

**CLACKAMAS COUNTY BOARD OF COUNTY COMMISSIONERS**  
Acting as the Governing Body of Clackamas County Service District No.1  
and the Tri-City Service District

**Study Session Worksheet**

**Presentation Date:** October 8, 2013 **Approx Start Time:** 3:30 **Approx Length:** 30 min.

**Presentation Title:** Blue Heron West Project Update

**Department:** Water Environment Services

**Presenters:** Kathy Frasier, Greg Geist, Chris Storey, Mike Kuenzi

**Other Invitees:** Amy Kyle, Amanda Keller, Ryan Johnson

**WHAT ACTION ARE YOU REQUESTING FROM THE BOARD?** In addition to providing a project update, staff is requesting the Board's direction on the potential use of alternative contracting methods for remediation of the Blue Heron treatment lagoon.

**EXECUTIVE SUMMARY:**

Clackamas County Service District No. 1 and the Tri-City Service District ("Districts") entered into a co-investment strategy to acquire the Blue Heron West environmental assets in 2012 to secure a superior outfall pipe and its associated Clean Water Act permit. The objective was to meet future challenges of increasingly stringent environmental regulations governing heat discharges and toxic mixing into the Willamette River. Staff also saw the opportunity to acquire an asset that would allow the Districts to meet expected service demands due to future growth and for substantial ratepayer savings.

The Districts were successful in purchasing the property, finalizing transfer from the bankruptcy court in July 2012. Staff is currently assessing and remediating the site's contamination prior to opening a dialog with the BCC on the final disposition of the site. Staff is providing an update on the status of the project to date, including the investigation related to the clean-up of the former Mill's treatment lagoon and status of the water quality permit for the site.

**FINANCIAL IMPLICATIONS (current year and ongoing):** The Districts have established a total investment of \$6 million for the procurement and clean up of the site while negotiating permits for its outfall.

**LEGAL/POLICY REQUIREMENTS:** Staff is seeking the Board's direction on the potential use of alternative contracting methods for the remediation work to minimize District risk until permit negotiations with the Oregon Department of Environmental Quality (DEQ) are concluded and the disposition of the property has been determined. County Counsel has prepared a brief analyzing the statutory requirements and staff and Board obligations for granting an exemption to the traditional competitive bidding process.

**PUBLIC/GOVERNMENTAL PARTICIPATION:**

- The Districts' standing Advisory Boards and the Regional Wastewater Capacity Advisory Committee supported the purchase and receive regular updates on the project.
- The Districts and the City of West Linn are coordinating planning activities for the future use of the areas of the property not needed by the Districts.
- The Districts are working through the processes outlined in their Prospective Purchaser Agreement with the DEQ, as well as on a proposed water quality permit modification.

**OPTIONS:**

1. The Board supports staff exploring the use of alternative contracting methods for the remediation of the Blue Heron West treatment lagoon.
2. The Board requests that staff pursue a more traditional approach to contracting the site cleanup.
3. The Board requests additional information from staff prior to providing its support of alternative contracting methods.

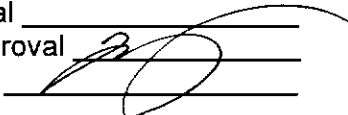
**RECOMMENDATION:**

Staff respectfully recommends that the Board support staff exploring the potential use of alternative contracting methods versus traditional contracting procedures for the remediation of the Blue Heron West treatment lagoon.

**ATTACHMENTS:**

- 1) Letter dated September 13, 2013 from Oregon DEQ Northwest Region Director Dick Pederson to Chair Ludlow regarding transfer of the Blue Heron NPDES Permit.
- 2) County Counsel brief analyzing the use of alternate contracting methods as opposed to traditional competitive contracting procedures.
- 3) Blue Heron Remediation Investigation Report.

**SUBMITTED BY:**

Division Director/Head Approval \_\_\_\_\_  
Department Director/Head Approval \_\_\_\_\_  
County Administrator Approval \_\_\_\_\_ 

For information on this issue or copies of attachments, please contact Trista Crase @ 503/742-4566.



# Oregon

John A. Kitzhaber, MD, Governor

**Department of Environmental Quality**  
Northwest Region Portland Office/Water Quality  
2020 SW 4th Avenue, Suite 400  
Portland, OR 97201-4987  
(503) 229-5263  
FAX (503) 229-6957  
TTY 711

September 13, 2013

John Ludlow, Chair  
Clackamas County Board of Commissioners  
2051 Kaen Road  
Oregon City, OR 97045

Re: Letter on the Clackamas County Water Environment Services purchase of Blue Heron assets and transfer of NPDES permit

Dear Chair Ludlow and Commissioners:

As you are aware, communities across Oregon that treat and discharge municipal sanitary wastes are looking for solutions to address temperature and other discharge limitations that are contained in DEQ-issued wastewater discharge permits. Though recent legal challenges to Oregon's regulatory approach have complicated the wastewater permitting process, DEQ is committed to working through those issues with our stakeholders so that we can issue and renew wastewater discharge permits. We recognize that having regulatory certainty is important to you as you plan how to invest precious ratepayer dollars in ways that maintain compliance with Clean Water Act requirements and provide cost-effective wastewater treatment for your community and we share that challenge. We are endeavoring to create processes that treat permit holders with fairness and equity while providing legally defensible options for meeting water quality standards in an environment of competing uses.

Sincerely,

Dick Pedersen  
Director

To: Mike Kuenzi  
From: Amanda Keller  
RE: Blue Heron Alternative Contracting Methods  
Date: October 1, 2013

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QUESTION PRESENTED

Is it possible for Clackamas County Service District No. 1 and Tri-City Service District (collectively, the "District") to use an alternative method of contracting for the Blue Heron Restoration Project as opposed to the normal competitive bidding procedures required for public improvement contracts by the Clackamas County Code and Oregon Revised Statutes?

ANALYSIS

**1. Clackamas County Code Requirements.**

Alternative Contracting Methods. The Local Contract Review Board Rules contained in the Clackamas County Code<sup>1</sup> ("County Code") authorize contracting agencies to use alternative methods for public improvement contracts as permitted by ORS 279C.335. Alternative contracting methods are defined by the County Code as "innovative Procurement techniques for obtaining Public Improvement Contracts, utilizing processes other than the traditional method of Design-Bid-Build."<sup>2</sup>

Alternative contracting methods commonly include variations of Design-Build contracting, Construction Manager/General Contractor, Energy Savings Performance Contracts, as well as other developing techniques such as general "performance contracting" and "cost plus time" contracting.<sup>3</sup> The County Code provides the following detailed definitions of various alternative contracting methods available:<sup>4</sup>

- **Construction Manager/General Contractor ("CM/GC")** means a form of Procurement that results in a Public Improvement Contract for a Construction Manager/General Contractor to undertake project team involvement with design development; constructability reviews; value engineering, scheduling, estimating and subcontracting services; establish a Guaranteed Maximum Price to complete the Contract Work; act as General Contractor; hold all subcontracts, self-perform portions of the Work as may be allowed by the Contracting Agency under the CM/GC Contract; coordinate and manage the building process; provide general Contractor expertise; and act as a member of the project team along with the Contracting Agency, architect/engineers and other consultants. CM/GC also refers to a Contractor *under this form of Contract*, sometimes known as the "Construction Manager at Risk."

