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Earth and Environmental Technologies

Groundwater Long-Term Compliance Monitoring Plan Fostoria Business Park

Prepared for
Northstream Development

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GROUNDWATER LONG-TERM COMPLIANCE MONITORING PLAN
FOSTORIA BUSINESS PARK

1.0 PROJECT OBJECTIVES

This Long-term Compliance Monitoring Plan is submitted on behalf of Northstream Development for Buildings A, B, and C of the Fostoria Business Park (Figure 1). This plan describes the methods and procedures that will be used to collect groundwater samples as part of the long-term compliance monitoring required by the Washington State Department of Ecology (Ecology) for the issuance of the No Further Action (NFA) letter on this site. The NFA letter will require quarterly groundwater monitoring in the years 2001 and 2003 to demonstrate that the remedial actions on the site are protective of groundwater in the area.

2.0 PROJECT BACKGROUND

The Fostoria Business Park, located in Tukwila, Washington (Figure 1) is developed for commercial and light industrial use within a three-parcel business park. The 5-acre property is bounded by the Duwamish River valley to the east and a slope which rises to an upland area to the southwest. The property is approximately 10 to 20 feet above the Duwamish valley floor.

As shown on Figure 2, the property contains three warehouse buildings surrounded by asphalt pavement and landscape borders. Two independently owned properties are also located within the developed industrial park; World Tire Building to the northwest and Fostoria Park Industrial Center to the north and northeast. Separate investigations and compliance monitoring programs have been being performed for these sites (Earth Consultants, 1991 and 1999; Dames & Moore, 1996).

Groundwater beneath the site property originates as runoff and underflow from the adjacent upland area and discharges to the perimeter ditches and the Duwamish River valley. These ditches are shown with flow directions on Figure 2. Rainfall on the business park contributes little recharge to the local system. Details on the hydrogeology and geology of the site are presented in the Independent Remedial Action Report (Hart Crowser, 1996).

A portion of buildings A, B, and C are underlain by fill material containing cement kiln dust (CKD). The approximate lateral extent of the CKD is presented on Figure 2. To address the potential environmental issues associated with the

CKD, an Independent Remedial Action was implemented in 1996 (Hart Crowser, 1996). This action included a restrictive covenant placed on the property deed to maintain this cap, as well as requirement for cap inspection and confirmational groundwater monitoring.

As part of the independent remedial action, groundwater has been analyzed for total and dissolved metals and conventional parameters in selected monitoring wells through time. Monitoring well locations are presented on Figure 2. The results of these analyses are presented in Table 1. Total chromium, copper, lead, and zinc were detected in MW-1 in 1991 at concentration greater than the state freshwater criteria. In addition, total lead was detected in the April 1997 sampling of MW-1002. Based on the chemical results of this groundwater monitoring, long-term compliance monitoring was requested by Ecology.

3.0 PROJECT ORGANIZATION

Hart Crowser, under contract to Northstream Development, will collect groundwater samples in accordance with this long-term compliance monitoring plan. The samples will be submitted to MultiChem Analytical Service (MultiChem) of Renton, Washington, for chemical analysis.

4.0 SAMPLING LOCATIONS, FREQUENCY, AND PROCEDURES

The long-term compliance monitoring will be conducted to demonstrate that the remedial actions on the site are protective of groundwater. Sampling frequency and sample number, the method of collection, and analytical methods are discussed below. If the long-term monitoring data from 2001 and 2003 indicate that constituents of concern are below state surface water standards (as presented in Table 1), we will request that Ecology no longer require groundwater monitoring.

4.1 Sampling Location and Frequency

Groundwater sampling will be conducted on a quarterly basis in February, May, August, and November in the years 2001 and 2003. Samples will be collected from two monitoring wells, MW-1001 and MW-1002 (Figure 2).

4.2 Sampling Procedures

The groundwater monitoring wells will be located and their condition evaluated. Any damage or needed repairs will be reported and recorded in the field notes.

4.2.1 Sample Collection

Prior to sampling, the depth to groundwater in each monitoring well will be recorded using a manually operated electric water level sounder. The wells will be purged using a peristaltic pump to obtain connection with the aquifer. During purging, groundwater pH, conductivity, and temperature will be recorded. Purging will continue until field parameters have stabilized (± 10 percent). It is anticipated that the estimated purge volume will be three casing volumes. Once purging is completed, groundwater samples will be collected using a low-flow (100 ml/min) peristaltic pump. Final field parameters will be recorded. The two samples will be submitted for analysis of the following chemical constituents:

- Total Suspended Solids (TSS);
- Total Metals (As, Cd, Cr, Cu, Pb, Ni, Ag, Zn); and
- Dissolved Metals (As, Cd, Cr, Cu, Pb, Ni, Ag, Zn).

