City of Portland

Sampling and Analysis Plan (Year 3) Basin-Scale Stormwater Outfalls Monitoring

City of Portland Outfalls Project

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ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

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Abbreviations and Acronyms

BEHP	bis-2(ethylhexyl) phthalates
City	City of Portland
DEQ	Oregon Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
GSI	GSI Water Solutions, Inc.
JSCS	Joint Source Control Strategy
MDL	method detection limit
MRL	method reporting limit
NFA	No Further Action
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
PHSS	Portland Harbor Superfund Site
PQL	practical quantitation limits
QA/QC	quality assurance/quality control
RAL	Remedial Action Level
SAP	Sampling and Analysis Plan
SCD	Source Control Decision
SCE	Source Control Evaluation
SMA	Sediment Management Area
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TSS	total suspended solids
UPDI	ultrapure deionized
WPCL	City of Portland Water Pollution Control Lab

SECTION 1: Introduction

This Sampling and Analysis Plan (SAP) outlines the approach for basin-scale stormwater monitoring for the City of Portland's (City's) Outfalls Project being conducted under the oversight of the Oregon Department of Environmental Quality (DEQ) Cleanup Program. The data collected will be used to confirm that the City's stormwater source control programs, in conjunction with the various state and federal programs, continue to be effective in achieving source control in the Portland Harbor Superfund Site (PHSS) Study Area through the collection of new basin-scale stormwater data from City outfalls.

1.1 Background

The City completed a stormwater source control evaluation of 39 outfalls into the PHSS, 35 of which remain active. This work was initiated in 2000 and was completed in 2021. DEQ issued a Conditional Source Control Decision (SCD) in April 2021 (DEQ, 2021). DEQ concluded that source control has been effectively achieved (or has been identified for control by upland parties) in the City's outfalls discharging to the PHSS. The SCD also requires confirmation monitoring from up to five outfalls per year for 5 consecutive years following the SCD. The first year of sampling was conducted in the 2021 to 2022 rainy season, during which outfalls OF11, OF22B, OF47, OF50, and OFS-6 were sampled. The second year of sampling was conducted in the 2022 to 2023 rainy season, during which outfalls OF16, OF17, OF52, OF52A and OF53 were sampled.

The results of the first-year outfall monitoring are summarized in the *Basin-Scale Source Control Effectiveness Monitoring Report (2021-2022)*, dated June 12, 2023 (GSI, 2023c). The draft *Basin-Scale Source Control Effectiveness Monitoring Report (2022-2023)* was delivered to DEQ on December 21, 2023 (GSI, 2023d).

This SAP presents the approach and methods proposed to conduct the 2023 to 2024 effectiveness monitoring program. The approach and methods are based on previous SAPs approved by DEQ for the City Outfalls Project, including the SAP provided in the Source Control Measure Effectiveness Demonstration technical memorandum submitted to DEQ in 2015 (City of Portland, 2015).

1.2 Monitoring Objectives and Scope

The objective as stated in the Scope of Work (City of Portland Agreement No. 30006994; DEQ Agreement No. R002-20; dated April 16, 2021) is to "satisfy the condition on the source control decision for the City Outfalls Project in the PHSS, by verifying that the City's programs, in conjunction with the various state and federal programs, continue to be effective toward achieving source control through collection of new basin-scale stormwater data for City outfalls." To demonstrate the effectiveness of the various regulatory controls, sampling will be prioritized in basins where the majority of source control actions at sites contributing stormwater discharge to City outfalls have been completed, including those under DEQ's Cleanup Program. The primary purpose of this SAP is to collect additional representative basin-scale stormwater data from stormwater drainage basins (or outfalls), which will be evaluated in conjunction with existing information and data. Basins discharging to the PHSS sediment management areas (SMAs) are prioritized for selection. Basins are also selected nearby other basins of interest to allow sample teams to move from one basin to the next during a storm event.

Stormwater from up to five outfalls per year will be sampled beginning in 2021 and continuing through the 2025 rainy season (up to 25 outfalls will be monitored in total over the 5-year life of the project). The goal is to sample each outfall four times in the sampling year (i.e., rainy season). Outfall basins and respective monitoring locations will be chosen each year following the evaluation of the previous year's data and any

other new information or available data for the PHSS that may be helpful for decision-making for this monitoring effort. Outfalls for sampling were chosen collaboratively with DEQ.

The analytical suite (discussed in Section 4) includes polychlorinated biphenyl (PCB) congeners, polycyclic aromatic hydrocarbons (PAHs), phthalates, total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), bis(2-ethylhexyl)phthalates (BEHP), total suspended solids (TSS), and dioxin/furans where deemed necessary. The decision to analyze stormwater for dioxin/furans was determined by reviewing potential sources within each basin and sediment data collected near the outfall of each basin as described in Section 4.

An evaluation of basin-scale stormwater data collected under this SAP will be conducted to demonstrate that the collective site and basin source controls (implemented under City and state stormwater quality programs and state and federal cleanup programs) continue to be effective in minimizing the potential for recontamination of the eventual in-water sediment remedy.

SECTION 2: **Monitoring Locations – Year 3 (2023–2024)**

The PHSS hydroboundary for stormwater drainage is shown in Figure 1 and includes the stormwater basins selected for the third year of monitoring (2023 to 2024 rainy season). These stormwater basins were selected in consultation with DEQ and include OF43, OF44, OF45, OF48, and OF49. These basins were selected because they are subject to source control programs and measures that are complete or substantially complete, they drain to (or near) PHSS SMAs, they represent a variety of land uses throughout the PHSS, and they have historically been sampled.

Table 1 lists the selected Year 3 basin sampling locations, and the rationale for each monitoring location. Additional characteristics (including source control status, land use, and size of each basin) are summarized in the City of Portland Outfall Basin Completion Summaries (City of Portland, 2014) and the Source Control Measures Effectiveness Demonstration technical memorandum (City of Portland, 2015), as well as in Table 2 of the DEQ Conditional Source Control Decision (DEQ, 2021). Sampling locations and basins are displayed in Figures 2 through 6.

Stormwater samples will be collected from manholes rather than the end of the outfall. Many outfalls are often at least partially submerged during the rainy season and therefore are not conducive to collecting representative samples. Manhole locations are available within each affiliated stormwater conveyance system that represent all, or the majority of, the basin drainage area. The selected sample manholes have been sampled by the City previously.

Table 1. Proposed Sampling Locations for Year 3 of Monitoring (2023–2024)

Basin	Sampling Location	Description

43	Manhole ANR758	▪ This outfall discharges within the RM11E Project Area.
		▪ Before 2011, Basin 43 consisted of 51 acres of mostly light industrial land. Stormwater from the eastern portion of the basin was diverted to the City's wastewater treatment plant in 2011. As a result, the current basin consists of about 14 acres of small manufacturing and commercial businesses, parking areas, railroad and light-rail corridors, and paved roads.
		▪ OF43 serves as a combine sewer overflow discharge. The proposed sampling location is upstream of the overflow connection.
		▪ Stormwater manhole ANR758 is located within the N. River Street right-of-way and is the last stormwater conveyance access point before entering the Cargill-TEMCO property and discharging to the Willamette River through OF43.
		▪ Sampling location ANR758 encompasses most of the basin except for a small portion of the Cargill-TEMPCO property.
		▪ Stormwater was sampled in 2008-2009 (pre-diversion) and 2012 (post-diversion).
		▪ Three ECSI sites are located in this basin:
		  ▪ Tucker Building: ECSI No. 3036 (Conditional No Further Action Determination [NFA])
		  ▪ Cargill-TEMCO Irving Grain Terminal: ECSI No. 5561 (SCD Issued)
		  ▪ BBS Albina: ECSI No. 6287 (SCE in progress; site redeveloped)
		▪ There is one active NPDES 1200-Z permit within the basin, held by Cargill-TEMCO.

