization as Subtitle C soil was correct.

3.5 SOIL DISPOSAL

Soil generated from the excavation was segregated into three classes. The final determination of the soil classification was based on analytical results obtained during sampling described above. Quantities of soil disposed off-site are shown in Table 4. The three classes of soil and their disposal protocols are described in the following three subsections.

3.5.1 Clean Soil

The clean soil stockpile was primarily used as backfill, except for approximately 85 tons that was deemed unsuitable for this purpose[1]. This soil was sent to the Alaska Street transload facility in Seattle where it was then loaded onto rail cars and transported to Waste Management's Columbia Ridge Landfill in Arlington, Oregon for use as alternative daily cover. Copies of truck tickets are provided in Appendix E.

3.5.2 Subtitle D Soil

According to contained-out letter received from Ecology for this site (Appendix F), soil that contained PCE concentrations of less than 19.6 mg/kg could be considered non-hazardous and disposed of as refuse at the Columbia Ridge Landfill, a permitted Subtitle D landfill. Ecology prohibits the soil from being used as alternative daily cover. Subtitle D soil that was in roll-offs or stockpiled was removed from the site and transported to the Columbia Ridge Landfill for disposal as refuse. Approximately 200 tons of Subtitle D soil was disposed of at the Columbia Ridge Landfill. A total of five samples were collected from the Subtitle D stockpile. The concentrations ranged from non-detect to 2.5 mg/kg. Due to the mixed nature of the stockpile, the entire stockpile was disposed of as Subtitle D soil.

3.5.3 Subtitle C Soil

Three roll-offs with soil, including the demolished manhole, contained PCE with concentrations above 19.6 mg/kg and were classified as hazardous waste. The roll-offs were transported off-site under a manifest and sent by rail to the Chemical Waste Management Landfill in Arlington, Oregon, (ChemWaste) a permitted Subtitle C hazardous waste landfill. All three roll-offs contained soil with concentrations greater than 60 mg/kg. Under the Resource Conservation and Recovery Act (RCRA), soil with contamination levels greater than 60 mg/kg is unacceptable for direct disposal and must be treated to lower concentrations to levels that are less than 60 mg/kg prior to disposal. Treatment was performed at the landfill using a biotreatment process. Once appropriate concentration levels were achieved the soil could be directly disposed of at ChemWaste Landfill. Approximately 50 tons of soil/debris in three roll-offs were treated and disposed of at the ChemWaste Landfill.

[1] The 85 tons also included metal debris, hay bales, trash, plastic, left over import soil, and other miscellaneous disposables.

3.6 SITE RESTORATION

Site restoration included the following elements:

- Backfill and compaction of the excavation with clean soil and imported fill to compaction requirements in accordance with COB regulations. Additional fill soil was imported to account for the soil transported off site to the Subtitle C and D landfills.
- Installation of a new Type 2 catch basin. New PVC storm sewer pipes were attached to the existing pipe at the excavation limits and extended to the new catch basin. All storm sewer components were installed at the previously existing invert and rim elevations.
- Grading, paving and striping of the site.
- Removal of existing SVE system from the site.
- Removal of the fence and temporary erosion control measures, and demobilization by Wilder.

3.7 DEVIATIONS FROM THE WORK PLAN

Adherence to the work plan was consistent with one exception: The alternative outlined in the work plan enabling treatment of SVE on-site, instead of at the landfill, was not performed on Subtitle C soil. The work plan outlined two separate classifications for Subtitle C soil. The first contained soil concentrations from 19.6 mg/kg to 60 mg/kg which could be directly disposed at Arlington. The second classification provided for soil greater than 60 mg/kg, which would require treatment prior to disposal.

During the excavation, it was determined that all Subtitle C soil in roll-offs contained PCE concentrations greater than 60 mg/kg. Based on the small quantity of this soil and its elevated PCE concentrations, it was determined that transporting the soil to Arlington for biotreatment would be more cost-effective and expeditious than on-site treatment.