Samples for dissolved metals analysis will be filtered in the field using a peristaltic pump with in-line 0.45 micron filter. Sample bottles, preservation, and holding times are presented in Table 2.

4.2.2 Sample Handling and Custody

Once filled, each bottle will be capped and placed into coolers with Blue-Ice. Samples will be kept under custody until shipped to the analytical laboratory. Samples are considered to be in "custody" if they are:

(1) In the custodian's possession or view;
(2) Retained in a secured place (under lock) with restricted access; or
(3) Placed in a container and secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

Custody procedures will be initiated during sample collection. A chain of custody record will be signed by the field representative and others who subsequently hold custody. Each person who has custody of the samples will sign the form and ensure that the samples are not left unattended unless properly secured. The custody form will accompany samples at all times and will be signed at each point of transfer. The custody forms will be filled out in indelible ink. Minimum documentation of sample handling and custody will include:

- Sample location, project name, and unique sample number;
- Sample collection date and time;
- Any special notations on sample characteristics or problems;

- Description of analysis to be performed;
- Initials of the person collecting the sample; and
- Date sample was sent to the laboratory.

Prior to shipping, sample containers will be appropriately packed and secured inside a cooler with ice packs or crushed ice. The original signed custody forms will be transported with the cooler. The cooler will be secured with custody seals and appropriately labeled for shipping and handling. Samples for chemical analyses will be couriered to the appropriate laboratory.

The analytical laboratory will contact Hart Crowser immediately if discrepancies between the custody forms and the sample shipment are discovered upon receipt. The laboratory QA Officer will specifically note any coolers that are not sufficiently cold upon receipt. The laboratory will not dispose of the environmental samples for this project until properly notified by the QA Coordinator or the client.

4.2.3 Field Documentation

A complete record of field activities will be maintained for the duration of the field phase of work. Documentation includes:

- Field forms maintained by field personnel for every sample; and
- Use of sample labels and custody forms for samples collected for analysis.

The field forms will provide a description of the following:

- Date and time of sample collection;
- Sampling personnel;
- Weather conditions;
- Sample descriptions;
- Field parameter measurements;
- List of equipment used; and
- Any modifications to the procedures and plans identified in the project plans.

4.2.4 Equipment Decontamination

Since disposable equipment will be used to sample groundwater, equipment decontamination will not be required. New sampling equipment (tubing, etc.) will be used at each sample location.

4.2.5 Purge Water Disposal

Purge water will be collected in 5-gallon drums and disposed of on site immediately following collection.

4.3 Sample Analysis and Quality Assurance

The groundwater samples will be submitted to MultiChem for analysis of the following:

- Total Suspended Solids (TSS, EPA Method 160.2);
- Total Metals (As, Cd, Cr, Cu, Pb, Ni, Ag, Zn, EPA Method 6000/7000); and
- Dissolved Metals (As, Cd, Cr, Cu, Pb, Ni, Ag, Zn, EPA Method 6000/7000).

Reporting limits for sample results will be at or below the state screening criteria presented in Table 1.

4.3.1 Laboratory Quality Control

The quality assurance objectives for this project are to develop and implement procedures that will ensure the collection of representative physical and chemical data of known and acceptable quality. The following quality control procedures will be used to assess the acceptability of the data.

Initial and Continuing Calibration. Multi-point initial calibration will be performed on each instrument at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet control criteria. Ongoing calibration will be performed daily to track instrument performance.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at a frequency of 1 continuing calibration blank for every 10 samples. If the ongoing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

Matrix Replicates. Analytical replicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical replicates are subsamples of the original sample that

are prepared and analyzed as a separate sample. A minimum of one replicate will be analyzed per sample group.

Matrix Spikes. Analysis of matrix spike samples provides information on the extraction efficiency of the method on the sample matrix. A minimum of one matrix spike will be analyzed for every sample group.

Method Blanks. Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of one method blank will be analyzed for every sample batch.

Results of the quality control samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The quality control sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the Project Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

4.3.2 Field Instrument Calibration

Field meters, including pH, conductivity, and temperature probes, will be calibrated and maintained in accordance with manufacturers specifications by Hart Crowser's equipment manager, as well as by appropriate field staff when in use. All routine maintenance will be recorded in instrument log books or directly on the instrument as appropriate.

5.0 REPORTING

Results from the long-term monitoring will be reported in monitoring reports, to be completed for each quarterly sampling result. The reports will include:

- A site plan showing sample locations;
- A summary of field activities, including a deviations from the long-term monitoring plan;
- An table presenting the current and historical compliance monitoring data compared to applicable state standards;
- A brief data quality review;
- Trend analysis graphs for each detected metal; and
- Laboratory certificates of analysis.