Basin	Sampling Location	Description

44	Manhole ABC352	▪ This outfall discharges within the RM11E Project Area.
		▪ The outfall conveys stormwater from an approximately 16-acre drainage basin. Current land use in the basin is light industrial and includes an electrical power substation and paved roadways.
		▪ In 2002, the City completed installation of stormwater treatment in the storm line along N. Loring Street. The City installed a sedimentation basin (AMQ287) to remove sediment from approximately 5 acres of basin drainage area.
		▪ Manhole ABC352 conveys stormwater from the entire basin.
		▪ Stormwater samples were collected in 2008/2009 and 2016/2017.
		▪ There are five ECSI sites in or adjacent to Basin 44:
		  ▪ PacifiCorp Albina River Lots.: ECSI No. 5117 (SCD Issued)
		  ▪ Valvoline: ECSI No. 3215 (NFA)
		  ▪ Vermiculite NW, Inc.: ECSI No. 2761 (post-closure operation)
		  ▪ Glacier NW: ECSI No. 5449 (SCE in progress)
		  ▪ Ross Island Sand & Gravel: ECSI No. 5577 (SCE recommended)
		▪ There are no active NPDES 1200-Z permits within the basin.
		▪ There are two properties within the basin that hold 1200-Z No Exposure Certificates.
		  ▪ Northwest Biofuel LLC./Cloudburst Recycling
		  ▪ Steelab LLC

45	Manhole ABC319	▪ This outfall discharges within the RM11E Project Area. ▪ Outfall 45 discharges stormwater from an approximately 10-acre drainage basin. The basin is primarily zoned as heavy industrial with some light industrial zoning and adjacent rights-of-way. ▪ Manhole ABC319 conveys stormwater from the entire basin. ▪ Stormwater samples were collected from this manhole in 2008 and 2016/2017. ▪ There is one ECSI site in this basin, UPRR Albina Yard: ECSI No. 178. (SCE is progress). ▪ There is one active NPDES 1200-Z permit partially within the basin held by Oldcastle APG West, LLC – Central Premix Concrete Products Co.

Basin	Sampling Location	Description
48	Manhole AAJ670	▪ Outfall 48 discharges to U.S. Environmental Protection Agency's (EPA's) Fund Lead 3 Project Area. ▪ Basin 48 is approximately 7.5 acres and consists almost entirely of paved streets in a residential neighborhood. ▪ A stormwater treatment pond and swale were constructed in 1995. Readily available As-Built specifications for the treatment pond are included in Appendix A. ▪ Manhole AAJ670 conveys stormwater from the entire basin and is located after the stormwater pond/swale. ▪ Stormwater samples were collected from this manhole in 2007. ▪ No known or suspected contaminant sources to the Basin 48 stormwater conveyance system have been identified. ▪ No NPDES permitted properties are located within Basin 48.
49	Manhole AAG634	▪ Outfall 49 discharges within the Willamette Cove Project Area. ▪ The drainage basin for this outfall is approximately 33 acres in a predominantly residential area in the St. Johns district. Basin 49 also includes small areas of commercial, major transportation (Highway 30 Bypass), and open space land uses. ▪ A stormwater treatment pond and swale were constructed in 1995. Readily available As-Built specifications for the treatment pond are included in Appendix A. ▪ Manhole AAG669 conveys stormwater from the entire basin. ▪ Stormwater samples were collected from this manhole in 2007. ▪ No known or suspected contaminant sources to the Basin 49 stormwater conveyance system have been identified. ▪ No NPDES permitted properties are located within Basin 49.

Notes

City = City of Portland

DEQ = Oregon Department of Environmental Quality

ECSI = Environmental Cleanup Site Information

NFA = No Further Action

NPDES = National Pollutant Discharge Elimination System

PCB = polychlorinated biphenyl

RM = River Mile

RM11E = River Mile 11 East

SCD = Source Control Decision

SCE = Source Control Evaluation (

Manhole IDs and invert elevations were obtained from the Portland Maps Open Data "Collection System Lines" data set (accessed at http://gis-pdx.opendata.arcgis.com).

Inundation of the selected sampling locations may occur during periods of high river elevations. The invert elevations of each sampling manhole and percent likelihood that a sample manhole becomes inundated are

presented in Tables 2 and 3, respectively. It appears that there is a low probability of the selected sampling locations being inundated.

Table 2. Sampling Location Invert Elevations

Basin	Location	Invert Elevation (City of Portland Datum)
43	Manhole ANR758	19.8 feet
44	Manhole ABC352	17.1 feet
45	Manhole ABC319	12.4 feet
48	Manhole AAJ670	21.7 feet
49	Manhole AAG634	34.1 feet

Note

Manhole IDs and invert elevations were obtained from the Portland Maps Open Data "Collection System Lines" data set (accessed at http://gis-pdx.opendata.arcgis.com).

Table 3. Percentage of River Elevation Above Invert Elevation (Past 10 Years)

Basin	Invert Elevation (feet)	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
43	19.8	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
44	17.1	0.0	0.0	0.0	0.0	0.0	0.0	2.7	2.5	5.2	4.8	0.0	0.0
45	12.4	0.0	0.0	0.0	2.9	5.1	5.4	6.7	12.6	30.5	23.2	0.5	0.0
48	21.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note

Based on U.S. Geological Survey Morrison Bridge Gage Height Daily Means from 6/15/2013 to 6/15/2023, converted to City of Portland Datum (accessed at https://waterdata.usgs.gov/nwis/uv?14211720).

SECTION 3: **Sampling Approach and Schedule**

The sampling approach is intended to collect stormwater data sets in general accordance with the Joint Source Control Strategy (JSCS) (DEQ and EPA, 2005; DEQ, 2007). Sampling data will be compared to existing representative data sets to evaluate the significance of concentration trends. Health and safety guidelines will be followed during all sampling activities as presented in the plan provided in Appendix B.

Table 1 presents the 35 currently active City outfalls within the PHSS and summarizes the outfall effectiveness sample locations to date. Additional City outfall and basin source control information can be found in DEQ's SCD (DEQ, 2021).

