FARALLON consulting

975 5th Avenue Northwest, Issaquah, Washington 98027
Tel: (425) 295-0800 Fax: (425) 295-0850
www.farallonconsulting.com

REMEDIAL INVESTIGATION WORK PLAN

CAPITAL INDUSTRIES, INC.
5801 THIRD AVENUE SOUTH
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

Submitted by:
Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027

Farallon PN: 457-004

For:
Mr. Ron Taylor
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

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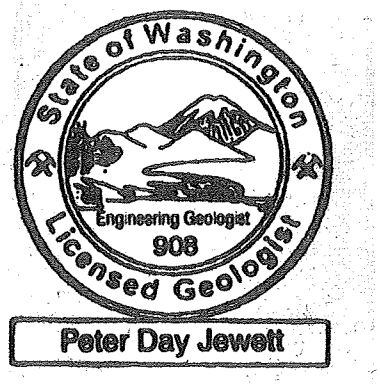
Prepared by:

Daniel Caputo
Project Chemist

Reviewed by:

Peter Jewett, L.G., L.E.G.
Principal



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ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

ABP	Art Brass Plating
Agreed Order	Agreed Order No. DE 5348 between the Washington State Department of Ecology and Capital Industries, Inc.
ARARs	applicable or relevant and appropriate requirements
BDC	Blaser Die Casting
bgs	below ground surface
Capital	Capital Industries, Inc.
Capital Area of Investigation	Area south of Mead Street South, north of South Front Street, east of 1st Avenue South, and west of 4th Avenue South; and the property north of South Mead Street
Capital Property	Property located at 5801 3rd Avenue South in Seattle, Washington
Capital Site	Area where constituents of concern exceed regulatory cleanup levels
cis-1,2-DCE	cis-1,2-dichloroethene
COCs	constituents of concern
COPCs	constituents of potential concern
Ecology	Washington State Department of Ecology
ECS	Environmental Consulting Services, Inc.
EPA	U.S. Environmental Protection Agency
Farallon	Farallon Consulting, L.L.C.
FSM	Floyd Snider McCarthy, Inc.
HVOCs	halogenated volatile organic compounds
Intermediate Zone	water-bearing zone from 40 to 70 feet below ground surface
MTCA	Washington State Model Toxics Control Act Cleanup Regulation
PCE	tetrachloroethene
PGG	Pacific Groundwater Group
PID	photoionization detector
PPP	Public Participation Plan
PQLs	practical quantitation limits
PSC	Philip Services Corporation
PTC	Pioneer Technologies Corporation

QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RI Work Plan	Remedial Investigation Work Plan
SAP	Sampling and Analysis Plan
Shallow Zone	water-bearing zone from 20 to 40 feet below ground surface
SSDS	Sub-Slab Depressurization System
TCE	trichloroethene
trans-1,2-DCE	trans-1,2-dichloroethene
VOCs	volatile organic compounds
WAC	Washington Administrative Code
Water Table Zone	water-bearing zone from surface to 20 feet below ground surface

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Remedial Investigation Work Plan (RI Work Plan) on behalf of Capital Industries, Inc. (Capital) to provide the scope of work and objectives for the Remedial Investigation (RI) of the Capital Area of Investigation (Figure 1). For purposes of the RI, the Capital Area of Investigation is defined as the area south of South Mead Street, north of South Front Street, east of 1st Avenue South, and west of 4th Avenue South, and the property north of Mead Street and west of 4th Avenue South (Figures 1 and 2). In accordance with Exhibit A of draft Agreed Order No. DE 5348 entered into by Capital and the Washington State Department Ecology (Ecology) on January 24, 2008 (Agreed Order) and with Section 200 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-200), the Capital Site will be defined as the area where concentrations of constituents of concern (COCs) released from the Capital Property, located at 5801 3rd Avenue South in Seattle, Washington, exceed regulatory cleanup levels. The results of the RI will be used to determine the Capital Site.

The purpose of the RI is to collect sufficient information to enable development and evaluation of technically feasible cleanup alternatives in accordance with WAC 173-340-360 through 173-340-390. The RI will provide sufficient data to refine the conceptual site model for use in evaluating technically feasible cleanup alternatives for selection of a final cleanup action applicable to the Capital Site.

The RI Work Plan is a deliverable required by the Agreed Order that includes a Reconnaissance Sampling and Analysis Plan (Appendix A), a Quality Assurance Project Plan (Appendix B), and a Health and Safety Plan (Appendix C) prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA), as established in WAC 173-340-350 and pursuant to the Agreed Order. Additional documents required under Exhibit B of the Agreed Order include a Public Participation Plan and a Vapor Intrusion Assessment Work Plan, which are provided under separate cover. A Vapor Intrusion Mitigation Work Plan and a Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan will be provided as described in the Vapor Intrusion Assessment Work Plan. A Groundwater Monitoring Plan will be provided in accordance of the schedule presented in Section 6, Remedial Investigation Deliverables. Quarterly progress reports and an RI Report will be submitted during and after completion of the RI Field Program, respectively.

1.1 REMEDIAL INVESTIGATION OBJECTIVES AND SCOPE

The objectives of the RI are to identify the nature and extent of the constituents of potential concern (COPCs) in the media of concern, to evaluate the impact on human health and the environment, and to collect and evaluate sufficient information to enable selection of a cleanup action for the Capital Site. The scope of work presented in the RI Work Plan will characterize the nature and extent of COPCs in groundwater at the Capital Area of Investigation; characterize the nature and extent of volatile organic compounds (VOCs) in indoor ambient air, as appropriate; identify the applicable or relevant and appropriate requirements (ARARs) for the

Capital Site to define the appropriate cleanup standards for a cleanup action; and comply with the requirements of WAC 173-340-350 and the Agreed Order.

1.2 PURPOSE OF THE REMEDIAL INVESTIGATION WORK PLAN

The RI Work Plan describes the project objectives and organization, functional activities, and quality assurance and quality control protocols that will be used to complete the RI. The purpose of the RI Work Plan is to:

- Provide a summary of previous investigations at the Capital Area of Investigation completed by Farallon and others;
- Describe the preliminary conceptual site model;
- Identify data gaps that require investigation to enable evaluation and selection of a cleanup action;
- Provide the rationale for the scope of work to be performed for the RI;
- Provide detailed methods for sampling and analysis, and a schedule for the RI; and
- Provide a summary of the elements to be included in the RI Report.

1.3 ORGANIZATION OF THE REMEDIAL INVESTIGATION WORK PLAN

The format of the RI Work Plan and supporting documents is in accordance with WAC 173-340-810 through 173-340-840 and the Agreed Order. Section 2 of the RI Work Plan provides a description of the Capital Area of Investigation and vicinity, a summary of background information, and a summary of previous investigations conducted at the Capital Area of Investigation and surrounding properties. Section 3 describes the technical issues for the RI, including applicable screening levels, potential media of concern and pathways, the COPCs, and preliminary ARARS. Section 4 summarizes the preliminary conceptual site model. Section 5 describes the scope of work for the RI. The reporting requirements for the RI are presented in Section 6. Section 7 provides a list of documents used in preparation of the RI Work Plan.

The Reconnaissance Sampling and Analysis Plan (SAP), including the Field Sampling Plan, provides specific requirements for sample collection and analytical activities during the reconnaissance phase of work and is included in Appendix A. The Quality Assurance Project Plan (QAPP) details the quality assurance/quality control protocols for the RI and is provided in Appendix B. The Health and Safety Plan is provided in Appendix C. Boring and well construction logs from previous investigations are included in Appendix D. Appendix E contains figures from previous investigations conducted at the Capital Property. Appendix F contains an addendum identifying the parameters and purpose of the BIOCHLOR modeling. Appendix G contains laboratory analytical reports from soil sampling and analysis activities conducted at the Second Avenue South Redevelopment area by Farallon. All appendices should be referenced in conjunction with the entire RI Work Plan.

2.0 SITE DESCRIPTION AND BACKGROUND

This section provides a description and the background of the Capital Area of Investigation, land use, environmental setting, hydrogeology, and previous investigations. Sources of historical data include reports describing previous investigations conducted at the Capital Property by Floyd Snider McCarthy, Inc. (FSM) (FSM 2004); Environmental Consulting Services, Inc. (ECS) (ECS 2005); and Farallon.

The Capital Area of Investigation is located within the area defined in the Data Summary Report as the West of 4th Groundwater Investigation Area (Farallon et al. 2008). Four known sources of COPCs to soil and groundwater are located within the West of 4th Groundwater Investigation Area, including the Capital Property, the Philip Services Corporation (PSC) facility, the Art Brass Plating (ABP) facility, and the Blaser Die Casting (BDC) facility (Figure 3).

Screening levels have been established for the region by PSC (2006b) that define the concentrations of COPCs in soil and groundwater that represent a risk to human health and the environment and are applicable to the Capital Area of Investigation (Farallon et al. 2008). Some of the screening levels established by PSC (2006b) have been modified for this RI Work Plan based on surface water protection where the receptor of concern is a person eating contaminated fish. The screening levels have been established for COPCs in groundwater for the Water Table Zone, defined as the water-bearing zone from the surface to approximately 20 feet below ground surface (bgs) (Table 1); the Shallow Zone, defined as the water-bearing zone from 20 to 40 feet bgs (Table 2); and the Intermediate Zone, defined as the water-bearing zone from 40 to 70 feet bgs (Table 3). The screening levels for soil are summarized in Table 4.

The historical and background data for the Capital Property, PSC facility, ABP facility, and BDC facility are summarized in the Data Summary Report (Farallon et al. 2008) and discussed below. The screening levels defined in the Data Summary Report (Farallon et al. 2008) have been used to evaluate the data collected at each of the source areas.

2.1 CAPITAL PROPERTY DESCRIPTION

The Capital Property is defined as the property owned by Capital at 5803 3rd Avenue South in Seattle, Washington. The Capital Property is located south of South Mead Street, north of South Fidalgo Street, west of the properties occupied by commercial buildings adjacent to Capital Plant 4, and east of 1st Avenue South, and includes the property at the northwestern corner of 4th Avenue South and South Mead Street in Section 39, Township 24 South, Range 4 East in Seattle, King County, Washington (Figure 2). The Capital Property consists of King County Assessor Parcel Nos. 1722802255 (5801 3rd Avenue South); 1722801620 (5801 3rd Avenue South); 1722802245 (5820 1st Avenue South); and 1722801530 (5801 3rd Avenue South). The four parcels total 182,468 square feet. Parcel Nos. 1722802255, 1722801620, and 1722802245 are developed with five adjoining tilt-up, slab-on-grade buildings designated as Plant 1 through Plant 5 (Figure 4). Parcel No. 1722801530 is north of Plant 4 (Figure 4) and is used by Capital for storage of finished products, including containers and dumpsters. Subsurface utilities that enter

the Capital Property from the north and south include natural gas, sanitary sewer, and water services.

2.2 CAPITAL PROPERTY HISTORY

Based on a review of historical records, including Sanborn Fire Insurance Maps and city directories, Capital has occupied the current location since 1965 (Environmental Data Resources, Inc. 2004). Prior to 1965, the Capital Property was primarily residential. The Capital Property was developed in five phases: Plant 2 was constructed in 1965, Plant 3 in 1973, Plant 4 in 1978, Plant 1 in 1980, and Plant 5 in 2005. The Capital Property has been operated exclusively for metal fabrication and related work such as painting since 1965 (ECS 2005).

Capital Plant 2 was destroyed by fire in January 2004 and was reconstructed later that year. Previous investigations conducted by others detected concentrations of VOCs above the screening levels in shallow groundwater beneath Capital Plant 2 (PSC 2003). As a result, a sub-slab soil vapor survey was conducted as part of the redevelopment and prior to construction of the new Capital Plant 2, to evaluate for the presence of VOCs in soil vapors beneath the concrete slab and for the potential for impact of sub-slab soil vapors on indoor ambient air in the new Capital Plant 2.

The reconstruction of Capital Plant 2 included excavation of soil from within the building footprint to approximately 5 feet below the base of slab elevation in some areas. Construction and breathing space monitoring for VOCs in soil vapor was conducted continuously during the excavation (FSM 2004). The analytical results for soil samples collected from the excavated soil within the Capital Plant 2 building footprint did not detect concentrations of VOCs above the laboratory detection limit. Approximately 330 cubic yards of soil was disposed of as nonhazardous/nonregulated waste based on field observations indicating the potential for contamination (FSM 2004). The remainder of the soil excavated from the building footprint was reused as backfill.