4.0 Vapor Pathway Analysis

An analysis of the vapor pathway from soil to air inside the storm sewer manhole was conducted using the guidance published by the US Environmental Protection Agency (USEPA) using the Johnson and Ettinger Model (EQM 2000). The analysis was performed to identify the PCE concentration in soil that could create a health risk for a worker in the manhole, the only conceivable exposure scenario for the residual PCE vapors. Since this site is zoned for commercial purposes, a residential exposure scenario was not evaluated. Analysis for the model was performed using a depth-to-contamination scenario of 10 feet below the base of the manhole. This depth is based on the placement of 10 feet of clean fill in between the residually contaminated soil at 20 feet and the base of the catch basin. Site-specific model parameters such as soil properties, dimensions, and thickness of the manhole were used whenever available. If site-specific parameters were unavailable, default model values were used. The model assumes a worker in the manhole for a duration of 4 hours per day, 1 day per year, for 30 years, with an ambient air exchange rate of once every 4 hours. These assumptions are considered relatively conservative.

Using these parameters, the model predicted that a PCE concentration of 1,880 mg/kg in the soil at a depth of 20 feet would exceed MTCA requirements and create a carcinogenic risk of 10^{-6} for vapors inhaled by the worker. This concentration is more than 3,000 times the actual PCE concentration remaining at the site following the cleanup action. Vapor pathway analysis verified that the concentrations of PCE remaining in the soil do not exceed vapor risk levels. Model worksheets are provided as Appendix G.

5.0 Conclusions

This cleanup action report documented the remedial action conducted to excavate PCE-contaminated soil at the Shops at First Street site. The cleanup was conducted as an independent cleanup action under the VCP with technical guidance provided by Ecology in accordance with all MTCA requirements.

Previous site investigations and remedial actions have identified the source of the PCE and the extent to which it has spread, in both soil and groundwater. A combination of data from soil borings, soil gas surveys, and sampling of upgradient and downgradient catch basins has revealed that there were only two areas of concern for contamination of PCE in soil. The cleanup action completed in 1994 removed soils with PCE concentrations greater than MTCA Method B Cleanup Levels in the area of the former dry cleaner. Trace concentrations of PCE greater than the Method A Cleanup Level remain at depth.

The cleanup action report documents the removal of all soil in the vicinity of the storm sewer manhole that contained PCE concentrations greater than the Method B cleanup level, and additional over-excavation to a depth of 20 feet bgs to ensure that nearly all of the source material that could pose a threat to groundwater was removed. In total, approximately 600 tons (350 cy) of soil was excavated, of which approximately 250 tons (145 cy) contained concentrations of PCE greater than the MTCA Method A Cleanup Level, and so could not bebe backfilled on-site. This soil was segregated and sampled to provide a cost-effective method of disposal. Approximately 200 tons (120 cy) of the excavated soil at concentrations above Method A but less than the Method B cleanup level was transported to a Subtitle D landfill. Fifty tons (25 cy) greater than the Method B cleanup level were treated and disposed of at a Subtitle C landfill.

Analytical results from confirmational sampling of the sidewalls and the base of the excavation verified that the cleanup level was achieved. Residual concentrations of PCE do not pose a risk to indoor air even under very conservative scenarios.

6.0 References

Kennedy/Jenks .Consultants 2002. Soil Evaluation Results and Findings, Storm Sewer Manhole. Prepared for Ron Timm of Ecology. Bellevue Washington. 8 July

Kennedy/Jenks Consultants. 1994. Remedial Investigation/Feasibility Study Report. Prepared for Benenson Bellevue II, L.P. New York, New York. November 1994

EQM 2000. Users Guide for the Johnson and Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Prepared by Environmental Quality Management for US Environmental Protection Agency.

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Tables

Final

Table 1
Sidewall Confirmation Sampling Analytical Data

	Sidewall PCE Concentrations, mg/kg					
	Phase 1				Phase 2	
Depth (ft bgs)	North	East	*South (1)*	*West (1)*	South	West
7.5	0.015	5	*0.39*	*0.04*	0.024	0.021
12.5	0.2	0.046	*200*	*61*	0.55	0.15
17.5	0.57	0.26	*3,000*	*0.3*	0.16	0.37

Notes:
Italicized results show concentrations in soil removed during Phase 2.
bgs = below ground surface

Table 2
Base Confirmation Sampling Analytical Data

Base - 20 feet bgs	
Quadrant	**PCE Concentration, mg/kg**
NW	0.055
NE	0.035
SE	0.031
SW	0.027