Table 4. City of Portland Basin Sample Dates

Basin	Basin Sample Date
10A	Not sampled
11	2008-2010 and 2021-2022 (Year 1 Outfall Effectiveness)
13	Not sampled
14	Not sampled
15	2006-2007 (Sulzer)
16	2007-2008 (LWG), 2016, and 2022-2023 (Year 2 Outfall Effectiveness)
17	2015-2016 and 2022-2023 (Year 2 Outfall Effectiveness)
18	2007-2008 (LWG)
19	2007-2008 (LWG), 2009-10 & 2016
19A	2009-2010
22	2007-2008 (LWG), 2010-11 (Chevron)
22B	2007-2008 (LWG) and 2021-2022 (Year 1 Outfall Effectiveness)
22C	2007-2008 (LWG)
22D	2008
42	Not sampled
43	2008-2009, 2012, and proposed for Year 3 Outfall Effectiveness (2023-2024)
44	2016-2017 and proposed for Year 3 Outfall Effectiveness (2023-2024)
45	Proposed for Year 3 Outfall Effectiveness (2023-2024)
47	2008 and 2021-2022 (Year 1 Outfall Effectiveness)
48	2007 and proposed for Year 3 Outfall Effectiveness (2023-2024)
49	2007, 2007-2008 (LWG), and proposed for Year 3 Outfall Effectiveness (2023-2024)
50	2007 and 2021-2022 (Year 1 Outfall Effectiveness)
52	2007 and 2022-2023 (Year 2 Outfall Effectiveness)
52A	2007 and 2022-2023 (Year 2 Outfall Effectiveness)
52C	2005 (Port) and 2007-2008
52D	2012-2014 (SSI) and 2016
53	2007-2008 and 2022-2023 (Year 2 Outfall Effectiveness)

Basin	Basin Sample Date
53A	2008, 2010, 2012, and 2016-2017
M1	2007 and 2007-2008 (LWG)
M2	2008, 2007-2008 (LWG), and 2016-17
M3	2007
S1	2007 and 2011
S2	2007
S5	2007
S6	2007 and 2021-2022 (Year 1 Outfall Effectiveness)

Notes:

All sampling conducted by the City of Portland, unless by others as indicated in parentheses.

LWG = Lower Willamette Group

Previous stormwater data sets collected from City basins by the City, the Lower Willamette Group, and others include a mix of composite and grab samples. The JSCS (DEQ and EPA, 2005; DEQ, 2007) (and subsequent DEQ guidance) supports collection of four stormwater grab samples during the rainy season to evaluate stormwater quality.

The sampling team will attempt to collect stormwater grab samples from the designated basin-scale monitoring locations during qualifying storm events (Section 4). The JSCS establishes target storm criteria as follows:

- Antecedent dry period at least 24 hours
- Minimum anticipated rainfall >0.2 inches per event
- Expected duration of storm at least 3 hours

For the purpose of the City's basin-scale investigation, these criteria are used as general guidelines to determine if forecasted storms should be targeted. To the extent practicable, project personnel will adhere to sampling those storms. However, it is possible that a forecasted storm meets the target criteria and is sampled, only to have the actual storm not meet optimal criteria when the sampling event is completed. The storm criteria will be used as a general guidance to determine when forecasted storms should be targeted for project sampling. Following the best professional judgement of the sample team and upon consultation with DEQ, storm events and associated samples that do not qualify for all three JSCS criteria may still be accepted to meet seasonal quotas. For instance, while a 24-hour antecedent dry period is the target, in some cases, accepting storms with shorter antecedent dry periods may be necessary to achieve sampling quotas; per previous SAPs approved by DEQ, an antecedent dry period greater than 6 hours may be considered acceptable.

Sampling events will generally target the first 3 hours of observed runoff to capture first-flush conditions representative of contributions from the entire basin rather than only portions closest to the monitoring locations. OF48 and OF49 sample manholes are located after treatment ponds and as a result, there is no first flush conditions for these locations. At this time, the volume of stormwater or duration of storm needed to fill the treatment ponds is not known. The City sample team will observe the sampling locations for OF48 and 49 during each sampling event. If stormwater is observed to be following through the sampling location, a stormwater sample will be collected. However, due to the nature of the treatment ponds, it is possible that basins 48 and 49 will be sampled later in the season when the ground is more saturated, and separate from basins 43, 44, and 45.

The sample team will use a weather forecasting service to determine whether storm events may meet target criteria. Due to the number of basins being sampled, outfall characteristics, the travel distance between sampling locations, and the variability of rainfall within different parts of the PHSS Study Area, it is possible that all five basins will not be sampled during the same storm events but OF43, OF44, and OF45 will be prioritized since they do not contain treatment ponds.

To ensure that samples represent only basin stormwater, sample teams will check the river stage and make visual observations prior to sampling (such as noting reversed flow direction due to inundation) to ascertain whether observed water at the monitoring locations likely represents stormwater flow from the basin or river water. If confirmation cannot be made of storm flow conditions, samples will not be collected at that time without first consulting with DEQ.

SECTION 4: **Stormwater Grab Sampling Method**

Stormwater samples will be collected from stormwater manholes using grab sampling techniques. Samples will be collected as outlined below.

Sample Equipment. Manholes will not be entered to collect samples and will instead be collected using a stainless-steel bailer attached to a rope or string. Sample staff will decontaminate stainless-steel bailers at the City of Portland Water Pollution Control Lab (WPCL) before each sampling event. A sufficient number of stainless-steel bailers will be brought by the field staff for each sample location. Decontamination will not occur in the field. Laboratory-supplied sample containers will be provided to field staff with appropriate preservatives for each analysis.

Sample Collection. The bailer will be lowered into the stormwater stream with care taken to not scrape the bailer against the sides or bottom of the manhole to not pick up extra solids. When the bottom of the bailer encounters the stormwater stream, it will be carried downstream allowing the bailer to lay horizontally within the center portion of the stormwater flow. The top/open end of the bailer will enter the stormwater at the downstream end of the manhole. The bailer will be filled from the top of the bailer similar to a cup or beaker, rather than dipping the bailer vertically through the water column.

The bailer will be raised to the surface, the first volume of stormwater retrieved is used as a rinse of the bailer. Staff will swirl the collected stormwater to completely rinse the interior of the bailer and discard the sample in a location where it will not contaminate the next sample volume that is retrieved.

Once the second volume of stormwater sample is retrieved, sample bottles will be filled by pouring stormwater directly into laboratory-supplied sample bottles. Bottles will be filled to about ½ inch of the top to ensure that no preservative is lost and to allow water expansion without breaking the bottle if the sample is frozen. As soon as the sample is collected, the bottle will be capped and placed in a resealable bag. The samples will be placed in a cooler filled with ice. The sample will either be directly dropped off at the laboratory or will be shipped to the laboratory overnight.

Quality Assurance/Quality Control (QA/QC) Samples. QA/QC samples will include a field rinsate blank and a field duplicate grab sample for each event (total of four). Rinsate blanks will be collected from a decontaminated stainless-steel bailer. Because bailers are decontaminated at the WPCL during field event preparations, a rinsate blank is collected before a bailer is used for sample collection. The purpose of the field decontamination blank is to both confirm effectiveness of decontamination procedures (the decontamination of the bailer and the carboy) and quantify contamination from field sampling activities (contamination from gloves, rainwater, atmospheric deposition, runoff from rain gear, etc.). To ensure that the blank captures the contamination that may be introduced from field sampling activities, field staff will replicate the physical positioning and order of operations that the sampling team would use while collecting a sample. The general field decontamination blank sample procedures are as follows:

1. Prepare a clean, designated polycarbonate carboy with a spigot.
2. To fill the carboy, empty any ultrapure deionized (UPDI) water out of the carboy. Rinse the interior of the carboy three times with UPDI water by filling it approximately 1/10th full, capping it, shaking, uncapping it, and dumping the rinsate. Fill the carboy to the shoulder with ultrapure deionized water and close the lid tightly.
3. Bring the carboy to the sampling location.
4. Upon arriving at the sampling location, set out the carboy on the lid of a cooler near the manhole.
5. While wearing a clean pair of gloves, remove the bailer from its protective aluminum foil covering.