A chemical and paint storage area in the Capital Plant 2 canopy area reportedly was used to service a "waterfall" paint station in the southwestern corner of Capital Plant 2 from 1968 to 1978 (Figure 4). Painting operations were moved from Capital Plant 2 to Plant 4, and drums of chemicals and paint were stored in a Capital Plant 4 canopy area in 1978 (Figure 4). Solvents were used in a hot solvent degreasing unit formerly located in an area between Capital Plant 3 and Plant 4 (Figure 4). A small quantity of a degreasing solvent reportedly was spilled onto the concrete floor in the area between Capital Plant 3 and Plant 4 in 1988 during a refilling operation of the degreaser unit (ECS 2005).

The subsurface investigations conducted at the Capital Property to date by Farallon and others have been performed as independent actions. The subsurface investigations have detected concentrations of trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (collectively referred to as halogenated volatile organic compounds [HVOCs]) in groundwater in the Water Table Zone and the Shallow Zone above the screening levels at the Capital Property. Concentrations of PCE and TCE have been detected in soil above the screening levels at Plant 4. Concentrations of TCE have been detected in soil

above screening levels at Plant 2. A detailed discussion of the purpose and scope of each investigation is presented in Section 2.7, Previous Investigations.

Parcel No. 1722801530 is located north of Plant 4 (Figure 4) and has not been included in investigations to date because there is no history of manufacturing processes conducted on this parcel. The parcel has been use by Capital only for storage of finished products, including containers and dumpsters. No hazardous substances are known to have been used or managed on this portion of the property. The parcel was used previously as a gravel parking area and was occupied by a small restaurant, which does not have a history of hazardous substance use. It is unlikely that a release of COPCs has occurred at this property.

2.3 UP-GRADIENT SOURCE AREAS

Known or potential sources of COPCs to groundwater that may have migrated in groundwater to the Capital Property include the BDC facility, the ABP facility, and the PSC facility (Figure 3). A detailed discussion of each of these potential source areas is provided in the Data Summary Report (Farallon et al. 2008).

2.3.1 Blaser Die Casting Facility

The BDC facility is located at the intersection of South Orcas Street and 3rd Avenue South, up-gradient and northeast of the Capital Property (Figure 3). BDC performs die casting using raw materials that include zinc ingots, which are melted and poured into molds. BDC uses machine oil for lubrication and water-based hydraulic lifts. Concentrations of HVOCs above the screening levels have been detected in soil beneath a building addition and in groundwater down-gradient of the BDC facility to the south-southwest (Pacific Groundwater Group [PGG] 2006). The building addition reportedly was constructed in 1996 and is used as a bin storage area housing several air compressors.

BDC implemented an interim action at the BDC facility that consisted of excavation of soil with concentrations of HVOCs above the screening levels from the southwestern corner of the BDC facility to a depth of 8 feet bgs in December 2007 and January 2008. (PGG 2007a; 2008). The excavation extended laterally until analytical results of soil samples were below the screening levels. However, soil containing concentrations of HVOCs exceeding the screening levels remains in-place (PGG 2008). A total of 1,000 tons of contaminated soil and construction debris were removed from the BDC facility and disposed of at a Subtitle D Landfill (PGG 2008).

2.3.2 Art Brass Plating Facility

A release of HVOCs to soil and groundwater has been confirmed at the ABP facility (Aspect Consulting 2005a; 2005b; 2007). TCE was formerly used at the ABP facility at two vapor degreasers, and was stored in the northwestern corner of the facility. Concentrations of HVOCs have been detected above the screening levels in groundwater samples collected from reconnaissance borings and groundwater monitoring wells installed down-gradient of the ABP facility in the Water Table Zone and Shallow Zone (Aspect 2007).

2.3.3 Philip Services Corporation Facility

The PSC facility is a Resource Conservation and Recovery Act-permitted former dangerous waste treatment, storage, and disposal facility located in an area that has a long history of diverse industrial uses. Operations associated with the treatment and storage of materials at the PSC facility resulted in releases of COPCs to soil and groundwater (PSC 2003). Concentrations of COPCs have been detected above the screening levels in groundwater down-gradient of the PSC facility to the west-southwest in the Water Table Zone, Shallow Zone, and Intermediate Zone. PSC is in the process of conducting final corrective action activities for site closure. Corrective actions conducted by PSC to date include surface closure of solid waste management areas, subsurface investigation at the PSC facility and beyond the facility boundaries, interim measures, routine groundwater monitoring activities, and remedial activities. Anticipated future corrective action activities include implementing an approved cleanup action plan and conducting compliance monitoring.

2.4 ADJACENT PROPERTIES

This section provides a description of the properties within, adjacent to, and up-gradient of the Capital Area of Investigation. Figure 2 depicts the properties, buildings, and streets included in and proximate to the Capital Area of Investigation.

2.4.1 Properties North of Capital Area of Investigation

Mead Building

The Mead Building property is located up-gradient and north of Capital Plant 2 at 202 South Mead Street, and is developed with a one-story office building that was built in 1968 (King County, Washington 2007)(Figure 2). Concentrations of TCE ranging from 1 to 400 micrograms per liter have been detected in reconnaissance groundwater samples collected from direct-push borings advanced on the up- and down-gradient sides of the Mead Building (PGG 2006, 2008).

Elevated concentrations of TCE have been detected in soil gas beneath the Mead Building in the past (PSC 2006a). The source of TCE in soil gas beneath the Mead Building may be the result of releases from the BDC facility or another source(s) up-gradient and northeast of the Mead Building (PSC 2006a). BDC has assumed responsibility for installing a mitigation system, performing annual inspection and maintenance, and conducting long-term monitoring of the mitigation system if one is required.

Northwest Sales Group

The Northwest Sales Group property is located north of Capital Plant 5 at 5818 1st Avenue South (King County, Washington 2007) (Figure 2). The property is developed with a one-story warehouse distribution building that was built in 1979.

Stone Craft

The Stone Craft property is located north of Capital Plant 5 at 112 South Mead Street (King County, Washington 2007) (Figure 2). The property is developed with a one-story warehouse distribution building that was built in 1960.

City Light Electrical Supply

The City Light Electrical Supply property is located north of Capital Plant 1 at 118 South Mead Street (King County, Washington 2007) (Figure 2). The property is developed with a one-story warehouse distribution building that was built in 1974.

Martin Sign Fabrication

The Martin Sign Fabrication property is located north of Capital Plant 1 at 122 South Mead Street (King County, Washington 2007) (Figure 2). The property is developed with a one-story warehouse distribution building that was built in 1962.

Single Family Residences

The properties north of Capital Plant 1 at 128, 132, and 134 South Mead Street were developed as single-family residential homes in 1908 (Figure 2). Based on the concentrations of TCE detected in groundwater proximate to the residences, PSC installed a sub-membrane system in each of the residences to mitigate potential TCE in indoor ambient air (PSC 2006a). The source of the TCE in groundwater beneath the residences may have been the releases from the BDC facility or another source(s) up-gradient of the residences (PSC 2006a). BDC has assumed responsibility for performing annual inspection and maintenance and long-term monitoring of the mitigation system.

Commercial Building

A commercial building is located up-gradient and north of Capital Plant 2 at 5706 2nd Avenue South (King County, Washington 2007) (Figure 2). The property is developed with a one-story warehouse distribution building that was built in 1978.

2.4.2 Properties East of Capital Area of Investigation

Commercial Building

A commercial building is located east of and adjacent to Capital Plant 4 at 5801 4th Avenue South (Figure 2). The property is developed with a one-story commercial building occupied by a restaurant.

Commercial Building

A commercial building is located east of and adjacent to Capital Plant 4 at 5807 4th Avenue South (Figure 2). The property is developed with a one-story commercial building. The King County, Washington (2007) Tax Assessor lists the property use of this building as light manufacturing. However, the building currently appears to be a Chinese restaurant.

Commercial Building

A commercial building is located east of Capital Plant 4 at 5815 4th Avenue South (King County, Washington 2007) (Figure 2). The property is developed with a one-story commercial building occupied by a restaurant, and is the former location of ABP, which operated as a metal plating facility that involved metal polishing and powder coating (ECS 2005).

2.4.3 Properties within the Capital Area of Investigation Boundary

Olympic Medical Building

The Olympic Medial Building property is located down-gradient and south of Capital Plant 2 at 5900 1st Avenue South (Figure 2). The property is developed with a warehouse and office building that was built in 1957. A concentration of TCE of 47.7 micrograms per liter was detected in reconnaissance groundwater samples collected from a direct-push boring located proximate to the Olympic Medical Building (PSC and Pioneer Technologies Corporation [PTC] 2005). Concentrations of TCE above Inhalation Pathway Interim Measure Action Levels were detected in indoor ambient air samples collected in the eastern side of the building (PSC and PTC 2005). Based on the concentrations of TCE detected in indoor ambient air, a Sub-Slab Depressurization System (SSDS) has been proposed for the warehouse and manufacturing areas on the eastern side of the building (PSC and PTC 2005). Capital has assumed responsibility for installing the SSDS, performing annual inspection and maintenance, and long-term monitoring of the SSDS, if necessary. Capital has provided Olympic Medical with a scope of work for installation of an SSDS in the manufacturing and warehouse areas of the Olympic Medical Building. Installation of the SSDS is pending provision of access to the Olympic Medial Building. A Draft Vapor Intrusion Mitigation Work Plan will be prepared specific to the Olympic Medical Building once access has been provided.

Mobile Crane Company

The Mobile Crane Company property is located south of Capital Plant 4 at 5917 4th Avenue South (Figure 2). The property is developed with a warehouse/office building that was constructed in 1966 and a large yard for storing cranes and related equipment.

Gull Industries Building

The Gull Industries Building property is located south of the Capital Property at 5901 4th Avenue South (Figure 2). The property is developed with a one-story warehouse/office building that was constructed in 1950.

Beckwith and Kuffel Building

The Beckwith and Kuffel Building property is located south of the Capital Property at 5930 1st Avenue South (Figure 2). The property is developed with a one-story warehouse/office building that was constructed in 1959.

Multi-Tenant Warehouse

The Multi-Tenant Warehouse property is located south of the Capital Property at 5960 1st Avenue South (Figure 2). The property is developed with a warehouse/office building that was constructed in 1967.

B & OI

The B & OI property is located south of the Capital Property at 5990 1st Avenue South (Figure 2). The property is developed with a warehouse/office building that was constructed in 1976.

Christferson Rader & Kief Building

The Christferson Rader & Kief Building property is located south of the Capital Property at 5939 4th Avenue South (Figure 2). The property is developed with an office building that was constructed in 1957.

Pacific Lamp & Supply

The Pacific Lamp & Supply property is located south of the Capital Property at 5939 4th Avenue South (Figure 2). The property is developed with a warehouse that was constructed in 1965.

Buckner Weatherby Building

The Buckner Weatherby Building property is located south of the Capital Property at 5939 4th Avenue South (Figure 2). The property is developed with a warehouse/office building that was constructed in 1965.

Multi-Tenant Warehouse

The Multi-Tenant Warehouse property is located south of the Capital Property at 5957 4th Avenue South (Figure 2). The property is developed with a warehouse that was constructed in 1968.

Fittings Inc. Company

The Fitting Inc. Company property is located south of the Capital Property at 5979 4th Avenue South (Figure 2). The property is developed with a warehouse that was constructed in 1965.

Commercial Building

A commercial building is located south of the Capital Property at the intersection of 1st Avenue South and South Front Street (Figure 2). The property is developed with a warehouse of unknown construction date.

2.5 LAND USE AND ENVIRONMENTAL SETTING

The Capital Area of Investigation is located within the Seattle city limits in King County, Washington (Figure 1). According to King County, Washington (2007) Assessor Parcel Records, the Capital Area of Investigation is zoned as industrial light manufacturing. Up-gradient properties and properties included in the Capital Area of Investigation are a mixture of light industrial, commercial, and residential properties, as described in Section 2.4, Adjacent Properties.

2.5.1 Demographics

The Capital Area of Investigation is located south of downtown Seattle in the Georgetown neighborhood, which consists predominantly of industrial, commercial office, retail, and residential properties. The population of Seattle is approximately 563,374 (U.S. Department of Commerce 2000).