6.0 REFERENCES

Dames & Moore, 1996. Report on Groundwater and Sediment Quality Assessment, Former American Tire Wholesalers Building, Tukwila, Washington.

Earth Consultants, 1999. Groundwater and Surface Water Compliance Monitoring Plan, Fostoria Park Industrial Center Buildings A through E, 4400 through 4500 South 134th Place, Tukwila, Washington. March 18, 1999.

Earth Consultants, 1991. Preliminary Subsurface Site Characterization, Fostoria Park Industrial Center, Tukwila, Washington.

Ecology, 1997. Water Quality Standards for Surface Waters of the State of Washington. Chapter 173-201A. November 1997.

Hart Crowser, 1991. Subsurface Exploration and Testing, Fostoria Business Park, Tukwila, Washington.

Hart Crowser, 1996. Independent Remedial Action Report, Fostoria Business Park, Tukwila, Washington.

Hart Crowser, 1997. Submittal of Additional Information for IRAP Review. Fostoria Business Park Buildings A, B, and C. 4400 South 134th Street in Tukwila, Washington. June 3, 1997.

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Table 1 - Summary of Groundwater Chemistry Data
Fostoria Park

	Regulatory Standards		Site Groundwater						
	FW Critieria (1)		MW-1001	MW-1001	MW-1001	MW-1002	MW-1002	MW-1	MW-1
	Acute	Chronic	1/7/1999	9/11/1996	5/3/1996	1/7/1999	4/27/1997	9/11/1996	2/11/1991
pH	–	6.5 to 9.0	7.9	7.0	8.9	7.0	9.9	6.7	8.3
Hardness		–	120	132	NA	450	98	67.7	NA
Total Suspended Solids	–	–	10 U	20	NA	150	160	47	NA
Total Dissolved Solids	–	–		NA	NA		740	NA	NA
Dissolved Metals in ug/L									
Arsenic	360	190	9.6	17.4	30	73	53	12.9	NA
Cadmium (2)	6.8	1.6	0.2 U	0.1 U	*5 U*	1 U	0.1 U	1 U	NA
Chromium (3)	15	10	10 U	10 U	10 U	10 U	10 U	10 U	NA
Copper (2)	29	18	2 U	1 U	*30 U*	2 U	6.8	1 U	NA
Lead (2)	117	4.6	3 U	2.03	2 U	3 U	3.6	1 U	NA
Nickel (2)	2261	251	10 U	30 U	30 U	17	10 U	30 U	NA
Silver (2)	8.94	–	0.5 U	1 U	*20 U*	0.5 U	0.2 U	1 U	NA
Zinc (2)	183	167	10 U	20 U	20 U	10 U	10 U	20 U	NA
Total Metals in ug/L									
Arsenic	360	190	10	30.6	35	93	60	18	NA
Cadmium (2)	7.33	1.75	0.2 U	0.33	*5 U*	1 U	0.15	*5 U*	0.3 U
Chromium (3)	15	10	10 U	5 U	10 U	10 U	10 U	5 U	**90**
Copper (2)	30	19	2 U	*30 U*	*30 U*	2 U	11	*30 U*	**80**
Lead (2)	165	6.4	3 U	4.26	3.4 U	3 U	**21**	1 U	**11**
Nickel (2)	2266	252	10 U	10 U	30 U	14	11	10 U	110
Silver (2)	10.52	–	0.5 U	1 U	20 U	0.5 U	0.2 U	1 U	NA
Zinc (2)	187	169	10 U	10 U	20 U	10 U	14	10 U	**220**

(1) Washington State Department of Ecology Surface Water Criteria (Chapter 173-201A, WAC, 1997)
(2) Criteria is Hardness based, calculated based on 174 mg/L (site average)
(3) Criteria based on Chromium $^{+6}$
NA Not Analyzed
U Not detected at indicated detection limit
– No Current standard
Bolded values exceed screening criteria
Italicized values represent detection limits greater than screening criteria