6. Open the spigot on the carboy and fill the bailer. Close the spigot on the carboy. The first sample retrieved is used as a rinse of the bailer. Swirl the sample to completely rinse the interior of the bailer and discard the sample in a location where it will not contaminate the next sample that is retrieved.
7. Again, open the spigot on the carboy and fill the bailer. Close the spigot on the carboy.
8. Fill the sample bottles.
9. Store filled sample bottles in a cooler with ice for transport to the laboratory.

Field Duplicate samples will be collected to quantify variability from field sampling practices, quantify variability from laboratory procedures, and quantify the precision of the sampling method in determining the quantity of an analyte in the media being sampled.

To collect a duplicate, field staff will follow the appropriate sampling procedures described above with the following variations.

1. When setting up bottles to be filled, lay two replicate bottle sets out side by side, organized by type of bottle.
2. Pour sample volume into like bottles (such as all 1 L ambers) so that the bottles are filled equally with each volume of sample retrieved (for samples that require multiple bails to collect sufficient volume). Take care to transfer the sample from the bailer to the bottle quickly to prevent settling of the sample. If the sample settles, swirl the sample prior to transfer to the bottle to ensure even mixing between like containers.

Sample Records. Field staff will prepare Stormwater Sample Logs and a Daily Field Report at the time of sampling. Stormwater Sample Logs will include the sample name, date, and exact place, method, and time of sampling. Additional sample information includes:

- Name of the sampler(s)
- Predicted storm conditions (antecedent dry period, anticipated rainfall, predicted duration, peak time)
- Time rainfall began
- Sample collection method (for example
- Number, types of samples collected
- Field measurement results (temperature, pH, specific conductivity)
- Field observations/conditions that may affect the sample results.

The Daily Field Report will describe the field team's observations and efforts to collect samples. The Daily Field Report will identify when the sample team arrived at each location (not only sample time), observations made upon arrival, and the decision to sample at that time or not. Entries in the Stormwater Sample Logs and Daily Field Reports will be made with ink. Any errors will be crossed out rather than whiting out or erasing.

Sample Names. Samples will be named for the Hansen identification numbers for the manholes where samples are collected. Field duplicate will be labelled as "DUP", and the field blank sample will be labelled as "FDB".

SECTION 5: **Analytical Approach**

The analytical suite will include PCB congeners, PAHs, phthalates (including BEHP), total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), and TSS. Dioxins/furans will not be analyzed for select outfalls, as described below. This analytical suite was chosen following the evaluation described in the SCD (DEQ, 2021), and following conversations with DEQ. This suite is also consistent with DEQ's JSCS (DEQ and EPA, 2005), as amended in 2007 (DEQ, 2007), and previous source control evaluation work conducted by the City and private parties. Measurements of pH, temperature, and conductivity will be made in the field.

The need to analyze dioxin/furan congeners was evaluated by reviewing potential contaminant sources within the basins and whether dioxins/furans were detected in sediment at concentrations greater than the PHSS Remedial Action Levels (RALs) (EPA, 2017 and 2022a) and practical quantitation limits (PQLs) (EPA, 2022b) near City outfall discharge locations. Based on the City's experience with sediment transport in the conveyance system and modeling conducted in the Swan Island Basin (Confluence Environmental Company et al., 2013), the majority of sediment is generally deposited within a 50-foot radius of the outfall. However, sediment samples may not be available within 50 feet of the outfalls. In these cases, dioxin/furan concentrations in the nearest samples were evaluated, as well as overall trends in the vicinity of the outfalls.

An evaluation of dioxins/furans for each of the five outfalls during the 2023 to 2024 rainy season is discussed below. 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD] and 1,2,3,7,8-pentachlorodibenzo-p-dioxin [PeCDD] were the only dioxin/furan congeners detected near outfalls at concentrations greater than RALs and PQLs, and therefore, are the only congeners included in the discussion. Figures C-1 through C-5 in Appendix C show available dioxin/furan surface sediment sample locations and PQL exceedances for surface sediment samples collected near each outfall.

Basins 43, 44, and 45 discharge to the PHSS River Mile 11 East (RM11E) Project Area. GSI Groundwater Solutions, Inc.'s (GSI's) *Phase I Evaluation of dioxin/furan data River Mile 11 East Phase I Remedial Design Sampling and Data Report* (GSI, 2021) and the subsequent technical memorandum *Review of Dioxin/Furan Sediment Data at the River Mile 11E Project Area Based on EPA's Practical Quantitation Limits* (GSI, 2023a) were reviewed to determine the extent of dioxin/furan RAL or PQL exceedances in the RM11E Project Area.

- **Basin 43 –** There are three ECSI sites in Basin 43, two of which have an NFA or SCD and one of which is in the process of having a SCD finalized. There are no known sources of dioxin/furans in Basin 43. Dioxins/furans were not detected above RALs or PQLs in the three surface sediment samples (RM11E_SL017, RM11E-C070, and RM11E-G066) collected within 100-feet downstream of OF43 (Figure B-1). TCDD and PeCDD exceeded their PQLs in surface sediment sample RM11E-G033, which was collected approximate 50 feet upstream of OF43. However, this appears as an isolated exceedance since dioxins/furans did not exceed RALs or PQLs in sample RM11E-C066 (collected approximately 100 feet upstream of OF43) and sample B408 (collected approximately 100 feet cross gradient of OF43). Existing data does not indicate Basin 43 is a source of dioxins/furans to the RM11E Project Area. Basin 43 will not be analyzed for dioxins/furans.
- **Basin 44 –** There are five ECSI sites in or adjacent to Basin 44, but there are no known sources of dioxin/furans in Basin 44. Additionally, OF44 is approximately 350 feet downriver from the nearest surface sediment PQL exceedance (sample RM11E_SL004). TCDD and PeCDD were not detected greater than PQLs in the four surface sediment samples (RM11E-C104, B398, RM11E-G008, and RM11E-G012) collected within a 100-foot radius of OF44 (Figure B-2). Existing data does not indicate Basin 44 is a source of dioxins/furans to the RM11E Project Area. Basin 44 will not be analyzed for dioxins/furans.