Table 3
Stockpile Sampling Analytical Data

	Stockpile Sample	PCE Concentration (mg/kg)	Disposed of as
Clean Soil Stockpile	1 N to NE	0.049	Backfill
	1 NE to E	0.01	Backfill
	1 E to SE	0.015	Backfill
	1 SE to S	ND (< 0.01)	Backfill
	1 SW to S	ND (< 0.01)	Backfill
	1 W to SW	ND (< 0.01)	Backfill
	1 N to NW	0.021	Backfill
	1 NW to W	ND (< 0.01)	Backfill
	1 Frontwest II	0.03	Backfill
	1 Backwest II	0.022	Backfill
Subtitle D Soil Stockpile	2-E (A)	ND (< 0.01)	Subtitle D
	2 New A	0.012	Subtitle D
	2 New B	0.28	Subtitle D
	2 New C	0.015	Subtitle D
	3-N	2.5	Subtitle D
Roll-offs	3-2 R.O.	0.82	Subtitle D
	4-3 R.O.	11	Subtitle D
	4-4 R.O.	0.71	Subtitle D
	4-5 R.O.	0.42	Subtitle D
	3-1 R.O.	660	Subtitle C to be biotreated
	4-1 R.O.	470	Subtitle C to be biotreated
	4-2 R.O.	160	Subtitle C to be biotreated

Table 4
Quantities of Soil Disposed Off-site

Soil Disposal	Tons	Cubic Yards[1]
Subtitle D (Alternative Daily Cover)	84.85	49.91
Subtitle D (Contained In)	198.62	116.84
Subtitle C (Biotreatment)	49.13	28.90

Notes:
1. A conversion of 1.7 tons per cubic yards was assumed.