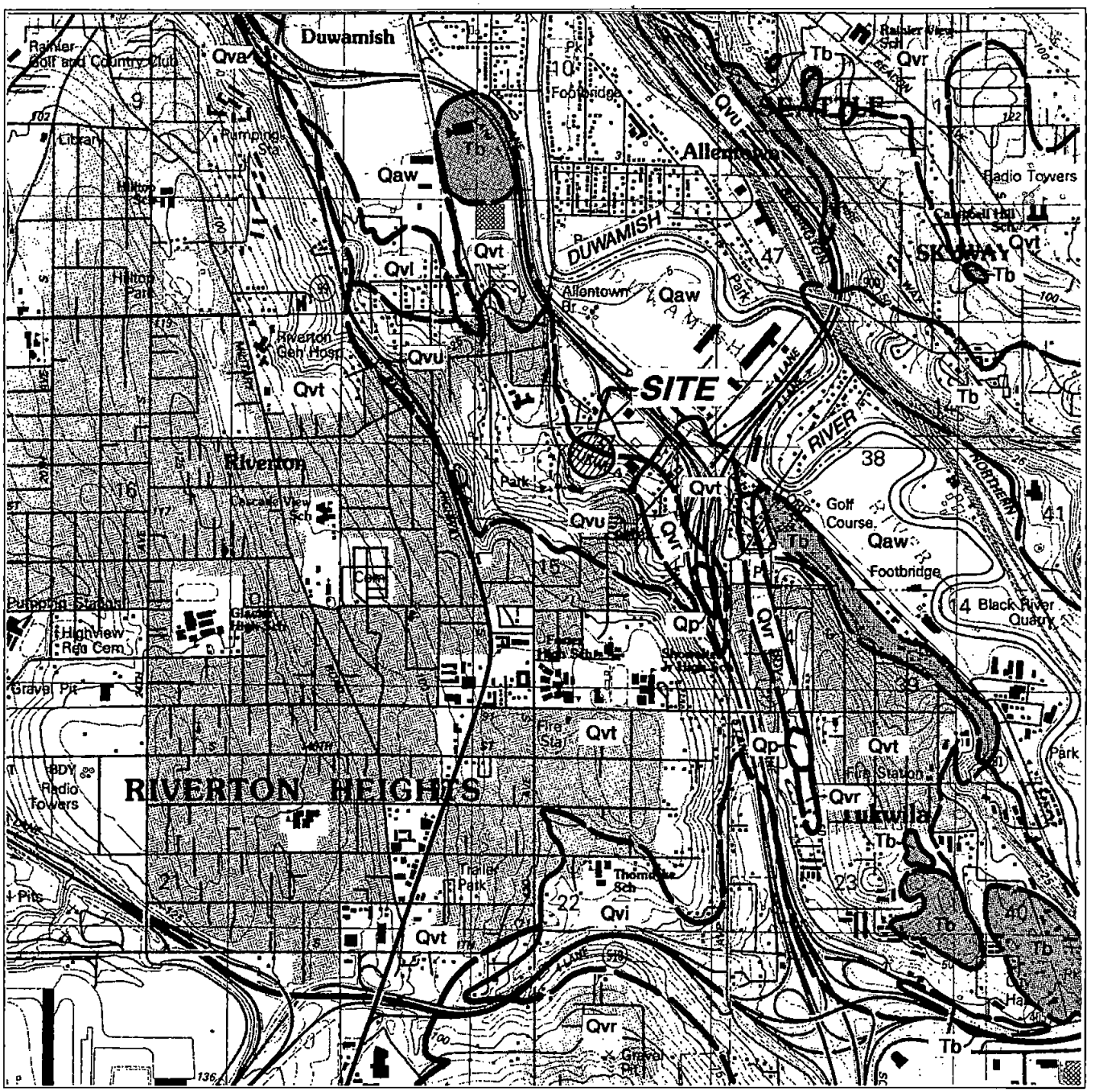
Table 2 - Sample Bottle, Preservation, and Holding Times

Chemical Analysis	Sample Container	Preservative (1)	Holding Time
TSS	1 L P		7 days
Total Metals	1 L P	pH <2 HNO_3	180 days
Dissolved Metals	1 L P	pH <2 HNO_3	180 days

(1) All samples shall be maintained at 4°C.

322205/Fostoria.xls - table2

Site Location and Surficial Geology Map



Qaw	Recent Alluvial Deposits
Qp	Peat Deposits
Qvr	Vashon Recessional Outwash
Qvt	Vashon Till
Qvl	Vashon Lacustrine Deposits
Qvu	Vashon Undifferentiated Deposits
Tb	Undifferentiated Bedrock
A-A'	Cross Section Location and Designation

N

0 2000 4000

Scale in Feet

Note: Base map prepared from USGS 7.5 minute quadrangle map of Burien, Washington, dated 1983.