- **Basin 45 –** There is one ECSI site in Basin 45 with a SCE in progress and no known sources of dioxins/furans. OF45 is approximately 200 feet upriver from the nearest surface sediment PQL exceedance sample (sample B389). Dioxins/furans were not detected greater than RALs or PQLs in the two surface sediment samples (RM11E-C116-0-1 and RM11E-G075) collected within 100-foot radius of the outfall (Figure B-3). Existing data does not indicate Basin 45 is a source of dioxins/furans to the RM11E Project Area. Basin 45 will not be analyzed for dioxins/furans.
- **Basin 48 –** There are no ECSI sites in Basin 48. Basin 48 consists almost entirely of residential area streets with no known source of dioxin/furans. Additionally, stormwater is treated before discharge. Outfall 48 discharges to Fund Lead 3 Project Area adjacent to the University of Portland River Campus (i.e., Triangle Park) cleanup site and the McCormick & Baxter Superfund Site. Both of these sites are not included in Basin 48 and cleanup remedies for both sites have been implemented. The McCormick & Baxter site is a known historical source of dioxins/furans; however, the site's cleanup remedy was completed in 2005 isolating site contaminates. Stormwater from the McCormick and Baxter site is collected and mostly infiltrated through an onsite stormwater retention/infiltration pond with overflow discharged directly to the riparian area at the site and not through OF48. No sediment samples analyzed for dioxins/furans have been collected within 100 feet of the outfall (Figure B-4). Surface sediment sample WLCMBJ99D09937, was collected approximately 150 feet downriver from OF48 in 1999 prior to installing the McCormick & Baxter cap. This sample, while shown on Figure B-4, is part of the historic Portland Harbor dataset and not applicable to current conditions. The next nearest surface sediment sample is S144 collected over 300 feet downriver from OF48. PQL exceedances for both TCDD and PeCDD were identified in this sample. Due to the relative distance from the outfall, these exceedances are not considered a line of evidence to sample Basin 48 for dioxins/furans. OF48 discharges a residential area and the stormwater receives treatment through a treatment pond prior to discharge. Basin 48 will not be sampled for dioxins/furans.
- **Basin 49 –** There are no ECSI sites in Basin 49. Basin 49 consists entirely of residential area streets with no known source of dioxin/furans and stormwater is treated before discharge. Dioxins/furans were not detected above PQLs in three surface sediment samples (WC-007, WC-008, and LW2-G260) collected within a 100-foot radius of OF49 (Figure B-5). The closest surface sediment sample (WC-063) with a dioxin/furan exceedance is over 450 feet upstream of OF49. Existing data does not indicate Basin 49 is a source of dioxins/furans to the Willamette Cove Project Area. Basin 49 will not be analyzed for dioxins/furans.

Proposed methods and laboratory assignments are listed below, in primary order, to address the unlikely event that sample volume is limited. Target MRLs and MDLs for each analysis are summarized in Table 4 to allow comparison with existing data and DEQ screening levels. As DEQ is aware, readily available commercial laboratories commonly have MRL/MDLs that are greater than applicable screening levels for the following analytes: total PCBs, select PAHs, and total arsenic. Laboratories have been selected to achieve MRL/MDLs that will allow for a comparison, to the extent feasible, to existing data sets and DEQ screening tools, which is the primary purpose of this SAP.

Metals analyses will be initially run using standard MRL/MDLs using EPA Method 200.8. If the results of the initial analysis are not detected above the MDL, and the MDL is greater than the JSCS SLV, then the sample will be run using a low-level detection method (EPA 200.8-LL). Based on sampling from the first 2 years of this project, this second, low level analysis typically only applies to arsenic and cadmium. The low level MRL/MDLs for arsenic and cadmium are included in Table 4.

Table 4. Analytical Approach

Analyte Group	MRL	MDL	Method	Laboratory[1]
PCB Congeners	20.0 pg/L for individual congeners	1.21 – 4.98 pg/L for individual congeners	EPA 1668C	Vista
PAHs and Phthalates (including BEHP)	0.02 – 0.4 µg/L	0.01 – 0.2 µg/L	EPA 8270-SIM	Apex
Total Arsenic	1.0 µg/L 0.050 µg/L	0.5 µg/L 0.025 µg/L	EPA 200.8 EPA 200.8-LL	Apex
Total Cadmium	0.20 µg/L 0.040 µg/L	0.10 µg/L 0.020 µg/L	EPA 200.8 EPA 200.8-LL	Apex
Total Chromium	2.0 µg/L	1.0 µg/L	EPA 200.8	Apex
Total Copper	2.0 µg/L	1.0 µg/L	EPA 200.8	Apex
Total Lead	0.20 µg/L	0.10 µg/L	EPA 200.8	Apex
Total Mercury	0.080 µg/L	0.040 µg/L	EPA 200.8	Apex
Total Nickel	2.0 µg/L	1.0 µg/L	EPA 200.8	Apex
Total Silver	0.20 µg/L	0.10 µg/L	EPA 200.8	Apex
Total Zinc	4.0 µg/L	2.0 µg/L	EPA 200.8	Apex
TSS	5.0 mg/L	5.0 mg/L	SM 2450D	Apex

Notes

[1] Laboratory changes may be required but only laboratories certified by the Environmental Laboratory Accreditation Program will be utilized.

µg/L = micrograms per liter

Vista = Vista Analytical Laboratory (El Dorado Hills, Ca)

Apex = Apex Laboratories (Tigard, Oregon)

BEHP = bis-2(ethylhexyl) phthalates

EPA = U.S. Environmental Protection Agency

mg/L = milligrams per liter

MDL = method detection limit

MRL = method reporting limit

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

pg/L = pictograms per liter

SIM = selective ion monitoring

SM = Standard Method

TSS = total suspended solids

SECTION 6: **Reporting**

Draft and final reports will be prepared to present the data collected after each water year (i.e., a total of five data reports). Each data report will summarize data collection activities and analytical results and will evaluate data that meets field and laboratory quality control criteria, including target storm selection (when applicable), and adequate representation of basin stormwater discharge.

Data will be evaluated using lines of evidence approach consistent with that used in the *Basin-Scale Source Control Effectiveness Monitoring Report (2021-2022)* (GSI, 2023c) or as mutually agreed to by DEQ and the City (City of Portland, 2018). This approach includes comparing current data to previously collected data and to knee-of-the-curves established by DEQ's *Guidance for Evaluating the Stormwater Pathway at Upland Sites*, Appendix E: Tool for Evaluating Stormwater Data (DEQ, 2009).

Each annual report shall include recommendations for DEQ-led source tracing or additional source control work, if warranted by sampling results. Outfall selection for the subsequent year will be determined in tandem with the process of reporting results from the previous year to DEQ, and outfall sampling locations will be chosen collaboratively with DEQ. The fifth and final report will include a summary of the 5-year sampling effort.

SECTION 7: **References**

City of Portland. 2014. *Municipal Stormwater Source Control Report*, Appendix A: Closure Report for the City of Portland Outfalls Project, Outfall Basin Completion Summaries. Prepared by the City of Portland, Bureau of Environmental Services. January 2014.

City of Portland. 2015. Source Control Measures Effectiveness Demonstration Technical Memorandum. September 2015. Prepared by the City of Portland, Bureau of Environmental Services.

City of Portland. 2018. *Source Control Measure Effectiveness Monitoring and Assessment Report*. June 2018. Prepared by the City of Portland, Bureau of Environmental Services.

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DEQ. 2021. *Staff Report: Conditional Source Control Decision of Portland Outfalls Project in Portland Harbor*. Prepared by DEQ. April 2021.

EPA. 2017. *Record of Decision, Portland Harbor Superfund Site, Portland, Oregon.* U.S. Environmental Protection Agency, Region 10, Seattle WA. January 2017

EPA. 2022a. *Errata #3 for Portland Harbor Superfund Site Record of Decision, Table 6 and Table 21.* From: Hunter Young To: Portland Harbor site file. September 7, 2022.