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<sup>1</sup> C-049-0600 Alternative Contracting Methods.

<sup>2</sup> C-049-0610 Definitions for Alternative Contracting Methods.

<sup>3</sup> C-049-0610(1) Alternative Contracting Methods.

<sup>4</sup> C-049-0610(2)-(5).

- **Design-Build** means a form of Procurement that results in a Public Improvement Contract in which the construction Contractor also provides or obtains specified design services, participates on the project team with the Contracting Agency, and manages both design and construction. In this form of Contract, a single Person provides the Contracting Agency with all the services necessary to both design and construct the project.
- **Energy Savings Performance Contract ("ESPC")** means a Public Improvement Contract between a Contracting Agency and a Qualified Energy Service Company for the identification, evaluation, recommendation, design and construction of Energy Conservation Measures, including a Design-Build Contract, that guarantee energy savings or performance.
- **Guaranteed Maximum Price ("GMP")** means the total maximum price provided to the Contracting Agency by the Contractor, and accepted by the Contracting Agency, that includes all reimbursable costs of fees for the completion of the Contract Work, as defined by the Public Improvement Contract, except for material changes in the scope of Work. It may also include particularly identified contingency amounts.

Use of Alternative Contracting Methods. The County Code requires a competitive bidding process for all public improvement contracts unless an exception under ORS 279C.335 applies.<sup>5</sup> If a statutory exception applies, then an alternative contracting method may be used if:

- a) The exception that applies is sufficiently justified in accordance with the County Code;<sup>6</sup> and
- b) Pursuant to ORS 279.355, the contracting agency provides a post-project evaluation for any projects in excess of \$100,000.

## 2. Oregon Statutory Requirements.

General Rule; Exceptions. ORS 279C.335 requires public improvement contracts to be based upon traditional competitive bidding unless an exception applies. The local contract review board ("Board") may exempt a public improvement contract from the competitive bidding requirements upon approval of the following findings:<sup>7</sup>

- a) It is unlikely that the exemption will encourage favoritism in the awarding of public improvement contracts or substantially diminish competition for public improvement contracts.
- b) The awarding of public improvement contracts under the exemption will likely result in substantial cost savings to the contracting agency. In making this finding, the Board may consider the type, cost and amount of the contract, the number of persons available to bid and such other factors as may be deemed appropriate.

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<sup>5</sup> C-049-0620 Use of Alternative Contracting Methods.

<sup>6</sup> *Id.*

<sup>7</sup> ORS 279C.335(2).

Findings. In justifying the application of the exemption above, the District's supporting information must include specific findings. "Findings" are defined under the statute as the justification for a contracting agency conclusion that includes, but is not limited to, information regarding:<sup>8</sup>

- a) Operational, budget and financial data;
- b) Public benefits;
- c) Value engineering;
- d) Specialized expertise required;
- e) Public safety;
- f) Market conditions;
- g) Technical complexity; and
- h) Funding sources.

Board Obligations. In granting such exemptions, the statute requires the Board to do the following:<sup>9</sup>

- a) When appropriate, direct the use of alternate contracting methods that take account of market realities and modern practices and are consistent with the public policy of encouraging competition.
- b) Require and approve or disapprove written findings by the contracting agency. The findings must show the exemption of a contract complies with exception requirements listed above.

Public Hearing Requirement. Before final adoption of the required findings, a contracting agency must hold a public hearing and further satisfy the following requirements:<sup>10</sup>

- Notification of the hearing shall be published in at least one trade newspaper of general statewide circulation a minimum of fourteen (14) days before the hearing.
- The notice shall state that the public hearing is for the purpose of taking comments on the draft findings for an exemption from the competitive bidding requirement. At the time of the notice, copies of the draft findings shall be made available to the public. At the option of the contracting agency, the notice may describe the process by which the findings are finally adopted and may indicate the opportunity for any further public comment.
- At the public hearing, the contracting agency or state agency shall offer an opportunity for any interested party to appear and present comment.
- If a contracting agency or state agency is required to act promptly due to circumstances beyond the agency's control that do not constitute an emergency, notification of the public hearing may be published simultaneously with the agency's solicitation of contractors for the alternative public contracting method, as long as responses to the solicitation are due at least five days after the meeting and approval of the findings.

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<sup>8</sup> ORS 279C.330.

<sup>9</sup> ORS 279C.335(4).

<sup>10</sup> ORS 279C.335(5).

Post-Project Evaluation. Upon completion and final payment for any public improvement contract in excess of \$100,000 for which a competitive process was not used, the contracting agency must prepare and deliver to the Board an evaluation of the project. The evaluation must be completed within 30 days of the date the contracting agency accepts the public improvement project and must be made available for public inspection.<sup>11</sup> The evaluation must include, but is not limited to, the following information:<sup>12</sup>

- a) The actual project cost as compared with original project estimates;
- b) The amount of any guaranteed maximum price;
- c) The number of project change orders issued by the contracting agency;
- d) A narrative description of successes and failures during the design, engineering and construction of the projects; and
- e) An objective assessment of the use of the alternative contracting process as compared to the findings required by ORS 279.335.

CONCLUSION

Under the County Code and Oregon Revised Statutes, it is possible for the District to use an alternative contracting method as long as a statutory exception applies under ORS 279C.335 and the District is able to obtain Board approval by sufficiently justifying the use of the alternative method.

**Attorney-Client Privileged Communication**

This information is intended for the specified client and should not be relied upon by any other parties.

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<sup>11</sup> *Id.*

<sup>12</sup> ORS 279C.355.