2.5.2 Topography

The Capital Area of Investigation topography is relatively flat, sloping slightly toward the northeast. The ground surface elevation at the Capital Area of Investigation is approximately 15.5 to 20.5 feet above mean sea level (Alta/ACSM Title Land Survey 2004).

2.5.3 Meteorology

The climate of the Seattle area is maritime, characterized by cool summers and mild winters influenced by ocean air. The average annual minimum temperature is 45.1 degrees Fahrenheit, and the average annual maximum temperature is 61.5 degrees Fahrenheit. The average annual precipitation in Seattle is 36.22 inches, with over 4 inches of precipitation per month from November through March.

2.5.4 Groundwater Use

Potable water for the Capital Area of Investigation is supplied by the City of Seattle from the Cedar River and South Fork Tolt River watersheds. Use of groundwater as a drinking water source within Seattle city limits is prohibited by ordinance. There are no drinking water supply wells within a 0.5-mile radius of the Capital Area of Investigation (Ecology 2007). Groundwater at the Capital Area of Investigation is not used as a drinking water source.

The determination of groundwater non-potability in the Georgetown area is supported by Ecology, based on comments pertaining to the PSC (2003) Remedial Investigation Report. Ecology (2004) stated "Nevertheless, the use of Georgetown groundwater in the future for drinking water seems remote and at this time Ecology does not believe it reasonable to require PSC to actively remediate groundwater to protect such a future use." As a result of these comments by Ecology, groundwater at the Capital Area of Investigation is considered to be non-potable.

2.5.5 Potability Use Data Gaps

Capital does not intend to use drinking water standards in the development of Remediation Levels, consistent with the approach that has been employed by PSC (2003). PSC (2003) evaluated the beneficial use of groundwater in the Georgetown area, including developing cost estimates for several groundwater treatment options that would be necessary for groundwater to meet drinking water standards, and completed a spatial analysis of setbacks required by state and county regulations to identify areas in the lower Duwamish area where wells potentially could be located. PSC (2003) concluded that drinking water is not the highest beneficial use of groundwater at or near the PSC Georgetown facility based on background groundwater analytical results and current drinking water quality regulations.

Data gaps associated with evaluating the relevance of the PSC (2003) approach to the Capital Area of Investigation include identifying changes in land use between 2003 and completion of the Capital RI, reviewing current well records to confirm that drinking water wells do not exist within the Capital Area of Investigation, and reviewing available technologies and the costs of treating groundwater for drinking purposes. Confirming the relevance of the PSC (2003)

approach to evaluate potability of groundwater within the Capital Area of Investigation will be accomplished by satisfying the data needs identified below.

2.5.6 Potability Data Needs

Capital will use the approach employed by PSC (2003) to evaluate the potability of groundwater in the Capital Area of Investigation. Data gaps identified in Section 2.5.5 will be filled by:

- Identifying changes in land use between 2003 and completion of the Capital RI;
- Reviewing current well records to confirm that drinking water wells do not exist in the Capital Area of Investigation; and
- Reviewing available technologies and the costs of treating groundwater to attain levels suitable for drinking.

2.6 HYDROGEOLOGY

A summary of the regional geology and hydrology in the vicinity of the Capital Area of Investigation is provided below. The locations of the soil borings and monitoring wells proximate to the Capital Property are depicted on Figure 5. The boring and well logs are included in Appendix D.

2.6.1 Regional Geology

The regional geology in the area of the Capital Area of Investigation was defined by investigations conducted at the ABP facility, the BDC facility, and the Capital Property (PSC 2003) and summarized by Farallon (Farallon et al. 2008). The geology of the area has been described by Booth and Herman (1998), who defined two stratigraphic units: the Younger Alluvium and the Older Alluvium. The following geologic units have been identified within the Capital Area of Investigation, presented in order of increasing depth:

- Shallow Sand Unit
- Intermediate Sand and Silt Unit;
- Silt Unit;
- Deep Sand and Silt Unit; and
- Bedrock.

The Shallow Sand Unit correlates to the Younger Alluvium defined by Booth and Herman (1998) and is described as soft, moderately sorted deposits of silt, sand, and sandy silt, and containing abundant wood and organics. The Shallow Sand Unit is found from a few feet above sea level to below current sea level and represents channel and overbank floodplain sediments deposited by the Duwamish Waterway in an estuarine and deltaic environment. The upper portion of the Shallow Sand Unit includes fill material in some areas, which is largely reworked native material (Younger Alluvium) or imported soils for construction and grading purposes, which locally may contain woody debris or brick fragments.

The Intermediate Sand and Silt Unit correlates to the Older Alluvium defined by Booth and Herman (1998) and consists of interbedded sands and silts with discontinuous gravel lenses and trace amounts of shells and wood that is moderately dense to dense. It is considered to be of fluvial and marine origin. The Silt Unit has been identified in deeper borings east of 4th Avenue South. PSC (2003) interprets the Silt Unit as dipping to the west, beneath the Capital Area of Investigation. It is unclear whether this unit is present below the Capital Area of Investigation. If present, it likely is found at a depth greater than 75 feet bgs. The Deep Sand and Silt Unit consists of sandy silt with fine sand and interbedded silty sand, with local gravel and cobbles. Wood fragments and shells are present in trace amounts. The Intermediate Sand and Silt Unit, the Silt Unit, and the Deep Sand and Silt Unit all are likely part of the Older Alluvium defined by Booth and Herman (1998).

The bedrock consists of marine and continental sedimentary rocks consisting of claystone, siltstone, sandstone, and some coal (PSC 2003). The estimated depth to bedrock ranges from 330 to 660 feet bgs near the Duwamish Waterway (U.S. Geological Survey 1991).

2.6.2 Regional Hydrogeology

The regional hydrogeology of the Capital Area of Investigation summarized here is based on PSC (2003) and information obtained from more recent investigations conducted at the ABP facility, the BDC facility, and the Capital Property (Farallon et al. 2008). The following hydrogeologic units, presented in order of increasing depth, have been identified in the region:

- Shallow Aquifer Zone; and
- Intermediate Zone;

These hydrogeologic units correlate with the geologic units described in Section 2.6.1, Regional Geology, and are consistent with the terminology used by PSC (2003). The Shallow Aquifer Zone corresponds to the Shallow Sand Unit, is continuous across the region, and extends to a depth of 40 feet bgs. Groundwater in the Shallow Aquifer Zone is unconfined and appears to be hydraulically connected to the underlying Intermediate Aquifer Zone.

The Intermediate Aquifer Zone corresponds to the Intermediate Sand and Silt Unit and is continuous across the region. The Intermediate Aquifer Zone is interpreted to extend from a depth of approximately 40 to 70 feet bgs below the Capital Area of Investigation. In the vicinity of the PSC facility, the top of the Silt Aquitard within the Silt Unit forms the base of the Intermediate Aquifer. However, as noted above, the Silt Aquitard may not be present below the Capital Area of Investigation. The Intermediate Aquifer Zone was inferred by PSC (2003) to discharge to the Duwamish Waterway, located to the west. The overlying Water Table Zone and Shallow Aquifer Zone also discharge to the Duwamish Waterway.

PSC (2003) adopted standardized nomenclature for groundwater monitoring and sampling intervals that was incorporated into the Data Summary Report (Farallon et al. 2008) and is used here. For sampling purposes, the water-bearing zones have been segregated into four depth intervals that generally correspond to the upper and lower portions of the Shallow Aquifer Zone, the Intermediate Aquifer Zone, and the Deep Aquifer Zone, although the actual depth of each

aquifer zone may vary in some areas. For purposes of sampling, however, uniform intervals have been selected based on depth rather than hydraulic characteristics. The general nomenclature for the groundwater monitoring and sampling intervals developed by PSC (2003) will be used for the assessment of groundwater conditions at the Capital Area of Investigation for the RI. The depth intervals are described below:

- Water Table Zone—This zone corresponds to approximately the upper 10 feet of the Shallow Aquifer, from first-encountered groundwater to approximately 20 feet bgs;
- Shallow Zone—This zone is below 20 feet bgs and above 40 feet bgs, and generally is within the Shallow Aquifer Zone;
- Intermediate Zone—This zone includes the water-bearing zone below 40 feet bgs extending to a depth of 70 feet bgs. This zone may lie above the Silt Aquitard (if present in the area); and
- Deep Aquifer Zone—No data have been collected from the Deep Aquifer Zone in the vicinity of the Capital Area of Investigation.

2.6.3 Regional Hydrology

A groundwater monitoring event was conducted by Capital, BDC, ABP, and PSC in May 2007 for monitoring wells screened in the Water Table Zone, Shallow Zone, and Intermediate Zone and located west of 4th Avenue South, as part of the West of 4th Groundwater Investigation Area (Farallon et al. 2008). The West of 4th Groundwater Investigation Area includes the Capital Property, the BDC facility, and the ABP facility (Farallon et al. 2008). The findings from the May 2007 groundwater monitoring event indicated the following:

- The depth to groundwater ranged from approximately 6 to 10 feet below the top of the monitoring well casings in the monitoring wells screened in the Water Table Zone, Shallow Zone, and Intermediate Zone.
- The approximate direction of groundwater flow in the Water Table Zone was west-southwest for the area between 4th Avenue South and 1st Avenue South, turning more southerly in the vicinity of monitoring wells located west of 1st Avenue South (Figure 6). The cause of the southerly shift in groundwater flow is not clear, but may be due to the remnant river channel or other factors. The groundwater flow patterns in the area will be better established after installation of additional monitoring wells.
- The gradient for the Water Table Zone west of 4th Avenue South ranged from 0.002 to 0.003 foot per foot. Because the hydraulic gradient is a key factor in fate and transport analysis, Capital will work to ensure that the elevation control points are verified and consistent between monitoring wells.
- The maximum potentiometric head difference for nested monitoring wells screened in the Water Table Zone and the Shallow Zone west of 4th Avenue South was 0.66, which represents a vertically downward gradient of 0.21 foot per foot.
- The approximate direction of groundwater flow in the Shallow Zone was west-southwest for the area north of South Fidalgo Street, and southwest for the area south of South

Fidalgo Street (Figure 7). As noted above, the groundwater flow patterns in the area will be better established after installation and gauging of additional monitoring wells.

- The gradient for the Shallow Zone ranged from 0.001 to 0.005 foot per foot west of 4th Avenue South.
- The monitoring event west of 4th Avenue South included an insufficient number of monitoring wells to determine the estimated groundwater flow direction and gradient for the Intermediate Zone. PSC (2003) indicated that the groundwater flow in the Intermediate Zone west of 4th Avenue South was toward the southwest at a gradient of 0.001 foot per foot. If the first phase of the RI Field Program indicates that Capital has contributed COPCs to the Intermediate Zone, the flow direction and gradient within that zone will be established through installation of monitoring wells.

A detailed discussion of the monitoring event and gradient maps is included in the Data Summary Report (Farallon et al. 2008).

2.7 PREVIOUS INVESTIGATIONS

This section describes previous investigations conducted at the Capital Property and on adjacent properties by Farallon and others. Investigations at the Capital Property were conducted between January 2004 and May 2007 and included sub-slab soil vapor sampling and analysis after Capital Plant 2 was destroyed by fire in January 2004; soil vapor, construction monitoring, and soil sampling during redevelopment of Capital Plant 2 (FSM 2004; ECS 2005); three phases of subsurface investigations conducted to evaluate the nature and extent of HVOCs in soil and groundwater at the Capital Property (ECS 2005); and subsurface investigations at the Capital Property to assess the nature and extent of HVOCs in groundwater up- and down-gradient of the Capital Property (Farallon et al. 2008). Additional details pertaining to the investigation procedures and results are available in the reports cited and summarized below.

2.7.1 Floyd Snider McCarthy, Inc. 2004 Soil Vapor Monitoring

FSM (2004) conducted soil vapor monitoring during the redevelopment of Capital Plant 2 after the plant was destroyed by fire in January 2004. The fire destroyed the interior of Capital Plant 2, leaving the concrete slab and concrete tilt-up walls in place. The sub-slab soil vapor monitoring was conducted to assess whether HVOCs in groundwater beneath Capital Plant 2 posed a potential impact to indoor air quality in the new Capital Plant 2. A previous investigation of groundwater quality proximate to Capital Plant 2 conducted by PSC (2003) detected concentrations of HVOCs in groundwater samples collected from direct-push borings and monitoring wells advanced up- and down-gradient of Capital Plant 2. The work conducted at Capital Plant 2 by FSM (2004) included the following activities:

- Installation of 12 sub-slab soil vapor probes at Capital Plant 2;
- Collection of 12 soil vapor samples and analysis of the samples for HVOCs, benzene, toluene, ethyl benzene, and xylenes at an on-site mobile laboratory; and
- Collection of five sub-slab soil vapor samples and one ambient air sample in Summa canisters, and analysis of the samples for VOCs at an off-site laboratory to confirm the

analytical results for a select number of soil vapor samples analyzed by the on-site mobile laboratory.