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Figure 1

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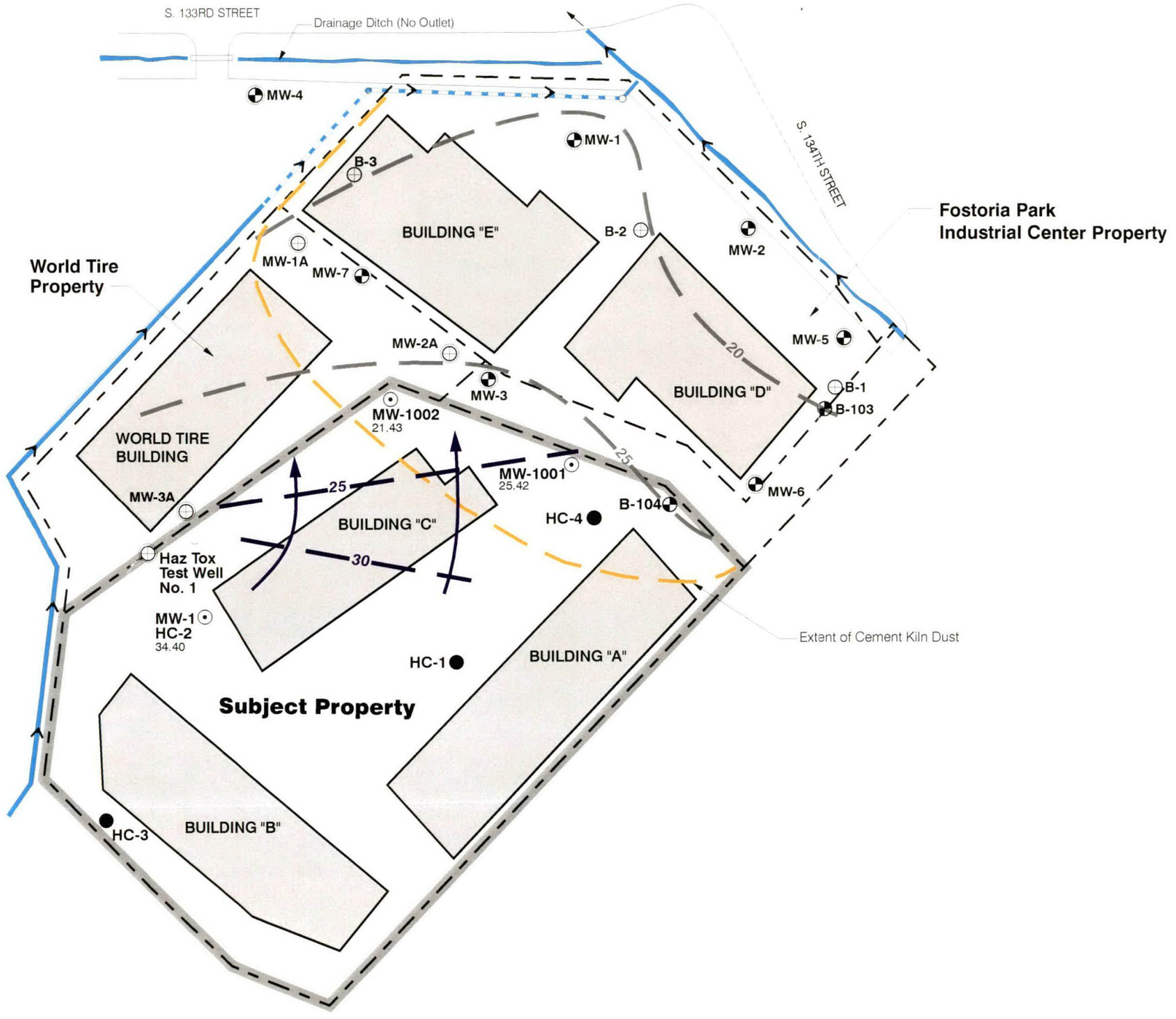
Site and Exploration Plan



Subject Property Exploration Location and Number

- MW-1 — Monitoring Well (Hart Crowser, 1991, 1996, and 1997)
- HC-1 — Boring (Hart Crowser, 1991 and 1996)
- 25 — Groundwater Elevation Contour in Feet
- 25.42 — Groundwater Elevation in Feet Measured April 1997
- Groundwater Flow Direction
- Subject Property Boundary

Adjacent Property Exploration Location and Number

- MW-5 — Monitoring Well (ECI, 1991)
- B-103 — Boring (ECI, 1991)
- B-1 — Boring (ECI, 1991)
- MW-1A — Monitoring Well (Dames & Moore, 1996)
- 25 — Groundwater Elevation Contour in Feet
- Drainage Ditch with Flow Direction

Note: Groundwater elevation contours on the subject property at referenced to an assumed datum of 25 feet at MW-1001.

N

0 100 200

Approximate Scale in Feet

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Figure 2

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