CHECKLIST – MINIMUM REQUIREMENTS FOR COMPLIANCE

1. **Determine whether an exception to the competitive bidding requirement may apply.**
  - a. Statutory Exception. Answer these two questions:
    - i. It is unlikely that the exemption will encourage favoritism in the awarding of public improvement contracts or substantially diminish competition for public improvement contracts.
    - ii. The awarding of public improvement contracts under the exemption will likely result in substantial cost savings to the contracting agency.
  - b. Findings. Use the following information to answer the two questions above:
    - i. Operational, budget and financial data;
    - ii. Public benefits;
    - iii. Value engineering;
    - iv. Specialized expertise required;
    - v. Public safety;
    - vi. Market conditions;
    - vii. Technical complexity; and
    - viii. Funding sources.
2. **Get Board approval.**
  - a. Present final report and findings to the Board.
  - b. Satisfy notice requirements by holding public hearing prior to final adoption of findings.
    - i. Notice published in a statewide trade newspaper of general circulation at least 14 days before the hearing.
    - ii. Notice must state purpose of hearing is to take comments on findings.
    - iii. Copies of draft findings made available to public when notice published.
    - iv. Any interested party must be given chance to appear and comment.
3. **Complete a post-project evaluation.**
  - a. Evaluation should at least answer the following questions:
    - i. The actual project cost as compared with original project estimates;
    - ii. The amount of any guaranteed maximum price;
    - iii. The number of project change orders issued by the contracting agency;
    - iv. A narrative description of successes and failures during the design, engineering and construction of the projects; and
    - v. An objective assessment of the use of the alternative contracting process as compared to the findings required by ORS 279.335.
  - b. Must be submitted to the Board within 30 days of District accepting the public improvement.
  - c. Must be made available for public inspection.



**DRAFT REPORT**

Remedial Investigation and Risk  
Assessment

Blue Heron Paper Company  
Aerated Stabilization Basin Site  
1317 Willamette Falls Drive  
West Linn, Oregon 97068

Prepared for:  
Clackamas County Water  
Environment Services  
150 Beaver Creek Road  
Oregon City, Oregon 97045

August, 26 2013

**CDM  
Smith®**

*A Report Prepared For:*  
Clackamas County Water Environment Services  
150 Beaver Creek Road  
Oregon City, Oregon 97045

**DRAFT REPORT  
REMEDIAL INVESTIGATION AND RISK ASSESSMENT  
BLUE HERON PAPER COMPANY  
AERATED STABILIZATION BASIN SITE  
1317 WILLAMETTE FALLS DRIVE  
WEST LINN, OREGON 97068**

August, 26 2013



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- Appendix F – Human Health Risk Assessment
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# Acronyms and Abbreviations

1,3-DCB	1,3-dichlorobenzene
µg/kg	microgram per kilogram
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
ARI	Analytical Resources Inc.
ASB	aerated stabilization basin
bgs	below ground surface
BOD	biological oxygen demand
BTEX	benzene, toluene, ethylbenzene, and xylenes
CCSD	Clackamas County Service District No. 1/Tri-City Service District
COC	chemical of concern
COI	contaminants of interest
COPC	chemicals of potential concern
CPEC	chemicals of potential ecological concern
CPAH	carcinogenic polycyclic aromatic hydrocarbon
CRBG	Columbia River Basalt Group
CSM	conceptual site model
dioxin/furan	chlorodibenzo-p-dioxin and chlorodibenzo-p-furan
DO	dissolved oxygen
DRO	diesel range organics
E&E	Ecology & Environment, Inc.
EDL	estimated detection limit
ELCR	excess lifetime cancer risk
EPH/VPH	extractable petroleum hydrocarbons and volatile petroleum hydrocarbons
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
ESA	environmental site assessment
FEMA	Federal Emergency Management
FS	feasibility study
ft	feet
ft bgs	feet below ground surface
GRO	gasoline range organics
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
MCL	maximum contaminant level
MEK	methyl ethyl ketone
MFA	Maul Foster & Alongi
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration

NPDES	National Pollutant Discharge Elimination System
NRI	<i>NRI Global, Inc.</i>
ODEQ	Oregon Department of Environmental Quality
ORO	oil range organics
PCBs	polychlorinated biphenyls
pg/g	picograms per gram
pg/L	picograms per liter
RA	risk assessment
RAGs	Risk Assessment Guidance for Superfund
RBC	risk based concentration
RI	remedial investigation
RME	reasonable maximum exposure
SC	specific conductance
SI	site investigation
SLVs	screening level values
TEF	toxic equivalency factor
TEQ	toxic equivalency
TSS	total suspended solids
USGS	United States Geologic Service
VOC	volatile organic compound
WES	Water Environment Services



# Section 1

## Introduction

This document presents the findings of a Remedial Investigation and Risk Assessment for the Blue Heron Paper Company Aerated Stabilization Basin (ASB) property located in West Linn, Oregon (Site) (**Figure 1**). Clackamas County Service District No. 1/Tri-City Service District (CCSD) purchased the ASB property from Blue Heron in May 2012. CCSD's primary interest in the property is the permitted outfall and will retain the outfall area in perpetuity. The City of West Linn is considering acquisition of the remainder of the property and is in the process of determining the highest and best use of the land.

On July 17, 2012 CCSD entered into a Consent Order with the Oregon Department of Environmental Quality (ODEQ) to complete a Remedial Investigation (RI), Risk Assessment (RA), Feasibility Study (FS), and Remedial Actions for the ASB property. Clackamas County Water Environment Services (WES) retained CDM Smith Inc. (CDM Smith) on behalf of CCSD to complete this RI and RA in accordance with the Consent Order.

### 1.1 Roles and Responsibilities

The primary contact names and roles of entities involved with the completion of this RI and RA are as follows:

ODEQ Project Manager - Shawn Rapp: Mr. Rapp is responsible for overseeing the adequacy of the technical aspects of the project on behalf of the agency and communicates the agency's needs, comments and other requirements to the WES project manager.

Phone: (503) 229-5614

Email: [rapp.shawn@deq.state.or.us](mailto:rapp.shawn@deq.state.or.us)

WES Project Manager - Leah Johanson: Ms. Johanson is responsible for overseeing the overall project, budget, tasking CDM Smith with the work required to complete the project, and coordinating communications between ODEQ, WES, and CDM Smith.

Phone: (503) 742-4620

Email: [LJohanson@co.clackamas.or.us](mailto:LJohanson@co.clackamas.or.us)

CDM Smith Project Manager - Jennifer Jones: Ms. Jones communicates with the WES project manager on the RI work and has overall responsibility in ensuring that the specific objectives of the field investigation have been met.

Phone: (503) 205-7403

Email: [jonesjm@cdmsmith.com](mailto:jonesjm@cdmsmith.com)

## 1.2 Objectives

The objectives of the RI and RA are as follows:

1. Identify the hazardous substances that have been released to the environment through non-permitted discharges from the facility.
2. Determine affected media and the nature, extent and distribution of hazardous substances.
3. Determine potential chemicals of ecological concern as a result of geochemical changes caused by existing conditions in the ASB.
4. Determine the fate and transport of hazardous substances and other chemicals of ecological concern identified at the Site.
5. Identify receptors potentially at risk from releases at the Site.
6. Estimate the risk to human health and/or the environment.
7. Obtain the information necessary to develop and evaluate remedial action alternatives and select a remedial action during development of an FS.