EPA. 2022b. Evaluation of consistently and reliably attainable practical quantitation limits for 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD for use in Sediment Management Area delineation at the Portland Harbor Superfund Site. Prepared by U.S. Environmental Protection Agency Region 10. September 2022.

GSI. 2021. Final River Mile 11 East Phase I Remedial Design Sampling and Data Report. Prepared for the River Mile 11 East Group by GSI Water Solutions, Inc., and Dalton, Olmsted & Fuglevand, Inc. December 2021.

GSI. 2023a. *Review of Dioxin/Furan Sediment Data at the River Mile 11E Project Area Based on EPA's Practical Quantitation Limits*. Prepared by GSI. Prepared for EPA. January 15, 2023.

GSI. 2023b. *Willamette Cove In-Water Remedial Design Group, Remedial Design Work Plan, Willamette Cove Project Area*. Prepared by GSI. March 2023.

GSI. 2023c. *Basin-Scale Source Control Effectiveness Monitoring Report (2021-2022), City of Portland Outfalls Project*. Prepared by GSI. June 12, 2023.

GSI. 2023d. Draft *Basin-Scale Source Control Effectiveness Monitoring Report (2022-2023), City of Portland Outfalls Project*. Prepared by GSI. December 21, 2023.

Figures

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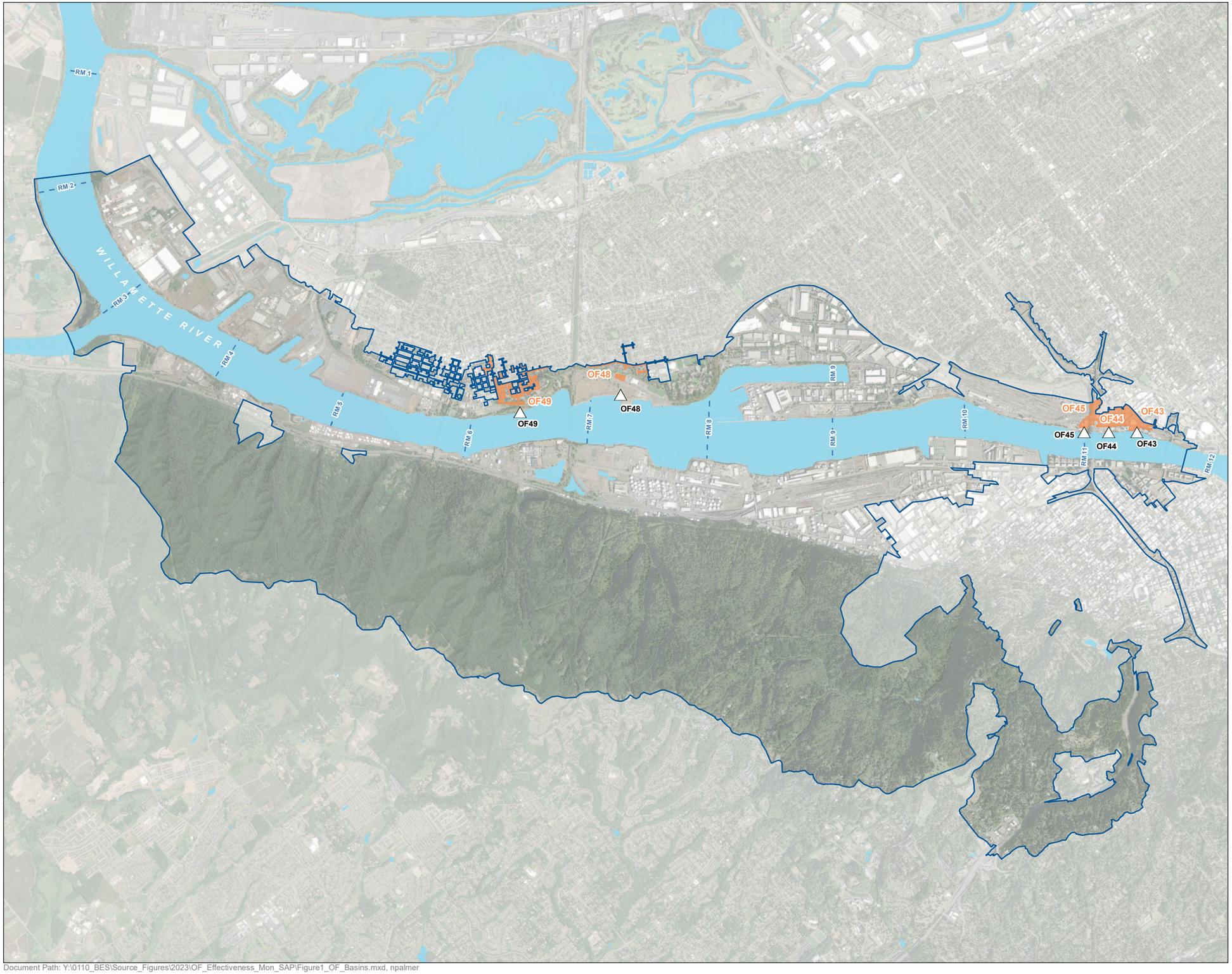
FIGURE 1

Basin Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring



LEGEND

- Outfall
- Outfall Basin
- Portland Harbor Hydroboundary
- River Mile
- Waterbody

N

0 2,000 4,000 6,000
Feet

Date: September 7, 2023
Data Sources: BLM, ESRI, ODOT, USGS, COP, Maxar Imagery (2023)

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure1_OF_Basins.mxd, npalmer

FIGURE 2

Basin 43 - Sample Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

- Sample Location
- Outfall Basin
- ECSI Site
- NPDES Stormwater Permit
- Outfall
- Non City Outfall
- Combined Sewer Overflow Mains
- Storm Gravity Mains
- Abandoned Mains

All Other Features

- Road
- River Mile
- Waterbody

N

0 85 170 255
Feet

Date: September 25, 2023
Data Sources: ESRI, USGS, BES, COP Imagery (Summer 2022)

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure2_OF43_Sample_Locs.mxd, npalmer

FIGURE 3

Basin 44 - Sample Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

NORTHWEST BIOFUEL LLC./CLOUDBURST RECYCLING

VERMICULITE NORTHWEST, INC. (FORMER)

STEELAB LLC

VALVOLINE

ALBINA GATEWAY

ROSS ISLAND SAND & GRAVEL - N RIVER ST.