Laboratory analysis detected concentrations of TCE in 2 of the 12 soil vapor samples collected, and concentrations of PCE in 10 of the 12 soil vapor samples collected. Analytical results for the soil vapor samples collected in the Summa canisters confirmed the analytical results obtained from the on-site mobile laboratory. Sample locations and analytical results are presented on the figures and the tables from ECS (2005), included in Appendix E.

The analytical results from sub-slab soil vapor samples were used to develop a vapor intrusion model using the Johnson & Ettinger Model for Surface Vapor Intrusion into Buildings Guidance to evaluate the potential for impact of sub-slab soil vapors beneath Capital Plant 2 on indoor ambient air quality in the new Capital Plant 2 (Environmental Quality Management 2000; U.S. Environmental Protection Agency [EPA] 2002a; FSM 2004). Modeling results predicted that HVOCs and aromatic petroleum hydrocarbon concentrations in the new Capital Plant 2 office and shop areas would be below applicable MTCA Method B ambient cleanup levels (FSM 2004).

2.7.2 Floyd Snider McCarthy, Inc. 2004 Construction Monitoring

The reconstruction of Plant 2 began in May 2004 and required removal of the concrete slab and excavation of soil to install a storage vault, footings, and utility trenches. A Soil Vapor and Construction Monitoring Report was prepared to govern the sampling proceedings associated with Plant 2 reconstruction excavation (ECS 2005). A photoionization detector (PID) was used to screen excavated soils for the presence of volatile substances. Removal of the pre-fire concrete slab resulted in a total of 1,068 cubic yards of concrete rubble that was exported from the Capital Property. The soil excavated for the Plant 2 reconstruction was field-screened using a PID, and soil exhibiting elevated readings was segregated and stockpiled. Approximately 19 cubic yards of suspect soil was encountered during excavation activities. Soil samples were collected from the suspect soil stockpiles and analyzed for HVOCs and benzene, toluene, ethyl benzene, and xylenes. These compounds were not detected above laboratory practical quantitation limits (PQLs). Suspect soil was used as backfill or disposed of as nonhazardous/nonregulated waste, with approximately 330 cubic yards of soil exported from the Capital Property (ECS 2005).

2.7.3 Environmental Consulting Services, Inc. 2004 Subsurface Investigation

ECS (2005) conducted a subsurface investigation at the Capital Property in November 2004 to evaluate the source of TCE detected in groundwater samples collected by PSC (2003) from monitoring wells CG-137-WT and CG-137-40, located proximate to Capital Plant 2 (Figure 5). The subsurface investigation conducted by ECS (2005) included the following activities:

- Review of Capital operations and historical records for sources of TCE at the Capital Property and at facilities adjacent and proximate to the Capital Property;
- Advancement of 27 direct-push borings in and around the Capital Property to depths of 9 to 37 feet bgs;

- Collection of reconnaissance groundwater samples from all 27 borings at depth intervals of 9 to 13 feet bgs, 21 to 25 feet bgs, and 33 to 37 feet bgs;
- Collection of continuous soil samples from select borings; and
- Submittal of reconnaissance groundwater and select soil samples for analysis by EPA Method 8260B.

The analytical results of reconnaissance groundwater samples collected from the Water Table Zone in borings advanced adjacent to and down- and up-gradient of the Capital Property detected concentrations of TCE above the screening levels (Figure 8; Table 5). The analytical results of reconnaissance groundwater samples collected from the Water Table Zone in borings advanced adjacent to and down-gradient of Capital Plant 4 detected concentrations of PCE above the screening levels (Figure 9; Table 5).

Concentrations of TCE were detected in reconnaissance groundwater samples collected from the Shallow Zone in borings advanced adjacent to and down- and up-gradient of the Capital Property (Figures 10 and 11; Table 5). Concentrations of TCE or PCE were not detected in the reconnaissance groundwater sample collected from the Shallow Zone in the boring advanced adjacent to and down-gradient of Capital Plant 4 (Figures 10 and 11; Table 5). Concentrations of vinyl chloride and other HVOCs were detected in reconnaissance groundwater samples collected from the Shallow Zone in borings advanced adjacent to and up- and down-gradient of the Capital Property (Table 5).

Concentrations of HVOCs in soil samples were below the laboratory reporting limits or screening levels.

2.7.4 Environmental Consulting Services, Inc. Subsurface Investigations

ECS (2005) conducted a subsurface investigation in February 2005 using Gore Sorber passive soil vapor samplers located at Capital Plant 2 and Plant 4. A total of 19 soil vapor samplers were installed at Capital Plant 2, and 11 soil vapor samplers at Capital Plant 4. The soil vapor samples were analyzed by EPA Method 8260A.

The analytical results of the Gore Sorber passive soil vapor samplers detected concentrations of PCE and TCE in soil vapor beneath the concrete slab at Capital Plant 2, with the highest concentrations detected at the southwestern corner of the Capital Plant 2 canopy area. Concentrations of TCE and PCE were detected in soil vapor samples collected from beneath the concrete slab at Capital Plant 4, with the highest concentrations detected at the southwestern corner of Capital Plant 4 and in the Capital Plant 4 canopy area. Figures from ECS (2005) depicting sample locations and analytical results are included in Appendix E.

ECS (2005) conducted subsurface investigations in April and May 2005 that included collection of soil and reconnaissance groundwater samples from borings located in Capital Plant 2 and Plant 4. The April and May 2005 subsurface investigations included the following:

- Advancement of five direct-push borings inside Capital Plant 2, and 10 borings inside Capital Plant 4;

- Collection of soil samples from each boring at variable depths ranging from 0.6 foot to 7 feet bgs;
- Collection of reconnaissance groundwater samples from each boring at depths ranging from 9 to 13 feet bgs; and
- Submittal of reconnaissance groundwater samples and select soil samples for analysis for VOCs by EPA Method 8260B.

Concentrations of TCE above the screening levels were detected in the reconnaissance groundwater samples collected from the Water Table Zone beneath the Capital Plant 2 canopy area and beneath the southwestern corner of Capital Plant 2 (Figure 8; Table 5). Concentrations of HVOCs were not detected above the screening level in soil samples collected at Capital Plant 2 (Figure 12). Concentrations of PCE and TCE above the screening level were detected in reconnaissance groundwater samples collected from the Water Table Zone beneath the southern portion of Capital Plant 4 and beneath the Capital Plant 4 canopy area (Figures 8 and 9; Table 5). Concentrations of TCE and PCE were detected above the screening level in soil samples collected from borings located in Capital Plant 4 at depths ranging from 0.7 foot to 6.8 feet bgs (Figure 12).

2.7.5 Farallon 2006 Subsurface Investigations

Farallon conducted subsurface investigations at Capital Plant 2 and Plant 4 in January and February 2006 to ascertain the groundwater flow direction proximate to the Capital Property, to assess the impact of an up-gradient source of TCE on groundwater at Capital Plant 2, and to assess the down-gradient extent of TCE and PCE in groundwater originating at Capital Plant 2 and Plant 4 (Farallon et al. 2008). Farallon's subsurface investigation included the following:

- Advancement of five direct-push borings in and around Capital Plant 2 to depths ranging from 35 to 38 feet bgs (Figure 5);
- Collection of reconnaissance groundwater samples from all five borings at depth intervals of 10 to 14 feet bgs, 15 to 18 feet bgs, 18 to 22 feet bgs, 22 to 26 feet bgs, 26 to 30 feet bgs, and 30 to 34 feet bgs. A reconnaissance groundwater sample was collected from one boring at a depth interval of 34 to 38 feet bgs;
- Collection of continuous soil samples from select direct-push borings;
- Submittal of reconnaissance groundwater samples and select soil samples for analysis by EPA Method 8260B;
- Installation of two up-gradient and two down-gradient monitoring wells proximate to Capital Plant 2, and one monitoring well inside the Capital Plant 2 canopy area (Figure 5);
- Installation of one up-gradient and one down-gradient groundwater monitoring well proximate to Capital Plant 4, and one monitoring well inside Capital Plant 4 (Figure 7); and
- Submittal of groundwater samples for analysis by EPA Method 8260B.

Farallon's field investigation detected concentrations of TCE above the screening level in reconnaissance groundwater samples and in groundwater samples collected from monitoring wells located in the Capital Plant 2 canopy area, and up- and down-gradient of Capital Plant 2 in the Water Table and Shallow Zones (Figures 8, 10, and 11; Tables 5 and 6). Concentrations of PCE and TCE were detected above the screening levels in reconnaissance and monitoring well groundwater samples located inside and down-gradient of Capital Plant 4 in the Water Table and Shallow Zones (Figures 8, 9, 10, and 11; Tables 5 and 6). Concentrations of PCE and TCE were not detected in groundwater monitoring well samples collected up-gradient of Capital Plant 4 above laboratory practical quantitation limits (Figures 8 and 9; Tables 5 and 6).

Groundwater monitoring and sampling events were conducted by Farallon in February 2006 and in May 2007 by Farallon, Aspect Consulting, PGG, and PSC as part of the West of 4th Groundwater Investigation (see Section 2.6.3, Regional Hydrology). Results from these groundwater monitoring and sampling events at monitoring wells screened in the Water Table Zone and the Shallow Zone at the Capital Property indicated the following (Farallon et al. 2008):

- The depth to groundwater ranged from approximately 6.30 to 8.58 feet below the top of the monitoring well casings (all well monuments are flush-mounted) (Table 7);
- The approximate direction of groundwater flow in the Water Table Zone in the vicinity of the Capital Property was to the southwest, with a approximate average gradient of 0.002 foot per foot (Figure 6);
- The approximate direction of groundwater flow in the Shallow Zone in the vicinity of the Capital Property was to the southwest, with a gradient of approximately 0.002 foot per foot (Figure 7);
- Vertical gradients proximate to the Capital Property were upward (0.0007 foot per foot) and downward (0.01 foot per foot), as measured at PSC nested monitoring wells CG-136-WT/CG-136-40 and GG-137-WT/CG-137-40, screened in the Water Table Zone and the Shallow Zone.

The preliminary conclusions of this investigation and others are based on historical data and a limited monitoring well network installed in the broader West of 4th region. These conclusions and assumptions will be refined during the RI Field Program by collecting samples and water level measurements in close succession with PSC and other West of 4th potentially liable persons.

2.7.6 2nd Avenue South Redevelopment

In June 2008, Capital began redeveloping a vacated portion of 2nd Avenue South between South Mead Street and South Fidalgo Street located between Capital Plants 1 and 2. Redevelopment included removal of asphalt paving and excavation of soil. Sampling activities were conducted by Farallon at the 2nd Avenue South redevelopment area at opportune locations to confirm the absence of HVOCs in soil (Figure 13).

Sampling activities conducted on June 30 and July 16, 2008 included collection of soil samples from the base of an electrical vault excavation area and eight test pits spaced approximately

equally across the redevelopment area (Figure 13). Test pits were sampled at 0.5 foot bgs and 1.0 foot bgs at each location. The electrical vault was sampled at 9.5 feet bgs, prior to encountering groundwater at 10 feet bgs. Soil samples collected for chemical analysis were placed into laboratory-prepared glass sample containers fitted with Teflon lids, placed on ice in a cooler, and transported to OnSite Environmental Inc. of Redmond, Washington under standard chain-of-custody protocols. The soil samples were submitted for analysis for HVOCs by EPA Method 8260B.

During the soil sampling activities conducted by Farallon on July 16, 2008, boring identification SSR-1 was repeated from the sampling activities conducted on June 30, 2008. The identifier for the sample collected from the electrical vault at 9.5 feet bgs on June 30, 2008 has been modified to SSR-1A.