## 1.3 Report Organization

The following sections of this report detail the basis, rationale, methodology and findings of this RI as follows:

- **Section 2 - Site Background:** This section presents a summary of the Site features, general hydrogeology, and historical industrial processes as revealed during CDM Smith's Phase I environmental site assessment (ESA) completed on March 12, 2012 (CDM Smith, 2012a) and Phase II ESA completed on March 26, 2012 (CDM Smith, 2012b). The scope and findings from prior environmental investigations completed for the Site by others are also summarized.
- **Section 3 - Remedial Investigation:** This section presents the approach and methodology for conducting the RI, including the field data collection and observations, analytical methods and results.
- **Section 4 - Nature and Extent of Contamination:** This section provides the preliminary risk screening, including a discussion of where contaminants of interest (COI) are found, naturally occurring constituents, and concentrations observed compared to media-specific screening levels.
- **Section 5 - Contaminant Fate and Transport:** This section presents an evaluation of the persistence and potential migration of COI at the Site, including an evaluation of the magnitude of impact to various media, and environmental fate and transport of COI.
- **Section 6 - Beneficial Water and Land Use:** This section discusses current and reasonably likely future beneficial uses of the land, groundwater and surface water, considering the City of West Linn's plans for future Site development.

- **Section 7 – Baseline Risk Assessment:** This section presents a summary of the human health risk assessment completed for the Site to identify chemicals of concern (COC) and the ecological risk assessment to identify chemicals of potential ecological concern (CPEC).
- **Section 8 – Summary and Conclusions:** This section presents a summary of the significant findings regarding the nature, extent, distribution and environmental fate and transport of contaminants in various media, along with our conclusions and recommended remedial action objectives.
- **Section 9 – References:** References cited in this RI are presented in this section.
- **Appendices:** Supporting information for this RI, including the human health and ecological risk assessments, is included in the appendices at the end of this report.

## Section 2

# Site Background

### 2.1 Site Location and Description

The Site lies approximately three miles southwest of the City of West Linn on the north bank of the Willamette River (**Figure 1**). The official Site address is 1317 Willamette Falls Drive; however, the property lies north of Volpp Street and is bisected by 4<sup>th</sup> Street. The Site is an irregular shaped area of approximately 39.15 acres. Site boundaries and features are shown on **Figure 2**.

The southern portion of the Site is occupied by an approximately 15-acre aerated settling basin that was used for industrial wastewater treatment (the ASB). The ASB is constructed of an approximately 15-foot high earthen berm. The top of the earthen berm is constructed as an access road. The as-built drawings of the ASB (PPC 1981; SWE 1971) indicate the presence of a compacted clay "seal" perhaps 1 to 2 feet thick in portions of the ASB, but no evidence of a clay seal or liner was discovered during CDM Smith's Phase II ESA when the sludge was sampled using a coring device to penetrate the entire sludge interval. The base of the ASB appeared to be constructed with native sediments.

The ASB and its earthen berm are surrounded by chain-link fencing with a locked gate at the entrance. A large wetland exists to the north of the ASB and is partly contained by the northern side of the ASB berm. A stream traverses the northern side of the ASB berm from west to east, passes through a culvert under 4<sup>th</sup> Street and meets up with Bernert Creek, which extends in a northwest-southeast direction, ultimately discharging into the Willamette River. The northern side of the ASB berm creates a barrier for the southern side of the wetland. The remainder of the Site is undeveloped and thickly vegetated with grass, trees, and brush.

Additional structures at the Site include:

- A boat house and sample shed that extend over the south edge of the ASB.
- A motor control room, pad-mounted transformer, and maintenance shop with attached shed located along the south side of the ASB.
- A dilapidated former landscape equipment shed located to the west of the ASB.
- A single-family residence located northwest of the ASB (1317 7<sup>th</sup> Street).
- A residential mobile home located northeast of the ASB (1355 4<sup>th</sup> Street), together with one, and possibly more, outbuildings.

The surrounding area is primarily residential with limited industrial land use. The only non-residential uses in the immediate surrounding area are a sewer pump station and a wastewater treatment ASB operated by a local pulp and paper company, both of which are located to the northeast of the Site.

Photographs of the Site and vicinity are presented in **Appendix A**.

## 2.2 Topography

The natural land surface topography on the Site is irregular, but slopes generally downward from northwest to southeast towards the Willamette River. The highest elevations (up to about 120 feet) are located at the north edge of the Site, along 5<sup>th</sup> Avenue. From there, the land surface slopes downward to the area on the north side of the ASB where the stream and wetland are located, which is also the area of the lowest onsite elevations (approximately 65-68 feet) of the portion of the property that is northwest of Volpp Street. A strip of the property extends south across Volpp Street and down to the River. The elevation at Volpp Street is approximately 78 feet. Elevations are based on North American Vertical Datum of 1988 (NAVD88).

The land surface slopes upward around the sides of the ASB to the top of the earthen berm. The as-built drawings indicate the base of the ASB is approximately 59.5 to 60 feet and the top of the berm at elevation 81.5 feet NGVD29 (PPC 1981; SWE 1971). Converting to NAVD88, the base of the ASB occurs at elevation 63 to 63.5 feet, and the top of the berm at 85.0 feet. The current survey measured the elevation of the top of the berm at approximately 85 feet NAVD88 – consistent with the as-built drawings. Based on this information, the berm is approximately 22 feet higher than the base of the ASB.

According to the National Oceanic and Atmospheric Administration (NOAA) the daily mean river stage on the Willamette River at the station above the Oregon City Falls ranges between about 55 and 60 feet (National Geodetic Vertical Datum - NGVD29). The flood stage is 64 feet. Using NOAA's vertical datum conversion online tool to convert to NAVD88, results in the daily mean river stage ranging between approximately 58.5 and 63.5 feet and the flood stage at 67.5 feet NAVD 88 (NOAA VERTCON). According to the Federal Emergency Management (FEMA) flood insurance maps, the base 100 year flood elevation at the Site is 75 feet NAVD88 (FEMA 2008).

## 2.3 General Geology and Hydrogeology

The Site is underlain by fine-grained alluvium consisting primarily of silt, sandy silt and silty sand, with occasional layers of sand and gravel. Bedrock occurs below the alluvium and was encountered at depths of 17 to 20.5 feet below ground surface (bgs) in three borings drilled during the RI. Groundwater occurs at depths ranging between approximately 10 and 17 feet bgs (deeper when drilling on top of the ASB berm). Static water level elevations range between approximately 62 and 69 feet NAVD88. Comparison of the elevation of the base of the ASB to the groundwater elevations measured in onsite monitoring wells indicates that the water in the ASB is in hydraulic communication with the groundwater. However, as further discussed in Section 5, the extreme difference between the water table elevations for wetland surface/groundwater and the ASB indicates that the permeability of the base and sides of the ASB is very low, flux from the ASB to shallow groundwater is very low, and thus the ASB likely has little impact on the overall groundwater flow regime at the Site.