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Figures

Final

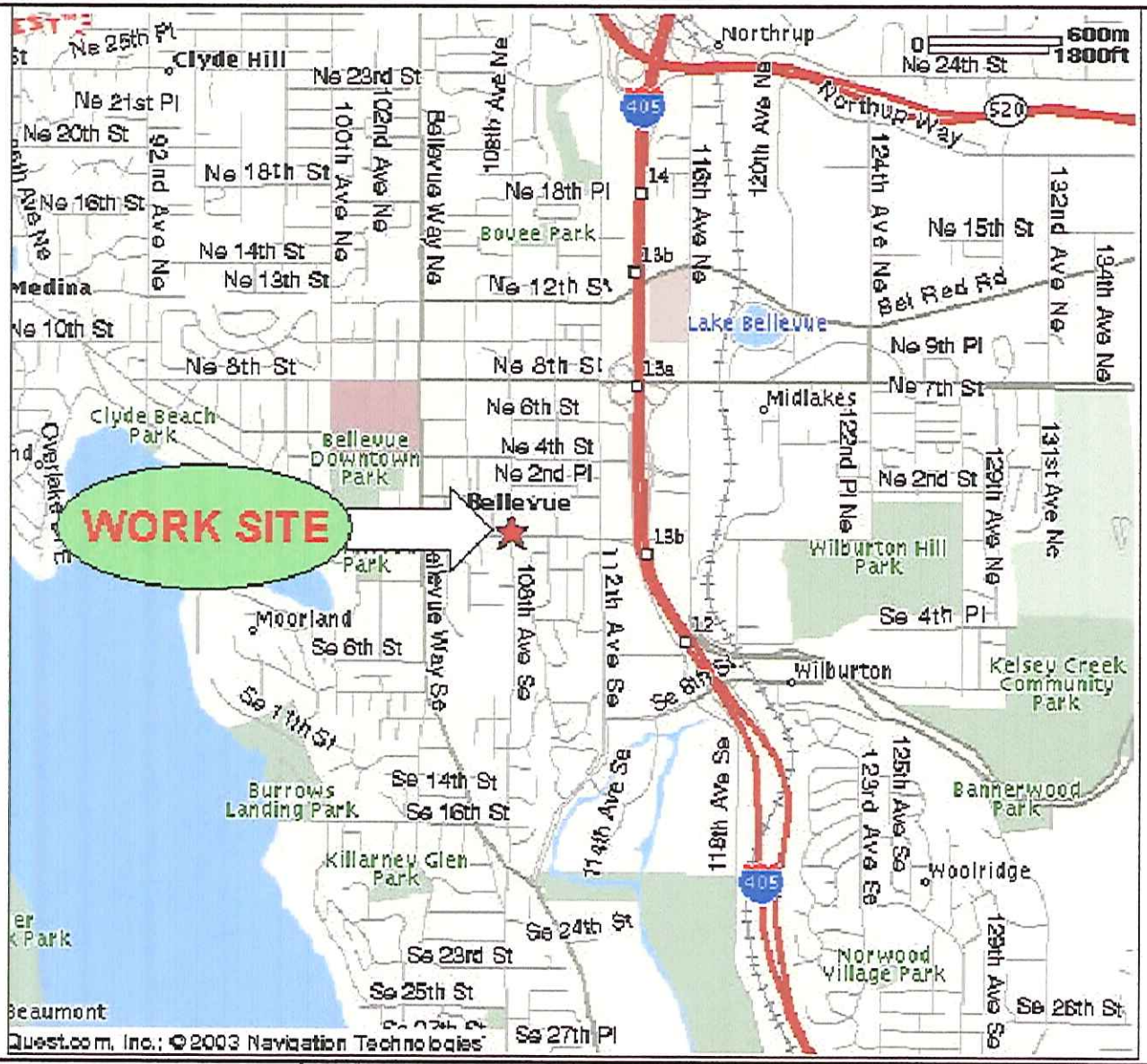

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Figure 1
Vicinity Map

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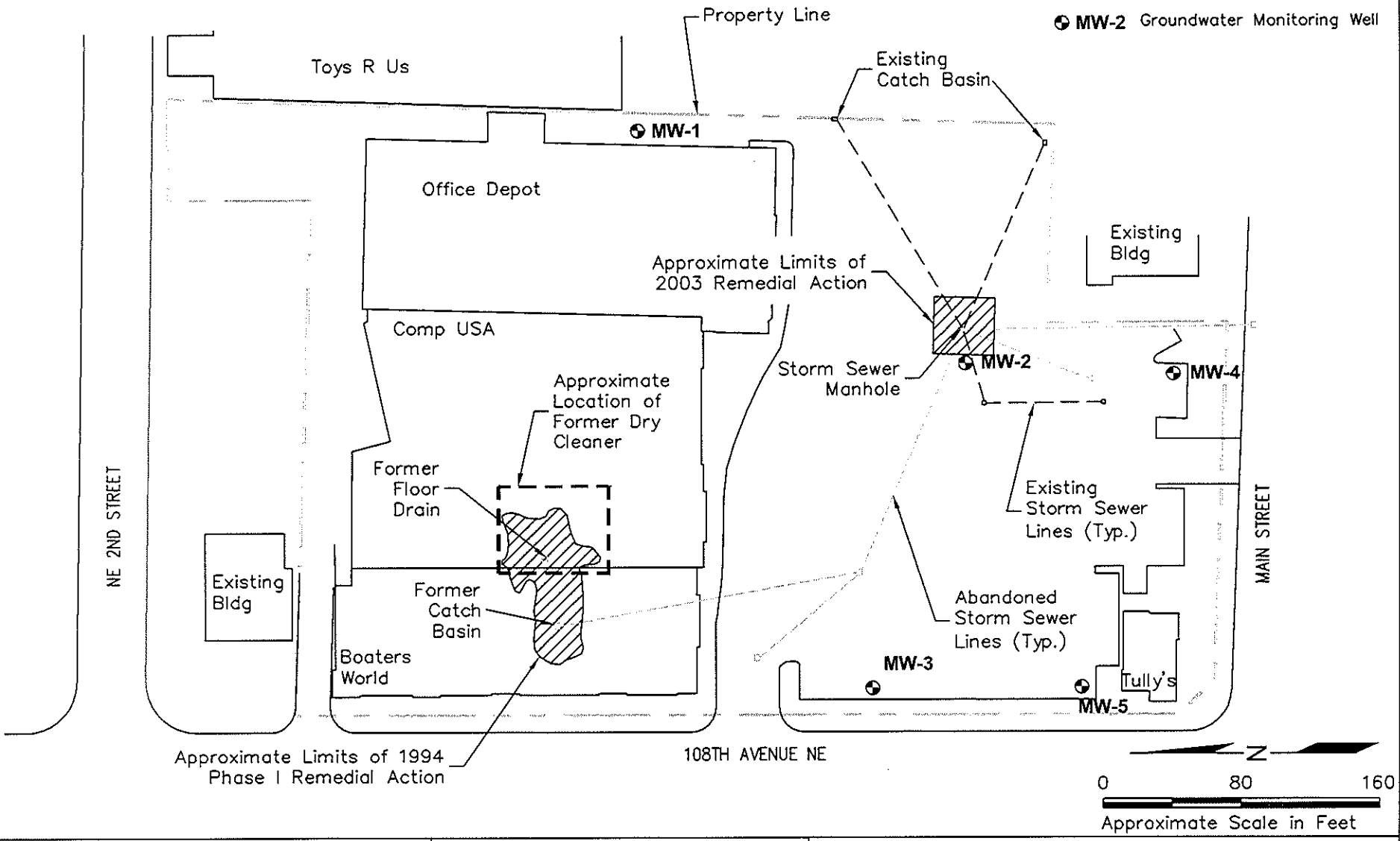