Analytical results for the 16 soil samples collected from test pits and the one soil sample collected from the electrical vault excavation area did not detect concentrations of HVOCs above soil screening levels or laboratory PQLs. The results of the 2nd Avenue South redevelopment area soil sampling are presented in Table 8. Copies of the laboratory analytical reports for the soil samples collected by Farallon are provided in Appendix G.

3.0 TECHNICAL ISSUES FOR THE REMEDIAL INVESTIGATION

This section summarizes the technical issues to be considered for the RI of the Capital Area of Investigation that were identified from previous investigations and the operational history of the Capital Property. These technical issues may be modified as appropriate, based on the results of the RI.

3.1 SCREENING LEVELS

The screening levels to identify the concentrations of COPCs that present a risk to human health and the environment in groundwater and soil at the Capital Area of Investigation for this RI are consistent with PSC (2006b) levels and those for the Data Summary Report (Farallon et al. 2008). The screening levels were calculated by PSC (2006b) using MTCA Modified Method B groundwater cleanup levels, and modified based on Asian Pacific Island Exposure scenarios for the consumption of fish for the groundwater-to-surface-water pathway, the Federal Clean Water Act Ambient Water Quality Criteria based on human health consumption of organisms for the groundwater-to-surface-water pathway, and the Residential Exposure Scenario for inhalation of indoor air exposure pathway (PSC 2006b). The screening levels for groundwater in the Water Table Zone are defined in Table 1, groundwater in the Shallow Zone in Table 2, groundwater in the Intermediate Zone in Table 3, and soil in Table 4.

3.2 MEDIA OF CONCERN AND PATHWAYS

Previous investigations detected concentrations of one or more of the COPCs above the screening levels in groundwater in the Water Table Zone and the Shallow Zone down-gradient, up-gradient, and at the Capital Property. Concentrations of TCE above the screening levels have been detected in soil at Plant 2. Concentrations of TCE and PCE above the screening levels have been detected in soil at Plant 4. Concentrations of COPCs above the screening levels have not been detected in soil elsewhere on the Capital Property.

Groundwater and soil are the media of concern for the Capital Area of Investigation. Potential media of concern that will be further evaluated for the RI include surface water (the Duwamish Waterway) and indoor ambient air.

Potential pathways for the migration of COPCs include:

- Leaching from soil to groundwater;
- Lateral and vertical transport in groundwater;
- Volatilization from soil and/or groundwater to indoor ambient air; and
- Discharge from groundwater to surface water.

3.3 CONTAMINANTS OF POTENTIAL CONCERN

The COPCs identified for the RI are based on the concentrations of COPCs that exceed screening levels detected in previous investigations at the Capital Property, as summarized in

Section 2.7, Previous Investigations, and those defined in the Agreed Order. The COPCs detected above the screening levels in previous investigations conducted at the Capital Property include:

- PCE;
- TCE;
- cis-1,2-DCE;
- trans-1,2-dichloroethene (trans-1,2-DCE); and
- Vinyl chloride.

Additional COPCs required by the Agreed Order include:

- 1,4-dioxane;
- Iron; and
- Manganese.

Table 9 summarizes the COPCs, PQLs, and screening levels for groundwater in the Water Table Zone and the Shallow Zone at the Capital Area of Investigation.

3.4 PRELIMINARY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The preliminary ARARs and other information specific to the Capital Area of Investigation to be considered for the RI have been categorized as chemical-specific, location-specific, and action-specific. Potential chemical-specific and location-specific ARARs have been identified based on data collected during previous investigations. The preliminary action-specific ARARs have been developed to assist with the evaluation of general response actions. The preliminary ARARs and other information specific to the Capital Area of Investigation to be considered for the RI include:

Chemical-Specific:

- MTCA (WAC 173-340);
- The MTCA Cleanup Level Risk Calculation tool (Ecology 2001b);
- Dangerous Waste Regulations (WAC 173-303); and
- Ambient Water Quality Criteria (Federal Clean Water Act Section 304).

Location-Specific:

- Water Quality Standards for Groundwater of the State of Washington (WAC 173-200);
- Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A); and
- Protection of Upper Aquifer Zones (WAC 173-154).

Action-Specific:

- Safety Standards for Construction Work (WAC 296-155);
- Minimum Standards for Construction and Maintenance of Wells (WAC 173-160); and
- Accreditation of Environmental Laboratories (WAC 174-50).

Additional ARARs and other information identified during implementation of the RI to be considered will be included in the evaluation. The primary ARARs will be defined in the RI Report.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL

The Preliminary Conceptual Site Model has been developed to summarize the current understanding of the Capital Area of Investigation to assist with identification of the applicable COPCs, the confirmed or potential sources of COPCs, the media of concern with concentrations of COPCs above the screening levels, and potential migration and exposure pathways. The sources of data used in developing the Preliminary Conceptual Site Model developed for this RI Work Plan include investigations conducted by PSC (2003), FSM (2004), ESC (2005), Farallon et al. (2008), Aspect Consulting (2005a; 2005b), and PGG (2008); Ecology files; site plans; aerial photographs; and information from the City of Seattle Department of Planning and Development, Seattle Public Utilities, Sanborn Fire Insurance Maps, Cole City Directories, and Environmental Data Resources, Inc. (2004). The Preliminary Conceptual Site Model has been used to develop the scope of work presented in this RI Work Plan to meet the data requirements for completion of the RI in accordance with WAC 173-340-350.

The elements comprising the Preliminary Conceptual Site Model include:

- The confirmed and potential source(s) of COPCs;
- COPCs and affected media;
- The nature and extent and known or potential routes of COPC migration;
- Known or suspected human and environmental receptors; and
- Data gaps.

Each of these elements is summarized below.

4.1 CONFIRMED AND POTENTIAL SOURCES OF COPCS

The confirmed and potential sources of the COPCs detected above the screening levels at the Capital Area of Investigation include the ABP facility, the BDC facility, the PSC facility, and the Capital Property (Aspect Consulting 2005a, 2005b; PGG 2008; PSC 2003; Farallon et al. 2008). Concentrations of COPCs may have migrated down-gradient from each of these facilities in groundwater in the Water Table Zone, the Shallow Zone, and/or the Intermediate Zone, and may have reached groundwater beneath and down-gradient of the Capital Property.

Sources for the concentrations of COPCs above the screening levels detected in groundwater at and down-gradient of Capital Plant 2 likely are the result of releases of HVOCs at the Capital Property, the ABP facility, the BDC facility, and the PSC facility. Sources for concentrations of HVOCs above the screening levels detected in groundwater in the Water Table Zone at and down-gradient of Capital Plant 2 likely are the result of commingling of releases at the BDC facility. The sources for the concentrations of COPCs above the screening levels in groundwater in the Shallow Zone at and down-gradient of the Capital Property may be the releases at the Capital Property and up-gradient sources, including the BDC facility, the PSC facility, and the ABP facility. Cross section A-A' is included to support these possibilities (Figures 14, 15, and 16). Cross section B-B' is included to depict the known possible nature and extent of the release

(Figures 14, 17, and 18). The concentrations of HVOCs detected in groundwater in the Water Table Zone at and down-gradient of Capital Plant 4 likely are the result of releases by Capital. The locations of these facilities are depicted on Figure 3 and discussed in Section 2.3, Up-gradient Source Areas. Additional investigation is necessary to evaluate the sources of COPCs.

4.2 COPCS AND AFFECTED MEDIA

The COPCs identified for the Capital Area of Investigation are based on the results of previous investigations and the Agreed Order, as summarized in the preceding sections of this document. The COPCs include the following:

- PCE;
- TCE;
- cis-1,2-DCE;
- trans-1,2-DCE;
- Vinyl chloride;
- 1,4-dioxane;
- Manganese; and
- Iron.

The results of previous investigations confirm that PCE and TCE are the primary contaminants at the Capital Area of Investigation. The results of previous investigations detected concentrations of cis-1,2-DCE; trans-1,2-DCE; and vinyl chloride, the typical degradation products of TCE and/or PCE, above the screening levels. Therefore, these analytes have been included as COPCs for the Capital Area of Investigation. The Agreed Order includes 1,4-dioxane; manganese; and iron as COPCs for the Capital Area of Investigation.

The media of concern for the Capital Area of Investigation include soil and groundwater in the Water Table Zone, and the Shallow Zone, and possibly the Intermediate Zone. Groundwater samples have not been collected from the Intermediate Zone within the Capital Area of Investigation. Other potential media of concern include indoor ambient air and surface water of the Duwamish Waterway. The scope of work for the RI is designed to define the media of concern applicable to releases of COPCs from the Capital Property.

4.3 NATURE AND EXTENT AND KNOWN OR POTENTIAL ROUTES OF COPC MIGRATION

The nature and extent of COPCs in soil at the Capital Property is adequately defined. Figures 8 through 11 show the current understanding of the nature and extent of PCE and TCE in groundwater in the Water Table Zone and the Shallow Zone at the Capital Property. The cross sections depicted on Figures 14 through 18 show the correct understanding of select HVOCs up- and down-gradient of Plants 2 and 4. Tables 5 and 6 show the concentrations of the HVOCs detected in groundwater at the Capital Property. The nature and extent of COPCs that have been

released at the Capital Property is not adequately defined laterally or vertically down-gradient of the Capital Property. The following pathways for migration of the COPCs will be considered for the RI to evaluate the nature and extent of COPCs released at the Capital Property.

4.3.1 Leaching from Soil to Groundwater

Leaching from soil to groundwater as a potential migration pathway will be considered at Plant 2 and Plant 4. These two areas are discussed in the sections below.

Plant 2

Previous investigations conducted at the Capital Property have detected concentrations of PCE; TCE; and cis-1,2-DCE above the screening levels in limited soil samples collected at Capital Plant 2. Concentrations of these COPCs are not a continuing source of contamination to the saturated zone and are not a current unacceptable source of vapor intrusion to Capital Plant 2, based on available data. The nature and extent of concentrations of COPCs in soil above the screening levels has been adequately defined by the results of previous investigations conducted at Capital Plant 2, and no additional soil borings are necessary to meet the goals of the RI. Concentrations of COPCs detected in soil, the impermeable surface, and the depth to groundwater support the conclusion that leaching of COPCs from soil to groundwater is not a migration pathway. However, concentrations of COPCs that do not continue to decline over time may indicate leaching of COPCs from soil to groundwater and may need to be considered during the RI. This scenario is not anticipated, based on review of previous investigations. Comparison of groundwater concentrations of COPCs up- and down-gradient of Capital Plant 2 during the RI Field Program is anticipated to support the conclusion that leaching of COPCs from soil to groundwater is not a migration pathway.

Plant 4

The nature and extent of concentrations of COPCs in soil at and proximate to Capital Plant 4 has have defined, in part, by previous investigations. Soil samples will be collected from select soil borings during the RI Field Program for analysis to fill data gaps associated with the extent of COPCs above screening levels at Capital Plant 4. In addition, leaching from soil to groundwater will be considered as a possible migration pathway.

4.3.2 Lateral and Vertical Transport in Groundwater

Concentrations of COPCs above the screening levels have been detected in groundwater in the Water Table Zone and the Shallow Zone at up- and down-gradient locations on the Capital Property (Figures 8, 9, 10, and 11). Lateral and vertical transport of COPCs in groundwater is a potential migration pathway and will be assessed in the scope of work for the RI. The scope of work will focus specifically on the areas up- and down-gradient of Capital Plant 2 and Plant 4, as discussed below.

Plant 2

The concentrations of COPCs detected in groundwater in the Water Table Zone up-gradient of Capital Plant 2 may have migrated laterally from releases at the BDC facility. The concentrations of COPCs detected in groundwater in the Shallow Zone up-gradient of the Capital

Property likely have migrated laterally in groundwater from the BDC facility and/or other up-gradient sources. The Intermediate Zone has not been investigated on the Capital Property up-gradient of Plant 2. Investigation of groundwater quality in the Water Table Zone, the Shallow Zone, and the Intermediate Zone up-gradient of Capital Plant 2 will be included in the scope of work for the RI.

The concentrations of COPCs above the screening level detected in groundwater in the Water Table Zone and the Shallow Zone down-gradient of the Capital Property likely are the result of lateral and vertical migration of COPCs released at the Capital Property that have commingled with releases from up-gradient sources. The Intermediate Zone has not been investigated within the Capital Area of Investigation. Investigation of groundwater quality to determine the lateral and vertical extent of migration of COPCs above screening levels released from the Capital Property in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone will be included in the scope of work for the RI.