The overall direction of groundwater flow at the Site is generally southeast toward the Willamette River. The Site geology and hydrogeology are further detailed in Section 5.

## 2.4 Site History

The ASB was constructed to receive industrial wastewater and stormwater from the former Blue Heron paper mill (and its predecessors) in Oregon City. The ASB operated from 1972 until early 2011 when the mill shut down. The ASB received wastewater from the former Blue Heron mill through a 3-

mile pipeline that passes under the Willamette River, continues aboveground, and then extends underground onto the subject property from the eastern side of the Site.

Wastewater from the mill's primary treatment clarifier, bleach plant, chemical recovery area, cooling water, and storm water was pumped to the ASB for further treatment. This treatment included settling of solids and use of microorganisms in the ASB to further break down the organic matter in the wastewater. The treated water was then discharged through an outfall to the river via a multi-port diffuser located at River Mile 27.8 (Outfall 001) under an NPDES (National Pollutant Discharge Elimination System) permit, leaving an accumulation of sludge in the ASB.

Currently, stormwater and certain wastewater are still being discharged to the ASB under a Use & Environmental Indemnity Agreement with CCSD dated July 18, 2012. Under the terms of the agreement NRI Global, Inc. (NRI) may discharge "treated Compliant Wastewater meeting all effluent limits and other requirements of the Permit." Discharges of bulk chemicals such as oil, coolant, organic solvents, transformer oil, or fuel are specifically prohibited, other than as may be present in incidental concentrations in the discharge water. NRI is responsible for monitoring and reporting of its effluent discharges. All discharges from the mill are to cease by the end of August 2013, unless a new agreement is drawn up between NRI and WES that extends this date.

Based on historical research conducted during CDM Smith's Phase I ESA, it appears that, with one exception, waste sulfite liquor (a historical waste by-product of one of the chemical pulping processes) was not discharged directly to the property or the ASB. The sulfite-based pulping process can be of concern because it typically included the use of chlorine to bleach and/or break down lignin in the pulp and is associated with the production of dioxins/furans. The one exception was a one-time, failed experiment in 1951 whereby 47,700 gallons of waste sulfite liquor was deposited into an asphalt-lined 50x50 foot waste pond constructed on the Site within the approximate area of the current ASB boat house (see **Figure 2**). All of the liquor leached into the ground from this experimental waste pond over an 18-day period. This is the only known industrial use of the Site by the paper mill prior to 1972.

In addition to the sulfite pulping process, facility representatives have reported that chlorine was likely used to bleach pulp during the period that magnesium sulfite processing was being employed, which occurred between 1965 and 1983. The use of elemental chlorine to bleach pulp is also associated with the generation of dioxins/furans. Thus, the wastewater discharging to the ASB between 1972 and 1983 may have contained dioxins/furans.

Paper recycling also was historically conducted at the mill. De-inking sludges may contain low concentrations of heavy metals. In addition, polychlorinated biphenyls (PCBs) were used in coatings on the back of carbonless paper and could have been a source of PCBs in the waste stream.

The sludge in the ASB has been dredged four times over the years between 1978 and 1999, although dredging was never conducted to such a degree that all of the sludge was removed. The average amount of sludge left at the base of the ASB after each dredging event ranged from 4 to 9.3 feet. Based on measurements completed by Blue Heron in 2010, current sludge thickness in the ASB ranges from approximately 1.3 to 16.2 feet. To date, the wastewater/stormwater discharges to the ASB have been consistent enough, even following the mill shut down, such that the water surface has never dropped low enough to expose the surface of the sludge and allow for drying to occur.

## 2.5 Previous Site Investigations

The Site, whether in conjunction with the paper mill or by itself, has been the subject of several environmental investigations over the years, including the following:

- In 2008 Ecology & Environment, Inc. (E&E) completed a Site Inspection (SI) for the entire Blue Heron Paper Company facility on behalf of the EPA, which included limited sampling on the Site (E&E 2008).
- In April 2008 Maul Foster & Alongi, Inc. (MFA) completed a Phase I and II ESA for the Site (MFA 2008).
- Sampling and analysis of the ASB sludge was sampled and analyzed on several occasions in order to gain approval of land application of the sludge prior to dredging.
- Discharge water from the ASB was sampled to comply with the NPDES permit.
- In 2011 Bridgewater Group Inc. conducted an investigation of PCBs in soil (Bridgewater Group 2011).
- CDM Smith completed Phase I and Phase II ESAs for the Site in 2012 (CDM Smith 2012a and 2012b).

CDM Smith's Phase I ESA included a review and evaluation of the earlier E&E, MFA, and Bridgewater Group reports and the historical ASB sludge and discharge water data. While NPDES information and existing river sediment data were reviewed, it is the understanding that WES will not be held responsible for potential environmental concerns, if any, as a result of discharges to the river, including river sediment quality. Thus, the Phase I ESA focused on the potential for soil and groundwater contamination, as well as potential contaminants within the sludge. The following potential contamination sources were identified:

- A 1951 experiment (before construction of the ASB) resulted in a release of waste sulfite liquor to the subsurface, which represented a potential source of subsurface contamination, particularly by organochlorides and dioxins/furans (**Figure 2**).
- The historical chlorine-based processes used at the paper mill represented a potential source of organochlorides and dioxins/furans in the ASB sludge.
- Historical paper recycling activities at the paper plant represented a potential source of heavy metals and PCBs in the ASB sludge.
- Elevated metal concentrations in groundwater (in particular, arsenic, cadmium, chromium, and lead) were suspected based on prior sampling by MFA; however, the concentrations were suspected to be biased high due the probability that analyses were conducted on highly turbid samples.
- Stained soils present in the landscape equipment shed represented a source of petroleum hydrocarbon contamination.

- Petroleum products or other hazardous substances may have been discharged to the floor drain in the maintenance shop and if so, represented a potential a source of subsurface contamination.

CDM Smith's Phase II ESA evaluated the potential contamination sources identified during the Phase I ESA. The following sections provide a brief summary of the scope and findings of the Phase II ESA by media. The information relevant to completion of the RI is provided in further detail in later sections of this report. The Phase II ESA exploration locations are shown on **Figure 3**.

### 2.5.1 Soil

The possible presence of PCB contamination associated with a reported spill of transformer oil at a transformer located behind the motor control room in 1988 was investigated by the Bridgewater Group, Inc. in 2001, but no PCBs were detected. This sampling effort was not repeated during CDM Smith's Phase II ESA.

CDM Smith's Phase II ESA included sampling and analysis of subsurface soils to evaluate the following:

- 1) The area of the experimental asphalt-lined sulfite liquor waste impoundment to evaluate the potential presence of dioxins/furans.
- 2) The landscape equipment shed to evaluate petroleum impacts from apparent surface spillage.
- 3) The maintenance shop area subsurface to evaluate the potential impacts of discharges to the floor drain or surficial spillage as may have occurred in the area.