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Strategy & Technical Solutions for Contaminated Properties

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Bellevue, Washington

Figure 2
Site Map

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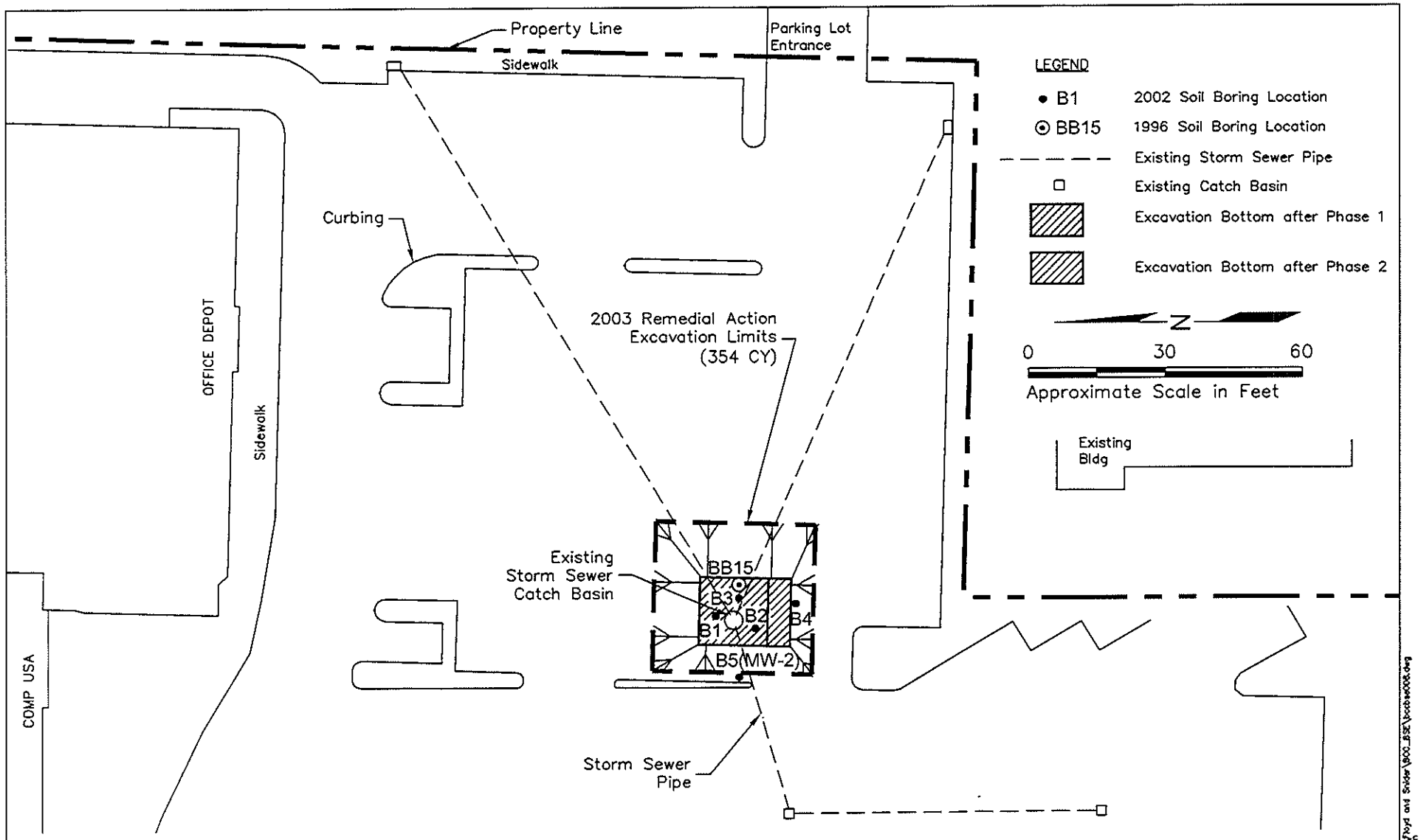

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Bellevue, Washington

Figure 3
2003 Remedial Action Soil Removal

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