Plant 4

Concentrations of COPCs detected in groundwater in the Water Table Zone and the Shallow Zone up-gradient of Capital Plant 4 likely have migrated laterally from up-gradient sources. The Intermediate Zone has not been investigated on the Capital Property up-gradient of Plant 4. Investigation of groundwater quality in the Water Table Zone, the Shallow Zone, and the Intermediate Zone up-gradient of Capital Plant 4 will be included in the scope of work for the RI.

Concentrations of COPCs above screening levels detected in groundwater in the Water Table Zone and the Shallow Zone down-gradient of Capital Plant 4 may be the result of lateral and vertical migration of COPCs released at the Capital Property that possibly have commingled with releases from up-gradient sources. Characterization of the Intermediate Zone was not included in previous investigations. The lateral and vertical migration of COPCs above screening levels in groundwater resulting from releases from Capital Plant 4 will be assessed as part of the scope of work for the RI.

4.3.3 Volatilization from Soil and/or Groundwater to Indoor Ambient Air

PSC (2003) identified vapor intrusion from groundwater as a migration pathway for contamination of indoor air in buildings located above groundwater in the Water Table Zone, with concentrations of VOCs above the action levels established as protective for this exposure pathway. Investigation of groundwater quality in the Water Table Zone down-gradient of the Capital Property will be included in the scope of work for the RI to identify buildings that may have a vapor intrusion exposure pathway.

4.3.4 Discharge from Groundwater to Surface Water

PSC (2003) determined that groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone discharges to surface water in the Duwamish Waterway. The scope of work for the RI will include investigation of the nature and extent of COPCs released from the Capital Property to assess whether the surface water of the Duwamish Waterway has been impacted by releases from the Capital Property. Tidal influence may exist in the Shallow Zone near the Duwamish Waterway; however, tidal influence within the Capital Area of Investigation is not

expected to be established. The scope of work for the RI will include an evaluation of tidal influence if effects become apparent.

4.4 KNOWN OR SUSPECTED HUMAN AND ENVIRONMENTAL RECEPTORS

The preliminary Conceptual Site Model developed for the Capital Area of Investigation indicates the following potential receptors to be considered in the evaluation of impacts on human health and the environment. Identified potential receptors include:

- Humans who inhale indoor air contaminated via vapor intrusion by volatilization of contaminated shallow groundwater or shallow soil;
- Humans who drink contaminated groundwater in the future, if groundwater is brought to the surface for this purpose;
- Workers who contact contaminated groundwater during construction or maintenance work;
- Workers who contact contaminated soil in the future if the buildings are removed;
- Humans who contact contaminated soil in the future if the buildings are removed;
- Humans who inhale contaminated soil particles in the future if the buildings are removed;
- Aquatic ecological receptors in the Duwamish Waterway if concentrations of COPCs released from the Capital Property discharge to surface water of the Duwamish Waterway at concentrations above the applicable screening levels; and
- Humans who eat aquatic ecological receptors for the Duwamish Waterway if concentrations of COPCs released from the Capital Property discharge to surface water of the Duwamish Waterway at concentrations above the applicable screening levels.

These potential receptors have been considered in the RI scope of work.

4.5 DATA GAPS

The following data gaps have been identified in the preliminary Conceptual Site Model as necessary information needed to accomplish the goals of the RI and enable the evaluation and selection of a technically feasible cleanup alternative. These data gaps are:

- The specific COPCs that have been released from the Capital Property that exceed the screening levels;
- The lateral nature and extent of concentrations of COPCs above the screening levels released from the Capital Property in groundwater down-gradient of the Capital Property;
- The vertical nature and extent of concentrations of COPCs above the screening levels released from the Capital Property in groundwater down-gradient of the Capital Property;
- The concentrations of COPCs in groundwater migrating to the Capital Property from up-gradient sources;

- The groundwater flow direction and gradient in the Water Table Zone, the Shallow Zone, and the Intermediate Zone south of Fidalgo Street;
- The potential for concentrations of COPCs above the applicable screening levels released from the Capital Property to reach surface water of the Duwamish Waterway;
- The lateral and vertical extent of concentrations of COPCs above the screening levels in soil at Capital Plant 4; and
- The potential for natural attenuation processes to effectively mitigate threats to human health and the environment posed by the Capital Property.

Section 5, Remedial Investigation Scope of Work, presents the approach and scope of work for the Remedial Investigation to address these data gaps to sufficiently evaluate and select a technically feasible cleanup alternative.

5.0 REMEDIAL INVESTIGATION SCOPE OF WORK

This section provides the approach and scope of work for the RI. The scope of work is designed to address the data gaps presented in Section 4.5, Data Gaps, and to provide sufficient information to evaluate and select a technically feasible cleanup alternative.

5.1 PROJECT PLANNING

Project planning is part of the project management task that provides overall management of the RI to ensure that work is performed on schedule and according to specified technical standards. Additional project management activities will include:

- Tracking the performance of each task;
- Administering subcontracts; and
- Preparing quarterly progress reports.

The objective of the project planning activities is to develop plans for collecting data and to manage data collection and evaluation throughout the RI. Planning activities conducted during the scoping effort for this RI have resulted in the development of the scope of work for this RI Work Plan. Project planning process activities to date include:

- Reviewing existing data to identify the conditions in the Capital Area of Investigation;
- Identifying the objectives of the RI; and
- Preparing project planning documents, including the Work Plan, Health and Safety Plan, and the Reconnaissance SAP, which includes Standard Operating Procedures and the Field Sampling Plan.

5.2 COMMUNITY RELATIONS

Capital has prepared a Public Participation Plan (PPP), provided under separate cover, to comply with the requirement for public notice defined in WAC 173-340-600. The PPP will define the location for documents to be accessed by the public, the methods to identify and address public concerns, and the procedures for modifying the PPP, if necessary.

5.3 REMEDIAL INVESTIGATION APPROACH

A phased approach will be used to conduct the RI Field Program that is consistent with the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988) and WAC 173-340-350(7). Each phase of the RI Field Program will focus on obtaining the data required to evaluate the data gaps identified in Section 4.5, Data Gaps. This approach will ensure that data collection is focused on the information relevant to the development of a Conceptual Site Model to evaluate and select a technically feasible cleanup alternative.

The first phase of the RI Field Program focuses on determining the nature and extent of HVOCs in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone

immediately up- and down-gradient of the Capital Property by collecting and analyzing reconnaissance groundwater samples from direct-push borings. The second phase of the RI Field Program includes installing and monitoring groundwater monitoring wells to define the nature and extent of HVOCs, analyzing for other COPCs, and defining the COPCs for the Capital Area of Investigation. The results of the first phase of the RI Field Program will be evaluated and discussed with Ecology to define the locations, depths, and construction details for the monitoring wells and to develop a schedule for groundwater monitoring. The scope of work for the second phase of the RI Field Program will be provided in the Groundwater Monitoring Plan.

5.3.1 First Phase of the RI Field Program

The first phase of the RI Field Program includes researching and a detailed review of past and current operations at properties located within the Capital Area of Investigation. The research will be conducted to identify past or current operations having the potential for release of HVOCS to the environment. If the results of the research identify other potential sources of HVOCs, the locations of the proposed reconnaissance groundwater sampling points and/or monitoring well locations will be modified.

Reconnaissance borings using direct-push drilling methods will be located to collect reconnaissance groundwater and soil samples for laboratory analysis. Reconnaissance groundwater sampling will be conducted in two tiers. Tier 1 reconnaissance groundwater sampling will include collection and analysis of reconnaissance groundwater samples from borings immediately up- and down-gradient of Capital Plant 2 and Plant 4 (Figure 19). The analytical results of the reconnaissance groundwater samples collected from Tier 1 locations will define Tier 2 sampling locations. Tier 2 reconnaissance sampling locations will be selected to characterize the lateral and vertical extent of HVOCs not fully defined by the results of Tier 1 reconnaissance sampling.

The objectives of collecting and analyzing reconnaissance groundwater samples include:

- Evaluating the lateral and vertical extent of concentrations of HVOCs above screening levels in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone down-gradient of Capital Plant 2 and Plant 4 that may have been released at the Capital Property;
- Establishing the lateral and vertical nature and extent of concentrations of HVOCs above screening levels in groundwater migrating to the Capital Property from up-gradient sources;
- Evaluating the lateral and vertical extent of HVOCs in soil proximate to Plant 4; and
- Providing sufficient data to select locations and depths for monitoring wells.

The scope of work for Tier 1 reconnaissance groundwater sampling is presented in the Reconnaissance SAP (Appendix A). The Tier 1 reconnaissance groundwater sampling includes collecting reconnaissance groundwater samples from direct-push borings for analysis for HVOCs immediately down-gradient of Capital Plant 2 and Plant 4 and up-gradient of Plant 4. The analytical results of groundwater samples collected by PGG from the proposed and existing BDC

monitoring wells located north of Plant 2 will be used to support the characterization of the lateral and vertical extent of HVOCs above screening levels in groundwater up-gradient of Plant 2, if installed and sampled prior to Tier 1 reconnaissance groundwater sampling. Reconnaissance soil samples will be collected for HVOC analysis at select reconnaissance borings proximate to Plant 4 to support characterization of the lateral and vertical extent of HVOCs in soil above screening levels that may have been released from Capital Plant 4.

Tier 2 reconnaissance groundwater sampling will include collecting reconnaissance groundwater samples from direct-push boring locations selected based on the analytical results of Tier 1 reconnaissance sampling. Tier 2 reconnaissance groundwater sampling will be performed if additional reconnaissance groundwater sample locations are necessary to characterize the down-gradient lateral and vertical extent of HVOCs in groundwater above screening levels. The analytical results of Tier 1 reconnaissance groundwater sampling may indicate that some or all of the proposed Tier 2 sampling locations are not required to characterize the vertical and lateral extent of HVOCs released from the Capital Property. The specific conditions for conducting Tier 2 sampling are defined in detail in the Reconnaissance SAP (Appendix A). Proposed Tier 1 and Tier 2 direct-push boring locations are depicted on Figure 19.

5.3.2 Second Phase of the RI Field Program

The second phase of the RI Field Program will include installation of pairs or clusters of monitoring wells into the Water Table Zone, the Shallow Zone, and the Intermediate Zone if necessary. The locations of the monitoring wells will be based on the analytical results of the Tier 1 and Tier 2 reconnaissance groundwater sampling. The monitoring wells will be monitored to assess the depth to groundwater, aquifer characteristics, concentrations of COPCs, and natural attenuation parameters.

Computer modeling may be used to evaluate fate and transport to assist evaluation of the risk to human health and the environment, and for support of the evaluation of technically feasible cleanup alternatives. The computer modeling results will be used to assess the fate and transport of HVOCs in groundwater and the potential for groundwater containing HVOCs released at the Capital Property to discharge to surface water. The EPA BIOCHLOR model will be used by Capital in conjunction with BDC and ABP to achieve the computer modeling goals.

Additional phases of the Field Program may be implemented if analytical results and fate and transport modeling indicate that the nature and extent of COPCs in groundwater at the Capital Area of Investigation has not been adequately characterized. Capital will collect sufficient data during the RI Field Program to conduct BIOCHLOR modeling. The data collection needs are presented in a discussion of the BIOCHLOR modeling scope, methods, inputs, and goals provided in Appendix F.

The objectives for the second phase of the RI Field Program include:

- Defining the lateral extent of concentrations of HVOCs above the screening levels in groundwater that may have been released from Capital Plant 2 and Plant 4;

- Defining the vertical extent of concentrations of HVOCs above the screening levels in groundwater that may have been released from Capital Plant 2 and Plant 4 and migrated down-gradient;
- Establishing the groundwater flow direction and gradient in the Water Table Zone, the Shallow Zone, and the Intermediate Zone south of Fidalgo Street if necessary;
- Defining whether concentrations of 1,4-dioxane; iron; and manganese exceed the screening levels at or down-gradient of the Capital Property and whether these should be included as COPCs for the Capital Area of Investigation;
- Assessing the potential for concentrations of COPCs above the applicable screening levels released from Capital to reach surface water of the Duwamish Waterway; and
- Evaluating the potential for natural attenuation processes to effectively mitigate threats to human health and the environment posed by releases from the Capital Property.

The results of the two phases of the RI Field Program will be used to develop a Conceptual Site Model to support the evaluation and selection of a technically feasible cleanup action. A description of the individual elements of the scope of work for the RI Field Program is provided below.