Field screening of soils collected from borings found negligible evidence of volatile organic compounds (VOCs), discoloration, sheen, odor or other evidence of soil contamination. Following is a summary of analytical findings from the soil sampling effort.

**Petroleum Hydrocarbons and VOCs:** Low concentrations of methylene chloride, acetone and benzene were detected in one soil sample collected at depth by the maintenance shop (**Figure 3**, boring B4). Methylene chloride and acetone are common laboratory contaminants and at the low concentrations reported, the detections in the sample may have been due to laboratory contamination. The concentration of benzene detected in the sample at 1.6 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) is less than the ODEQ's residential and occupational direct contact risk-based screening levels (RBCs) and the leaching to groundwater RBC.

**Dioxins/Furans:** Dioxin/furan concentrations in the two soil samples collected from within the area of the experimental sulfite liquor waste impoundment (**Figure 3**, boring B1) were below any of ODEQs RBCs by one to two orders of magnitude.

Based on the apparent lack of contamination, no further subsurface soil sampling was conducted during the RI.

### 2.5.2 ASB Sludge

During the Phase II ESA, the sludge in the ASB was sampled by collecting cores of the material at eight locations as shown on **Figure 3**. The core locations were selected to provide spatial representation across the entire ASB, as well as targeting of areas where the sludge was thickest, with the assumption that the oldest, and therefore likely most contaminated sludge, resides in areas where the sludge is deepest. Sludge thicknesses ranged from approximately 5 to 11 feet. Four-foot-long sample cores



were collected from the intervals of 0-4 feet (as measured from the base of the ASB upward) and from 4-8 feet (ft). The top few feet of the sludge layer was generally too fluid to successfully capture. Sometimes the 4-8 ft interval was a little less than 8 ft. If more than 8 ft of sludge was captured it was discarded. The material from each four-foot core was homogenized, sampled and submitted for analysis. In some instances, multiple four-foot cores from the same depth interval were composited. The exception was that of samples collected for petroleum hydrocarbon analyses, which were discrete samples collected before homogenization. Following is a summary of findings from the sludge sampling effort during the Phase II ESA.

**Total Petroleum Hydrocarbons:** Petroleum hydrocarbons were not identified as a potential contaminant of concern during the Phase I ESA. However, during sludge sampling and processing, a hydrocarbon-like odor was noted in the samples and it was determined that these analyses should also be included. Results of this testing confirmed that total petroleum hydrocarbons, particularly diesel (DRO) and oil range (ORO) are prevalent throughout the ASB sludge. Concentrations of DRO ranged as high as 18,000 mg/kg and ORO concentrations ranged as high as 32,000 mg/kg.

The source of petroleum hydrocarbons in the ASB sludge has not been determined. However, review of the coagulants, flocculants, and defoamer used in the primary clarifier at the Oregon City mill plant indicates these products contain 20 to 30 percent aliphatic hydrocarbons and one product may contain mineral spirits.

**PCBs:** The PCB Aroclors 1248 and 1254 were detected in all of the sludge samples. Although PCB concentrations were relatively low (less than 0.5 mg/kg) the concentrations of total PCBs in nine of the 11 samples exceeded the RBC for residential direct contact (0.20 mg/kg).

**Dioxins/Furans:** Dioxins were detected in each of the 11 samples analyzed. 2,3,7,8-TCDD is considered the most toxic of the congeners. Other dioxin congeners are given a toxicity rating from 0 to 1 with 2,3,7,8-TCDD being the most toxic. These toxicity ratings are called toxic equivalency factors (TEFs). The congeners are multiplied by their respective TEF values and summed to calculate a total dioxin toxic equivalence (TEQ). The TEQ concentrations ranged from 3.91 picograms per gram (pg/g) to 90.6 pg/g in the 11 samples analyzed.<sup>1</sup> When compared to ODEQ's RBCs, dioxin TEQ concentrations exceeded the residential direct contact RBC (4.4 pg/g) in 10 of the 11 samples.

**Metals:** Total metals were analyzed in four composite samples, each prepared from three to four core locations. The sludge metals data was comparable to historical sludge data. None of the metals concentrations exceeded the residential direct contact RBCs; however, copper and zinc concentrations exceed Oregon default background concentrations (ODEQ 2013).

### 2.5.3 Groundwater

CDM Smith's Phase II ESA included sampling and analysis of groundwater to evaluate the following:

- 1) Potential impacts of discharges from the floor drain inside the maintenance shop or surficial spillage that may have occurred in the maintenance shop area.

<sup>1</sup> The dioxin and TEQ values for the sludge samples presented this RI are different from those presented in the Phase II ESA. The dioxin values presented in this RI are based on the validated data. See Section 3.3.1 for additional discussion on the data validation.

- 2) Groundwater conditions upgradient and downgradient of the ASB to verify and characterize elevated metals concentrations in groundwater as indicated by MFA in 2008.

The Phase II ESA included extending five temporary push probes to collect groundwater samples (Figure 3, borings B1, B4, GW1, GW2, GW3). One sampling location was situated upgradient of the ASB and the remaining sample locations were situated along the top of the berm at the downgradient side of the ASB. Samples analyzed for metals were field filtered. Following is a summary of findings from the groundwater sampling effort during the Phase II ESA.

**Petroleum Hydrocarbons and VOCs:** Analytical results of the groundwater sample collected adjacent to the maintenance shop did not indicate impact by petroleum hydrocarbon compounds. Two VOCs, 2-butanone (aka, methyl ethyl ketone [MEK]) and 1,3-dichlorobenzene (1,3-DCB) were detected at relatively low concentrations of 6.1 and 0.2 micrograms per liter ( $\mu\text{g/L}$ ), respectively (Table 11). It is expected that these are true detections (as opposed to laboratory cross contamination) as the compounds are consistent with solvents that may have been used and discharged to the sink or floor drain and they are not common laboratory contaminants. There are no RBCs for MEK or 1,3-DCB; however, the concentrations of both of these compounds are not considered high enough to present a threat to human health or the environment. Based on the low VOC concentrations and apparent lack of a contamination source, no further analyses for VOCs in groundwater was conducted during the RI.

**Metals:** Cadmium, chromium, copper, lead, and mercury were not detected in any of the samples. Arsenic, manganese, nickel and zinc were detected in all groundwater samples analyzed. In all instances reported concentrations in the groundwater samples collected downgradient of the ASB were greater than the upgradient "Site background" sample.

Manganese concentrations in groundwater samples collected downgradient of the ASB appeared highly elevated as compared to background. Arsenic, nickel and zinc concentrations appeared to be slightly elevated downgradient of the ASB compared to background.