PACIFICORP – ALBINA RIVERLOTS

ABC352

OF44

GLACIER NORTHWEST

GLACIER NORTHWEST INC

RIVER MILE 11E STUDY AREA - PORTLAND HARBOR

RM 11.2

LEGEND

- Sample Location
- Outfall Basin
- ECSI Site
- NPDES Stormwater Permit
- Outfall
- Non City Outfall
- Storm Gravity Mains
- Abandoned Mains

All Other Features

- Road
- River Mile
- Waterbody

N

0 60 120 180
Feet

Date: September 25, 2023
Data Sources: ESRI, USGS, BES, COP Imagery (Summer 2022)

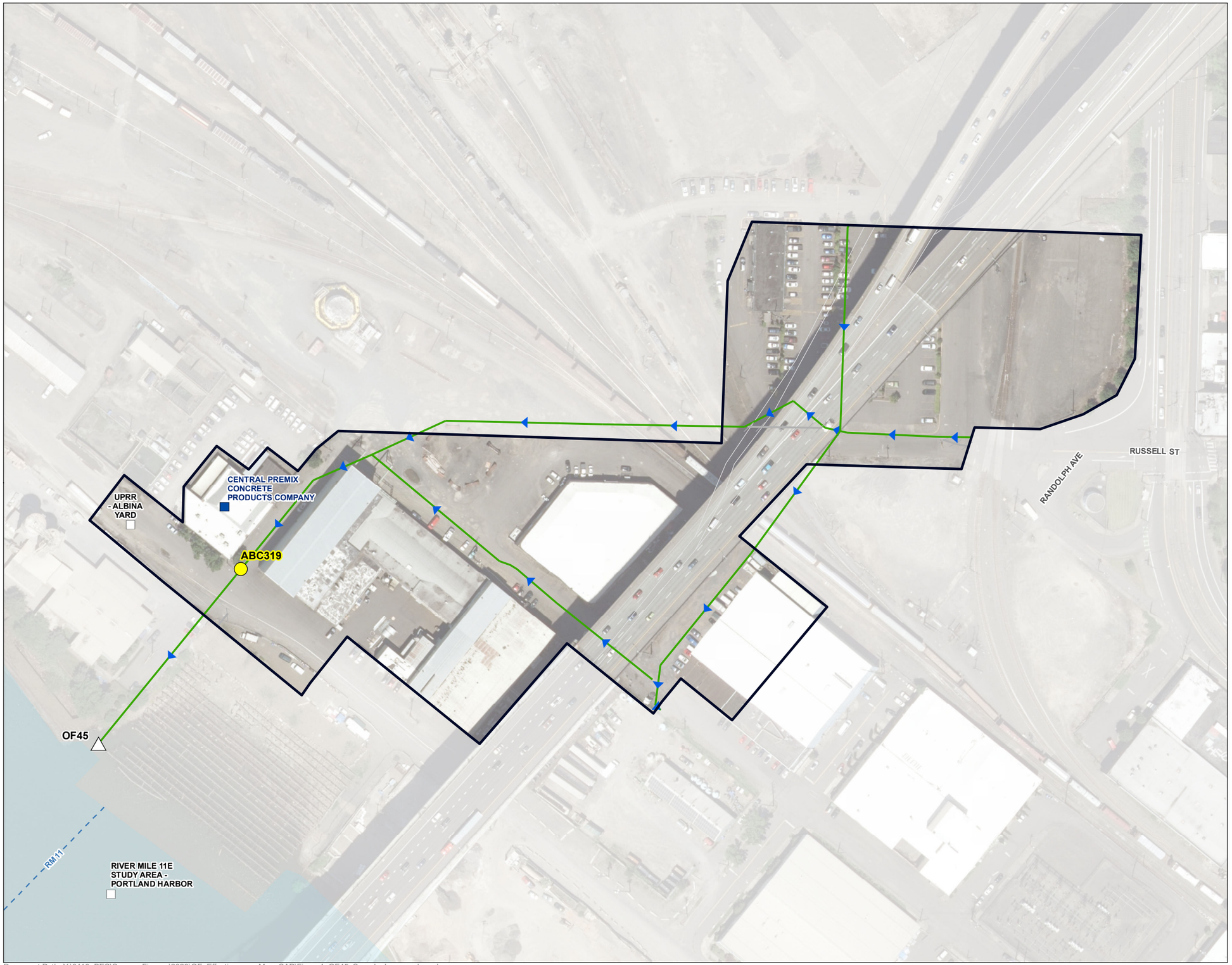
GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure3_OF44_Sample_Locs.mxd, npalmer

FIGURE 4

Basin 45 - Sample Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring



LEGEND

- Sample Location
- Outfall Basin
- ECSI Site
- NPDES Stormwater Permit
- Outfall
- Non City Outfall
- Storm Gravity Mains
- Abandoned Mains

All Other Features

- Road
- River Mile
- Waterbody

N

0 65 130 195
Feet

Date: September 25, 2023
Data Sources: ESRI, USGS, BES, COP Imagery (Summer 2022)

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure4_OF45_Sample_Locs.mxd, npalmer

FIGURE 5

Basin 48 - Sample Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

- Sample Location
- Outfall Basin
- Outfall
- Non City Outfall
- Unknown Type
- Storm Gravity Mains
- Abandoned Mains

All Other Features

- Road
- River Mile
- Waterbody

N

0 125 250 375
Feet

Date: January 24, 2024
Data Sources: ESRI, USGS, BES, COP Imagery (Summer 2022)

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure5_OF48_Sample_Locs.mxd, npalmer

FIGURE 6

Basin 49 - Sample Overview

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

- Sample Location
- Outfall Basin
- Outfall
- Non City Outfall
- Abandoned Mains
- Storm Gravity Mains

All Other Features

- Road
- River Mile
- Waterbody

N

0 150 300 450
Feet

Date: January 18, 2024
Data Sources: ESRI, USGS, BES,
COP Imagery (Summer 2022)

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\Figure6_OF49_Sample_Locs.mxd, iramos