5.4 REMEDIAL INVESTIGATION FIELD PROGRAM

The RI Field Program has been segregated into two phases. The first phase of the RI Field Program includes historical research, site access, Tier 1 reconnaissance groundwater sampling and analysis, and Tier 2 reconnaissance groundwater sampling and analysis. The second phase of the RI Field Program includes monitoring well installation and development, groundwater monitoring and sampling, natural attenuation evaluation, aquifer characterization, and fate and transport modeling. A schedule describing the two phases of the RI Field Program and the associated documentation is resented in Table 10.

5.4.1 First Phase RI Field Program Scope of Work

A detailed summary of the scope of work for each of the work elements for the first phase of the RI Field Program is provided below. The specific scope of work for the first phase of the RI Field Program is provided in the Reconnaissance SAP (Appendix A).

5.4.1.1 Historical Research

Historical research will include a review of aerial photographs, building permits, regulatory files, insurance maps, Sanborn maps, Polk City Directories, utility maps, and other information that may be relevant for the Capital Area of Investigation. An inventory of aerial photographs of the Capital Area of Investigation will be obtained from reasonably available sources that include the Washington State Department of Transportation, the Washington State Department of Natural Resources, the City of Seattle Department of Public Works, the University of Washington, and Walker and Associates. A selected set of aerial photographs dating back to at least 1950 will be acquired for review and interpretation. Copies of regulatory files and utility maps of the

Capital Area of Investigation will be obtained from the City of Seattle. Information obtained from the interpretation of aerial photographs, regulatory file reviews, Sanborn Maps, Polk City Directories, building permits, and utility maps will be used to evaluate potential sources of HVOCs in the Capital Area of Investigation that may result in modification of the proposed locations or selection of additional locations for the reconnaissance groundwater sampling points.

5.4.1.2 Site Access

Capital will provide reasonable notice to public and private property residents, occupants, owners, and/or other persons in custody to conduct the RI field sampling. The notice will include written and telephone contact prior to entry that will describe the reason for requesting access, the work to be conducted, and a schedule for the work. In accordance with WAC 173-340-800, Ecology will make reasonable efforts to facilitate access for Capital. Capital will obtain street use or public right-of-way access permits from the City of Seattle, as appropriate.

5.4.1.3 Tier 1 Reconnaissance Groundwater Sampling and Analysis

Tier 1 direct-push boring locations down-gradient of known or suspected sources at Capital Plant 2 and Plant 4 include boring B6 through B15 (Figure 19). These direct-push borings will be advanced to 70 feet bgs or refusal. Reconnaissance groundwater samples will be collected at 4-foot intervals from first-encountered groundwater to the completion depth in each of the direct-push borings. Soil samples will be collected continuously from each boring for lithologic description. Each Tier 1 direct-push boring will be sampled in accordance with the Reconnaissance SAP (Appendix A).

Tier 1 direct-push borings B6 through B12 have been located to characterize the lateral and vertical extent of concentrations of HVOCs in groundwater above screening levels down-gradient of Plant 2. Groundwater up-gradient of Plant 2 will be characterized by the Tier 1 reconnaissance groundwater sampling, using the analytical results of groundwater samples collected from existing BDC monitoring wells BDC-5-WT and BDC-6-30 and proposed BDC monitoring wells BDC-6-60, BDC-11-WT, BDC-11-40, and BDC-11-60, if possible (Figure 19). If monitoring wells BDC-6-60, BDC-11-WT, BDC-11-40, and/or BDC-11-60 have not been installed and/or sampled prior to Tier 1 reconnaissance groundwater sampling, these data will be acquired when the BDC monitoring wells have been installed and sampled.

Direct-push borings B13 through B15 have been located to characterize the lateral and vertical extent of concentrations of HVOCs in groundwater above screening levels down-gradient of Plant 4. The groundwater up-gradient of Plant 4 will be characterized by advancing reconnaissance borings B16 and B17 to a depth of 70 feet bgs or refusal. Proposed BDC soil borings PGG-33 and PGG-34 will provide additional up-gradient vertical and lateral characterization.

Soil samples will be collected from selected sampling intervals in each of the direct-push borings to describe subsurface soil conditions. Soil samples will be collected at

reconnaissance boring locations B14 and B15 in the unsaturated soil above the Water Table Zone and analyzed for HVOCs to characterize the lateral and vertical extent of concentrations of HVOCs in soil above screening levels that may have been released from Plant 4 (Figure 19). Reconnaissance boring B18 will be advanced from the ground surface to the Water Table Zone to collect soil samples for analysis to characterize the extent of HVOCs in soil that may have been released from Plant 4; groundwater samples will not be collected from reconnaissance boring B18. Soil sampling protocols are defined in the Reconnaissance SAP (Appendix A).

Evaluation of the reconnaissance groundwater and soil samples collected during Tier 1 reconnaissance groundwater sampling will include:

- Analysis of reconnaissance groundwater samples for HVOCs using EPA Method 8260B;
- Analysis of select soil samples for HVOCs using EPA Method 5035A/8260B;
- Analysis of select soil samples for total organic carbon by EPA Method 415.1;
- Collection of dissolved oxygen, pH, and redox potential data for groundwater across the Capital Area of Investigation;
- Preparation of surface maps and cross sections developed from analytical results of reconnaissance groundwater samples collected from the Tier 1 reconnaissance groundwater sampling to show the distribution of concentrations of HVOCs in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone if necessary; and
- Compilation of reconnaissance borings logs.

Parcel No. 1722801530 located north of Plant 4 is owned by Capital (Figure 3). There is no history of manufacturing processes or use of chemicals on this parcel. Capital has used the parcel for the storage of finished products, which include containers and dumpsters. Because no hazardous substances are known to have been used or managed on this portion of the property, it is unlikely that a release of COPCs has occurred at this property. To confirm that a release of COPCs has not occurred at Parcel No. 17228018530, Capital will evaluate the analytical results of groundwater samples collected from soil borings PGG-33 and PGG-34 proposed by BDC and will advance reconnaissance boring B17 to 70 feet bgs on this portion of the property (Figure 19).

5.4.1.4 Tier 2 Reconnaissance Groundwater Sampling and Analysis

Installation and sampling of direct-push borings for Tier 2 reconnaissance groundwater sampling is conditional on the analytical results of Tier 1 reconnaissance groundwater sampling. The criteria used to determine whether and where Tier 2 reconnaissance groundwater sampling will occur is defined in the Reconnaissance SAP (Appendix A). The objective of Tier 2 reconnaissance groundwater sampling is to characterize the lateral and vertical extent of HVOCs that may have been released from Capital Plants 2 and 4, if not fully characterized by Tier 1 reconnaissance groundwater sampling.

Tier 2 direct-push boring locations may include borings B19 through B24 (Figure 19). Reconnaissances borings will be advanced to the depth defined by Tier 1 reconnaissance groundwater sampling or refusal, but will not extend deeper than 70 feet bgs. Reconnaissance groundwater samples will be collected at 4-foot intervals from first-encountered groundwater to the completion of the boring. Each Tier 2 direct-push boring will be sampled in accordance with the Reconnaissance SAP (Appendix A).

Reconnaissance borings B19 through B21 may be advanced to a depth defined by the conditions defined in the Reconnaissance SAP to further characterize HVOCs that may have been released from Plant 4. Reconnaissance borings B22 through B24 may be advanced under the conditions defined in the Reconnaissance SAP to further characterize HVOCs that may have been released from Plant 2. Soil samples will be collected continuously for lithologic description and development of a stratigraphic section at each boring location advanced. Reconnaissance groundwater samples will be collected from Tier 2 direct-push borings advanced as described in the Reconnaissance SAP (Appendix A).

Evaluation of the reconnaissance groundwater samples collected by the Tier 2 Reconnaissance Groundwater Sampling will include:

- Analysis of reconnaissance groundwater samples for HVOCs using EPA Method 8260B;
- Analysis of select soil samples for total organic carbon by EPA Method 415.1;
- Collection of dissolved oxygen, pH, and redox potential data for groundwater across the Capital Area of Investigation;
- Preparation of surface maps and cross sections developed from analytical results of reconnaissance groundwater samples collected from both the Tier 1 and Tier 2 reconnaissance groundwater sampling to shown that show the distribution of concentrations of HVOCs in groundwater in the Water Table, the Shallow, and the Intermediate Zone if necessary; and
- Compilation of reconnaissance borings logs.

The results of the first phase of the RI Field Program evaluation will be presented in the Draft First Phase RI Field Program Results Report for review and discussion with Ecology. Based on these results, Capital will prepare a Groundwater Monitoring Plan to define the scope of work for the second phase of the RI Field Program.

5.4.2 Second Phase of the RI Field Program

A brief summary of the scope of work for the second phase of the RI Field Program is provided below. A detailed discussion of the scope of work for the second phase of the RI Field Program will be provided in the Groundwater Monitoring Plan.

The results of the Tier 1 and Tier 2 reconnaissance groundwater sampling soil descriptions and the soil and reconnaissance groundwater analytical results will be used to evaluate and revise the Site Conceptual Model, fill existing data gaps, and determine monitoring well locations and

depths. The stratigraphy and vertical and lateral distribution of concentrations of HVOCs in groundwater will be evaluated to select monitoring well locations, depths, and screened intervals. Monitoring wells may be located on the western, eastern, and southern edges of the HVOC plume to delineate the cross- and down-gradient extent of concentrations of HVOCs in the Water Table Zone and the Shallow Zone that are above the screening levels, and to provide sufficient data to evaluate the potential for the indoor air migration exposure pathway. Monitoring wells may be installed into the Intermediate Zone if the results of Tier 1 and Tier 2 reconnaissance groundwater sampling indicate that concentrations of HVOCs above the screening levels released from the Capital Property have impacted groundwater in the Intermediate Zone.

The monitoring wells will be screened at specific depths to evaluate the vertical distribution of concentrations of COPCs. The Groundwater Monitoring Plan will be prepared to document the monitoring well locations, depths, and screening intervals, and will include a Groundwater Monitoring SAP defining the details of well installation and sampling procedures.

5.4.2.1 Monitoring Well Installation and Development

The locations, screen intervals, and depths of the monitoring wells will be based on field observations and analytical results for the reconnaissance groundwater samples collected from Tier 1 and Tier 2 direct-push borings, concentrations of HVOCs detected in groundwater samples collected during previous investigations at the Capital Property, and concentrations of HVOCs detected in groundwater samples collected from BDC reconnaissance borings and monitoring wells, and will depend on accessibility and the presence of utilities. Monitoring wells may be installed as pairs screened in both the Water Table Zone and the Shallow Zone, or as clusters in the Water Table Zone, the Shallow Zone, and the Intermediate Zone. Details of monitoring well installation and development will be defined in the Groundwater Monitoring Plan to be prepared after completion of Tier 1 and Tier 2 reconnaissance groundwater sampling.

5.4.2.2 Groundwater Monitoring and Sampling

The Groundwater Monitoring Plan will define groundwater monitoring and sampling protocols. Data collected from the monitoring wells will be used to: calculate groundwater flow direction and the horizontal and vertical gradients in the Water Table Zone and the Shallow Zone (and in the Intermediate Zone if monitoring wells are installed in the Intermediate Zone); define the COPCs applicable to the Capital Area of Investigation, determine the nature and extent of COPCs in groundwater; and evaluate natural attenuation parameters.

Groundwater samples will be collected from all existing monitoring wells, including monitoring wells MW-1 through MW-8, PSC CG-137-WT/CG-137-40, and PSC CG-141-WT/CG-141-40 (Figure 5), and the monitoring wells to be installed for the RI Field Program after completion of monitoring well installation. The monitoring wells will be developed, monitored, and sampled in accordance with the protocols defined in the Groundwater Monitoring Plan. The groundwater samples collected from the first round of groundwater monitoring will be submitted for analysis for HVOCs by EPA Methods 8260B/8260B SIMS; 1,4-dioxane by EPA Method 8270C; total and dissolved

manganese and iron by EPA Method 6010; and natural attenuation parameters, as discussed below. Groundwater samples collected from subsequent monitoring events will be analyzed only for COPCs that exceed screening levels in the first round of groundwater sampling, as will be defined in the Groundwater Monitoring Plan.