The fact that metals concentrations in groundwater, particularly manganese, tends to be greater at locations immediately downgradient of the ASB than upgradient of the ASB suggests that the ASB could be the source of elevated metals in groundwater. However, the ASB sludge does not contain manganese, arsenic, or nickel at concentrations greater than background soil concentrations. Zinc concentrations are somewhat elevated in the sludge as compared to background soil concentrations, but not exceedingly so. The absence of elevated metals concentrations in the sludge indicates that a change in ambient groundwater conditions in the vicinity of the ASB, such as pH or redox potential, may be causing an increase in the equilibrium concentration of some naturally occurring metals, most particularly manganese. The source and significance of elevated metals concentrations downgradient of the ASB was identified for further investigation during the RI.

#### 2.5.4 ASB Water

The ASB water was not sampled and analyzed during the Phase II ESA, but monitoring reports required under the NPDES permit were reviewed. Monitoring was conducted for a variety of parameters, including flow, biological oxygen demand (BOD), total suspended solids (TSS), pH, temperature, whole effluent toxicity, mercury, methylmercury, cadmium, copper, lead, and zinc. Historical ODEQ records indicate that BOD and TSS limits were exceeded in the past (1970s and 1980s) due to excessive accumulations of sludge. Discharge monitoring reports from 2001 to 2005 found that the facility met effluent limits with one exception in February 2003 when the monthly

average turbidity limit was violated. The September 2010 NPDES renewal application indicates the facility was meeting all permit requirements at that time.

With the mill shut down, the current discharges to the ASB are strictly limited by the agreement between WES and NRI. NRI is responsible for monitoring these discharges until the complete cessation of discharges in August 2013. Considering that the mill is no longer discharging industrial waste water, the contaminant loading of future discharges to the ASB are expected to be less than when the mill was in operation. While the conditions of the NPDES permit were and are expected to be met, applicable discharge limitations, as applied to the water in the ASB, may not be sufficiently protective of human health and the environment under a future land use scenario, should the ASB remain as it is currently.

### **2.5.5 Willamette River Sediment**

E&E conducted sediment sampling in the Willamette River as a part of the Blue Heron Site SI (E&E 2008). During the SI sediment samples collected up and down river from the ASB outfall. While a range of chemicals were detected at relatively low levels, there is no conclusive evidence that the ASB had contributed significant contamination to the Willamette River. Because the Consent Order does not hold WES responsible for investigation of the Willamette River sediment, further investigation of the sediment is not covered in the RI.

### **2.5.6 Potential Environmental Concerns Not Previously Investigated**

The Phase I ESA noted that the ASB had overtopped in 1974 and 1990 (CDM Smith 2011a). Recent observations indicate that there may have been other smaller events of overtopping, as small bits of plastic and a Styrofoam type of material were observed along the top, southern side of the ASB berm, approximately 200 feet west of the boat house/sample shed. A significant release of contaminants associated with the ASB sludge from overtopping events is considered low, as the quantity of sediment contained in the ASB water would be low and much of it would have been carried with the water to the river. Nevertheless, the potential that overtopping may have left contaminant laden sediment on the ground surface warranted further evaluation during the RI.

## Section 3

# Supplemental Field Investigation

### 3.1 Objectives

The objectives of the supplemental field investigation necessary to complete the RI were developed to fill in datagaps left following the Phase II ESA. By media, the objectives of the supplemental field investigation were as follows:

#### Surface Soil:

- Evaluate the potential presence of COI in surface soil as a result of the ASB overtopping.

#### Groundwater:

- Determine whether groundwater is impacted by petroleum hydrocarbons, dioxins/furans or PCBs as a result of leaching from the sludge in the ASB.
- Evaluate the source and mechanisms for the presence of elevated metals in groundwater.
- Evaluate the transport and fate of metals in groundwater; specifically whether groundwater is transporting metals to the Willamette River and wetlands at concentrations that may present a threat to aquatic receptors.

#### Surface Water:

- Evaluate COI in the ASB surface water, and if present, whether the concentrations present a threat to ecological receptors.
- Evaluate the potential presence of ASB COI in wetland surface water.

### 3.2 Investigation Methodology

The field investigation was conducted between March 14 and April 29, 2013. The following sections present a summary of the methodology and general field observations for the field investigation. All work was performed in general adherence with the RI Work Plan (CDM Smith 2013); any differences between the actual work performed and the RI Work Plan are noted in the text.

#### 3.2.1 Surface Soil Sampling

Surficial soil sampling was conducted in areas considered most likely to have been impacted by sediment deposited from water overtopping the ASB. A total of three composite samples (CS-1 through CS-3) were collected from the general locations shown on **Figure 4**. One composite sample was collected along the top outside edge of the ASB berm (CS-1), adjacent to the location where particles of plastic and Styrofoam, apparently deposited from water overflowing the top of the ASB, were observed. A second composite sample was collected between the Site gate and Volpp Street, further “downstream” along the apparent overflow path, utilizing two sample points on each side of the paved driveway into the Site (CS-2). A third composite sample, representing the furthest location along the overflow path, was collected between Volpp Street and the river (CS-3). The three composite soil samples were collected in accordance with procedures described in the RI Work Plan, and

analyzed for DRO and ORO by Northwest Method NWTPH-Dx, for dioxins/furans by EPA Method 1613B, and for PCBs by EPA Method 8082.

#### Deviation from the RI Work Plan:

- The RI Work Plan stated that the soil samples would be 3-point composite samples. For sample CS-2, a total of four samples were composited to allow for equal characterization of both sides of the Site driveway.

### 3.2.2 Well Installation and Development

Five monitoring wells (BH-1 through BH-5) were installed on March 14<sup>th</sup> and 15<sup>th</sup>, 2013 at the locations shown on **Figure 4**. One well was installed upgradient of the ASB (BH-1), on the west side of 4<sup>th</sup> Street to provide background water quality data. Two wells were installed at the downgradient base of the ASB berm near the southeast and southwest corners of the ASB (BH-2 and BH-3, respectively). A fourth well was installed at the top of the berm near the boat house (BH-4). The purpose of wells BH-2, BH-3, and BH-4 was to assess whether groundwater has been impacted by the contaminants identified in the ASB sludge. BH-4 was also situated in the area of the former sulfite waste liquor pond. The fifth monitoring well (BH-5) was installed on the south side of Volpp Street, across from BH-4, to assess the potential migration of contaminants associated with the ASB, if any.

The well construction details, including total depth and screened interval, are shown on **Table 1**, and boring logs are included in **Appendix B**. BH-1, BH-4, and BH-5 were advanced to depths ranging between 17 and 27 ft bgs when refusal occurred and weathered basalt was encountered. BH-2 and BH-3 were advanced to 20 feet bgs – weathered basalt was not encountered. The soils encountered in all the boreholes were generally fine-grained, ranging from silt to silty fine sand. Groundwater was first encountered at depths ranging between approximately 10.5 and 23 feet bgs. The stabilized water levels were approximately 2 to 7.5 feet higher than the apparent first encountered groundwater, except at BH-3.