The results of groundwater monitoring will be evaluated to prepare maps and cross sections depicting the boundaries of the hydrogeologic system, the areal and vertical distribution of geologic units, organic carbon content in soil, and the associated retardation factor(s) for COPCs. Isoconcentration maps and cross sections will be prepared showing the distribution of COPCs, dissolved oxygen, and pH in groundwater.

5.4.2.3 Natural Attenuation Evaluation

The results of the RI Field Program will be used to evaluate the biotransformation of HVOCs in the Water Table Zone and the Shallow Zone at the Capital Area of Investigation that results from the biologically mediated process of reductive dechlorination. The purpose of the natural attenuation evaluation is to assess whether the geochemistry of groundwater in the Water Table Zone and the Shallow Zone can support biotransformation of HVOCs and whether natural attention is a potential cleanup alternative for the releases of COPCs from the Capital Property. The Intermediate Zone may be assessed if the results of the reconnaissance groundwater sampling indicate that concentrations of COPCs above the screening level released from the Capital Property have migrated to below 40 feet bgs in groundwater.

Groundwater samples collected from selected monitoring wells will be submitted for analyses for natural attenuation parameters. The number and frequency of monitoring wells sampled and analyzed for natural attenuation parameters will be based on the location and density of the monitoring wells. Details of the sampling and analyzing of monitoring wells for natural attenuation parameters will presented in the Groundwater Monitoring Plan.

To evaluate whether biotransformation of HVOCs is occurring in groundwater within the Water Table Zone and the Shallow Zone, groundwater samples collected from monitoring wells may be analyzed for:

- Alkalinity by EPA Method 310.2;
- Sulfate by EPA Method 375.4;
- Sulfide by EPA Method 376.1;
- Nitrate and nitrite by EPA Method 353.2;
- Ferrous iron (FE^{+2}) and ferric iron (Fe^{+3}) by Method SM 3500-FeB/6010B;
- Manganese by EPA Method 6010B; and
- Methane, ethane, and ethene by Gas Chromatography/Flame Ionization Detection.

Field measurements of groundwater will include:

- pH;
- Temperature;

- Conductivity;
- Dissolved oxygen;
- Redox/oxidation-reduction potential;
- Turbidity.

5.4.2.4 Aquifer Characterization

Saturated soil samples from selected intervals within the Water Table Zone, the Shallow Zone, and the Intermediate Zone may be collected from borings for monitoring well installation to characterize the aquifer characteristics of the zones. Soil sample locations will be selected down-gradient of Capital Plant 2 in the area of borings B6 through B12, and down-gradient of Capital Plant 4 in the area of borings B13 through B19. The soil samples will be collected from the monitoring well borings based on field observations of the soil types encountered in the borings.

Slug testing may be conducted at select monitoring wells to estimate the hydraulic conductivity and transmissivity of the Water Table Zone and the Shallow Zone at the Capital Area of Investigation. The results of the slug testing will be used as input for fate and transport modeling. Slug testing will be performed at select monitoring wells installed in the Water Table Zone, the Shallow Zone, and the Intermediate Zone if necessary. The locations of the monitoring wells identified for slug testing will be based on the location and density of the monitoring wells to be installed at the Capital Area of Investigation. The location and methodology for the slug testing will be provided in the Groundwater Monitoring Plan after completion of the first round of groundwater monitoring.

5.4.2.5 Fate and Transport Modeling

To support the computer modeling needs to assess the hydrogeologic system and contaminant fate and transport at the Capital Area of Investigation, data and information collected will be compiled from available sources. Computer modeling will be used to evaluate fate and transport, to aid in evaluating the risk to human health and the environment, or to support the evaluation of cleanup actions. The BIOCHLOR screening model will be used to simulate intrinsic bioremediation through natural attenuation of HVOCs in groundwater (EPA 2002b). The software is based on the Domenico analytical solute transport model and is programmed in Microsoft Excel spreadsheet format. BIOCHLOR has the ability to simulate one-dimensional advection, three-dimensional dispersion, linear adsorption, and biotransformation via reductive dechlorination (the dominant biotransformation process at most chlorinated solvent-contaminated properties). For this evaluation, the degradation of dissolved-phase HVOCs is assumed to follow a sequential first-order decay process.

Capital will collect sufficient data during the RI Field Program to conduct BIOCHLOR modeling. The data collection requirements to conduct BIOCHLOR modeling are presented in a discussion of modeling scope, methods, inputs, and goals in Appendix F.

6.0 REMEDIAL INVESTIGATION DELIVERABLES

The following documentation is required for the Agreed Order. Some documents have been submitted in draft format that will be revised after completion of RI field sampling. Some documents will be prepared after completion of RI field sampling, as noted below.

6.1 PUBLIC PARTICIPATION PLAN (SUBMITTED)

Capital has submitted a revised PPP prepared in accordance with the Agreed Order and meeting the requirements of WAC 173-340-600. The purpose of the PPP is to keep appropriate governmental officials, persons residing in proximity to the Capital Site, interested persons visiting the Capital Site, and other persons requesting information about the Capital Site informed. In accordance with WAC 173-340-600(9)(g), the PPP includes a description of public notice, the information repository, the responsiveness summary, and amendments.

6.2 VAPOR INTRUSION ASSESSMENT WORK PLAN (SUBMITTED)

Capital has submitted a Vapor Intrusion Assessment Work Plan prepared in accordance with Arrow et al. (2007) that is attached to the Agreed Order as Exhibit D. The Vapor Intrusion Assessment Work Plan describes the procedures to be used to assess vapor intrusion of volatile COCs into buildings within the Capital Site. The Vapor Intrusion Assessment Work Plan proposes submittal dates for the Vapor Intrusion Mitigation Work Plan and the Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan, which are summarized in the following two sections.

6.3 VAPOR INTRUSION MITIGATION WORK PLANS (SUBMITTED)

Capital has submitted a Vapor Intrusion Mitigation Work Plan prepared in accordance with Arrow et al. that is attached to the Agreed Order as Exhibit D. The Vapor Intrusion Mitigation Work Plan describes the procedures to be used to mitigate the intrusion of volatile COCs to indoor ambient air in buildings located within the Capital Site. The eastern side of the Olympic Medical Building located at 5900 1st Avenue South has been identified by Arrow et al. (2007) as a building that requires vapor intrusion mitigation. Capital has proposed to install an SSDS in this building and to prepare a Vapor Intrusion Mitigation Work Plan for the building. Once access to the Olympic Medical building has been provided, Capital will prepare this document and install the SSDS.

6.4 VAPOR INTRUSION INSPECTION, MONITORING, AND MAINTENANCE WORK PLAN (SUBMITTED)

Capital has submitted a Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan prepared in accordance with PSC (2002) and Arrow et al. (2007) that is attached to the Agreed Order as Exhibit D. The Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan describes the procedures to be used to inspect, monitor, and maintain vapor intrusion systems installed at commercial and industrial buildings within the Capital Site. No vapor intrusion

systems currently are installed at the Capital Site. The Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan has been prepared to meet the requirements of the Agreed Order and is general in nature. The Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan will be revised, as necessary, if vapor intrusion systems are installed at the Capital Site.

6.5 RECONNAISSANCE SAMPLING AND ANALYSIS PLAN (APPENDIX A)

Capital has submitted a Reconnaissance SAP that will govern the sampling and analysis procedures for the first phase of the RI Field Investigation. The Reconnaissance SAP describes the reconnaissance field activities to be performed during the first phase of the RI.

The Reconnaissance SAP has been prepared in accordance with MTCA, as established in WAC 173-340-350 and 173-340-820 and in accordance with the Agreed Order. The purpose of the Reconnaissance SAP is to define the specific requirements for sample collection and analysis during the first phase RI Field Program at the Capital Area of Investigation to confirm that sampling is conducted in accordance with technically acceptable protocols, and that results meet the data quality objectives defined in the QAPP. The Reconnaissance SAP delineates the sampling objectives, sample locations, measurement frequencies, and protocols for sampling equipment, procedures, handling, and analysis that will be used during the first phase of the RI. The Reconnaissance SAP provides the basis for planning field activities and a mechanism for validating that quality assurance requirements are met.

6.6 DRAFT/FINAL TIER 1 RECONNAISSANCE GROUNDWATER SAMPLING TECHNICAL MEMORANDUM (TO BE SUBMITTED)

Capital will submit a Draft/Final Tier 1 Reconnaissance Groundwater Sampling Technical Memorandum following completion of the Tier 1 reconnaissance groundwater sampling described in Section 5.4.1.3, Tier 1 Reconnaissance Groundwater Sampling and Analysis. The Draft/Final Tier 1 Reconnaissance Groundwater Sampling Technical Memorandum will provide a discussion of the methods used for the Tier 1 reconnaissance groundwater sampling, a summary of the laboratory analytical results of Tier 1 reconnaissance groundwater sampling, conclusions developed from the information collected during the Tier 1 reconnaissance groundwater sampling effort, and proposed Tier 2 reconnaissance groundwater sampling locations, if additional investigation is warranted. This document will be submitted to Ecology for review and approval of Tier 2 reconnaissance groundwater sampling locations and depths. Upon approval, Tier 2 reconnaissance groundwater sampling will commence, if necessary.

6.7 DRAFT/FINAL FIRST PHASE RI FIELD PROGRAM RESULTS REPORT (TO BE SUBMITTED)

Capital will submit a Draft/Final First Phase RI Field Program Results Report to Ecology for review and approval following completion of the first phase of the RI Field Program. Data collected from research and review of past and current operations at properties located within the Capital Area of Investigation, Tier 1 reconnaissance groundwater sampling, Tier 2 reconnaissance groundwater sampling, and soil samples collected during the first phase of the RI Field Program will be presented in this report. Based on these data, Capital will propose

locations and depths for the monitoring wells to be installed under the second phase of the RI Field Program. Approval of this document by Ecology will mark the completion of the first phase of the RI Field Program.

6.8 DRAFT/FINAL GROUNDWATER MONITORING PLAN (TO BE SUBMITTED)

Capital will submit a Draft/Final Groundwater Monitoring Plan that complies with WAC 173-340-410 in accordance with the requirements of the Agreed Order. The Draft/Final Groundwater Monitoring Plan will address the second phase of the RI Field Program, provide final monitoring well locations and depths, and provide a Groundwater Monitoring SAP. The Groundwater Monitoring SAP will define the specific requirements for monitoring well installation and groundwater sample collection and analysis for the second phase of the RI Field Program to confirm that sampling is conducted in accordance with technically acceptable protocols, and that results meet the data quality objectives defined in the QAPP, included in this RI Work Plan as Appendix B. The Draft/Final Groundwater Monitoring Plan will provide the procedures to assess the nature and extent of COCs in groundwater, to document the occurrence of natural attenuation processes, and to collect data to estimate groundwater flow direction and vertical and horizontal gradients from groundwater data collected at the Capital Site. Following Ecology approval of the Groundwater Monitoring Plan, the second phase of the RI Field Program will commence.

6.9 QUARTERLY PROGRESS REPORTS

Progress reports will be prepared quarterly to describe the work completed, including quality-assured analytical results with summary tables and laboratory analytical reports, figures, and vapor intrusion data collected during the preceding 3 months, and work proposed for the next quarter.

6.10 DRAFT/FINAL REMEDIAL INVESTIGATION REPORT (TO BE SUBMITTED)

A Remedial Investigation Report will be prepared in accordance with the requirements of the Scope of Work in the Agreed Order and WAC 173-340-350. The Remedial Investigation Report will summarize the existing data and phases of Field Programs completed to characterize the Capital Site, define the COCs, sources of COCs, the nature and extent of COCs that exceed the screening levels, and the fate and transport of the COCs. The Remedial Investigation Report will include maps and figures of the plume of COCs, including depth, areal extent, isoconcentration lines of individual COCs, and groundwater elevation contours and flow direction. The Remedial Investigation Report format will be consistent with the format specified in WAC 173-340-840 and Table 3-13 of the EPA Remedial Investigation/Feasibility Study guidance (EPA 1988).

6.11 DRAFT/FINAL ASSESSMENT OF INTERIM ACTION PERFORMANCE (TO BE SUBMITTED IF WARRANTED)

The Scope of Work in the Agreed Order indicates that an assessment of interim action performance is to be submitted documenting the evaluation of interim actions conducted at the

Capital Site. Interim actions have not been implemented at the Capital Property to date. If interim actions are implemented, Capital will prepare the necessary documentation.

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