Well development occurred between March 18 and 22, 2013. Wells were developed by purging (pumping water from the well) and surging (moving a cylindrical block of slightly smaller diameter than the well screen up and down within the screened interval of the well). General water quality parameters temperature, turbidity, and specific conductance were measured during development with depth-to-water and the volume purged from the well. Flow rates during development of wells BH-2 and BH-4 were relatively high (about 15 gallons purged per hour), and the turbidity in those wells improved quickly. The well development was considered completed when turbidity was not noticeably improving. In contrast, wells BH-1, BH-3, and BH-5 quickly dewatered; consequently, it was necessary to develop them over the course of multiple days. While the water level at BH-1 recovered in a matter of hours, BH-3 and BH-5 required 24 hours to recover after each purge. Development for each of these wells was considered completed after purging dry 2 to 3 times.

#### Deviations from the RI Work Plan:

- The RI Work Plan specified that borings would be advanced using hollow-stem auger drilling methods, and that soil would be sampled at 2.5-foot intervals using a split-barrel sampler. Instead, the monitoring well borings were advanced and soil was sampled continuously using direct-push methods.

- Well locations were modified slightly from the RI Work Plan because of drilling rig access limitations and to avoid utility lines. The planned locations and the final surveyed locations are shown on **Figure 4**.
- The top of the screened interval was below the static water level at BH-1 and BH-2 because the static water level more than 6 feet above the estimated depth of first encountered groundwater.

### 3.2.3 Groundwater Sampling

Groundwater samples were collected using a peristaltic pump and following low-flow procedures (EPA 1996). Field measurements of temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected during purging, as specified in Section 6 of the RI Work Plan. Ideal low-flow sampling conditions were met at wells BH-3, BH-2, and BH-4; however, steady flow could not be sustained at BH-1 and BH-5. BH-1 and BH-5 were purged at the lowest rate possible with the peristaltic pump and purged dry before field parameters stabilized. The wells were allowed to recover for 24 hours before collecting the samples. When BH-1 and BH-5 were sampled after the 24 hour recovery, field parameters were recorded immediately after purging the sample tubing, followed by sample collection. Stabilized field measured parameters are presented in **Table 2**.

Groundwater samples collected from each of the five monitoring wells were analyzed for metals and select geochemical parameters. In addition, samples collected from BH-2, BH-3, and BH-4 were analyzed for petroleum hydrocarbons, dioxins/furans, and PCBs, to evaluate the ASB-to-groundwater pathway for these contaminants of concern. The groundwater analytical schedule is provided in **Table 3**.

#### Deviations from the RI Work Plan:

- Sampling methods were modified at BH-1 and BH-5, as described above due to the low yield at these wells.

### 3.2.4 Surface Water Sampling

One surface water sample was collected from the ASB and three surface water samples from the wetland at the approximate locations shown on **Figure 4**. The surface water samples were collected from the water's edge using a precleaned single-use polyethylene dipper with a 46-inch extension handle. Field parameters were measured once before sampling. Surface water field measured parameters are provided in **Table 2**.

The surface water sample collected from the ASB was analyzed for petroleum hydrocarbons, dioxins/furans, PCBs, metals, and selected geochemical parameters. Surface water samples collected from the wetland were analyzed for metals for use in evaluating background concentrations and potential impact from the ASB. The wetland sample collected adjacent to the ASB also was analyzed for petroleum hydrocarbons, PCBs, and dioxins/furans to evaluate the ASB-to-wetland pathway of these contaminants of concern. The surface water analytical schedule is provided in **Table 3**.

#### Deviations from the RI Work Plan:

- None.

### 3.2.5 Water Level Monitoring

Groundwater levels were measured manually at monitoring wells using an electronic water level indicator. To obtain surface water level measurements, 6-foot staff gauges were installed in the wetland and in the ASB to assess stage level changes. The surface water staff gauge locations are shown in **Figure 5**. Select locations, including wells BH-1, BH-4, and BH-5, and the wetland staff gauge, were monitored continuously between March 27 and April 26, 2013 using datalogging pressure transducers. A barometric pressure logger was installed at the Site to correct the water level data for barometric changes. The water level in the ASB was recorded four times per week over the same time period. Manually measured water levels are provided in **Table 4** (groundwater) and **Table 5** (surface water).

Compass Engineering surveyed the monitoring wells and staff gauges using NAVD88 Oregon real-time GPS network (Geoid 03) as the benchmark. At each monitoring well, the horizontal, ground surface and casing elevations were surveyed. The location and the top (6-foot mark) of each staff gauge were surveyed. Finally, the locations and ground surface elevations at two additional reference points (the top of the berm near BH-2 and BH-3) were surveyed. The survey data are summarized in **Table 1**.

#### Deviations from the RI Work Plan:

- None.

### 3.2.6 Other Data Sources

Willamette River stage data and precipitation data from a nearby station were obtained for comparison to Site water levels and to interpret groundwater and surface water level changes. Willamette River stage data were obtained online from the nearest United States Geological Survey (USGS) gauging station, approximately one mile from the Site: *14207740 Willamette River above Falls, at Oregon City, OR* (USGS 2013a). Precipitation data were obtained online from the nearest USGS precipitation station, approximately seven miles from the Site: *452359122454500 Durham Wastewater Treatment Plant at Durham, OR* (USGS 2013b). Although precipitation may vary over the seven-mile distance between the precipitation station and the Site, the data are expected to be reasonably representative of storm intensity, timing, and duration at the Site.

## 3.3 Field Measured Parameter Data

The stabilized field measured parameters for groundwater and surface water samples are summarized in **Table 2**.

Specific conductance (SC) in the groundwater samples ranged between 174 microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ) (BH-1) and 1,533  $\mu\text{S}/\text{cm}$  (BH-4). As will be seen in later sections, this is consistent with the groundwater analytical data, where solute concentrations were typically highest in BH-4 and lowest in upgradient well BH-1. SC was consistent in the wetland samples, ranging between 178 and 187  $\mu\text{S}/\text{cm}$ , and the SC in ASB-1 at 270  $\mu\text{S}/\text{cm}$  was only marginally higher than in the wetland samples.

Ferrous iron concentrations in BH-2 through BH-4, immediately downgradient of the ASB, ranged from 2 to greater than 3 milligrams per liter (mg/L). Ferrous iron concentrations at BH-1 and BH-5 (0.53 and 0.74 mg/L, respectively) were lower by at least an order of magnitude.

Dissolved oxygen (DO) concentrations at BH-2 through BH-4 were all less than 1 mg/L and oxidation reduction potential (ORP) ranged between -83.6 and 34.7 millivolts (mV). At upgradient well BH-1,