APPENDIX A

Stormwater Pond As-Built Drawings

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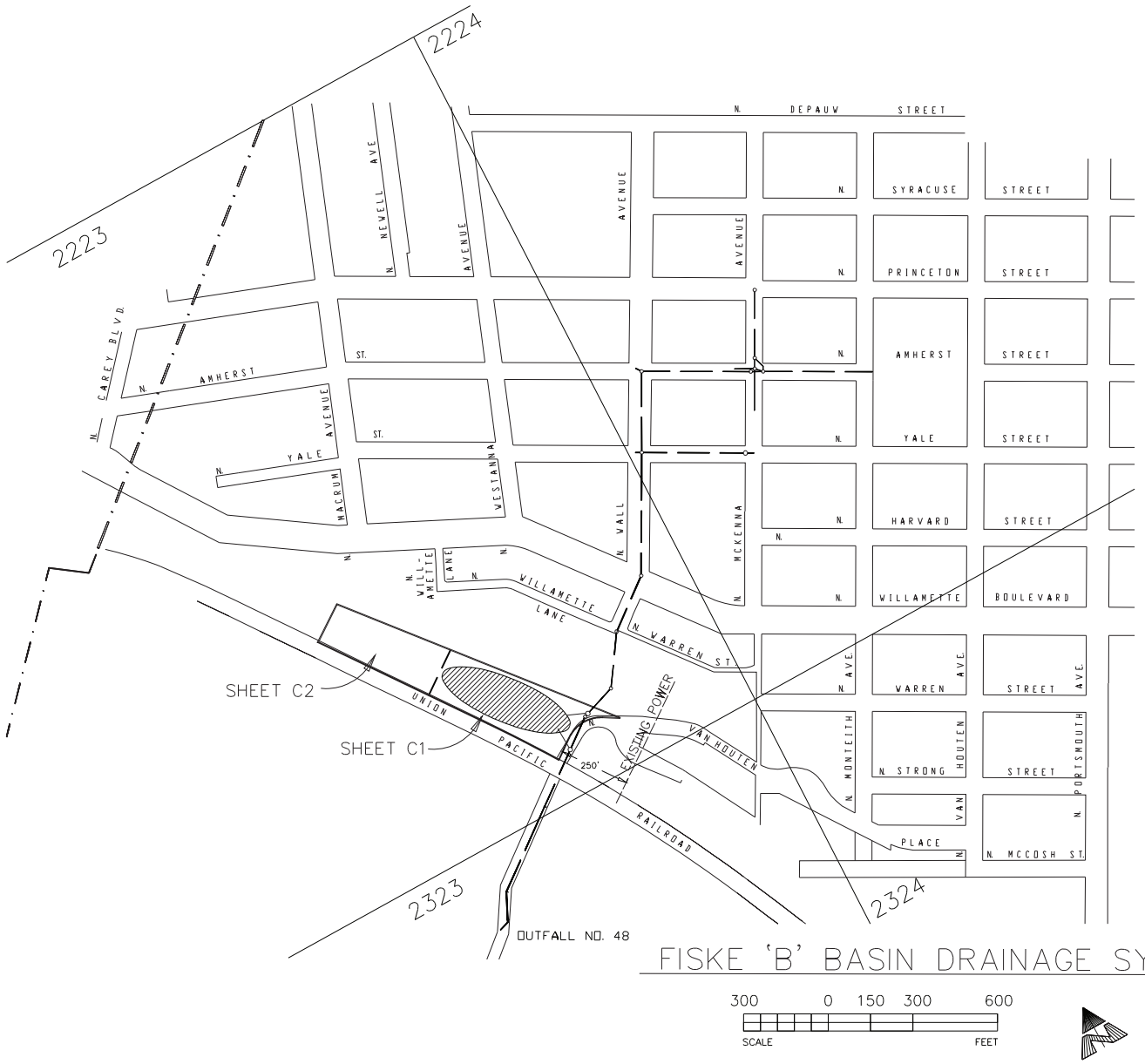
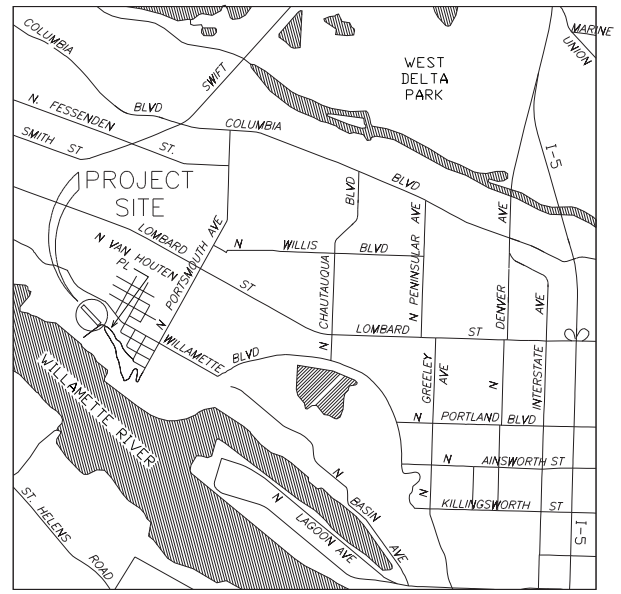
Basin 48 Stormwater Pond As-Built Drawings



FISKE 'B' BASIN DRAINAGE SYSTEM

300 0 150 300 600

SCALE FEET



VICINITY MAP

NTS

SHEET INDEX

NO.	NAME	DESCRIPTION
1	G1	COVER SHEET
2	C1	SITE PLAN
3	C2	GRADING PLAN (NORTH) & PIPE PROFILES
4	C3	CROSS SECTIONS
5	C4	INLET & OUTLET DETAILS
6	C5	DIVERSION MH DETAILS
7,8	L1,2	LANDSCAPE PLANS (NORTH & SOUTH)
9,10	L3,4	IRRIGATION LAYOUT (NORTH & SOUTH)
11	L5	IRRIGATION DETAILS

GENERAL NOTES:

1. EXISTING GRADES SHOWN ON PROFILES ARE TAKEN ALONG THE STREET CENTERLINE OR RIGHT-OF-WAY, ELEVATIONS PROVIDED BY THE CITY OF PORTLAND.
2. NEW ALIGNMENT DIMENSIONS ARE MEASURED FROM SURVEYED CENTERLINE PROVIDED BY THE CITY OF PORTLAND.
3. ALL UTILITIES SHOWN ON PLANS ARE APPROXIMATE LOCATIONS ONLY AND MUST BE VERIFIED IN FIELD PRIOR TO CONSTRUCTION.
4. WATER AND GAS SERVICE LATERALS ARE NOT SHOWN ON PLANS.
5. PGE POWERLINE LOCATED 250' SOUTHEAST OF PROJECT SITE. ELECTRICAL PERMIT REQUIRED BY THE CONTRACTOR.
6. SURVEY INFORMATION AVAILABLE FROM CITY OF PORTLAND, BUREAU OF TRANSPORTATION (BM # 485 & 486 USED)

NOTES

NOTICE TO EXCAVATORS:

IN ORDER TO PROTECT UNDERGROUND FACILITIES, EXCAVATORS PERFORMING WORK SHOWN ON THESE PLANS MUST COMPLY WITH THE PROVISIONS OF ORS 757.541 TO 757.571.

POTENTIAL UNDERGROUND FACILITY OWNERS
" ONE CALL "
UTILITIES NOTIFICATION CENTER
246-6699

AT & T	CITY WATER
CHEVRON PIPELINE	GTE
NW NATURAL GAS	NW PIPELINE
OLYMPIC PIPELINE	PGE
SANTA FE PIPELINE	PP & L
SPRINT	STATE HWYS
ELECTRIC LIGHTWAVE	US WEST
WESTERN UNION	
COLUMBIA CATV (HAYDEN IS)	
PARAGON CATV (EASTSIDE)	
TCI CATV (WESTSIDE)	

CITY FIRE ALARM	823-4013
CITY IRRIGATION	823-1610
CITY SEWERS	823-1779
CITY STREET LIGHTS	823-5217
CITY TRAFFIC SIGNALS	823-5185
CITY STREET TREES	823-4489
PGE (EMERGENCY ONLY)	464-7777

LEGEND

- PROPOSED STORM SEWER/MH
- PROPOSED SANITARY SEWER/MH
- PROPOSED INLET
- EXISTING STORM SEWER/MH
- EXISTING SANITARY SEWER/MH
- EXISTING INLET
- EXISTING HOUSE
- FIRE HYDRANT
- W12" WATER
- WATER VALVE
- G2" GAS
- GAS VALVE
- E ELECTRIC
- TEL TELEPHONE
- WM WATER METER
- POWER POLE
- LIGHT
- CURB
- EOP EDGE OF PAVEMENT
- EDGE OF DRIVEWAY
- FENCE
- 12" TREE WITH DIAMETER IN INCHES
- DITCH OR STREAM
- PERMANENT PLUG

ORIGINAL DESIGN SIGNED BY: Michelle W Lostra

Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c01.dwg, 12/18/98 at 11:41

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JMH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

ERIK STEN, COMMISSIONER
VICTOR RHODES, PE, CITY ENGINEER

APPROVALS

ORIGINAL DESIGN SIGNED BY: ——
ENGINEERING SERVICES PRINCIPAL ENGINEER
REG. PROF. ENGR. NO. 16123

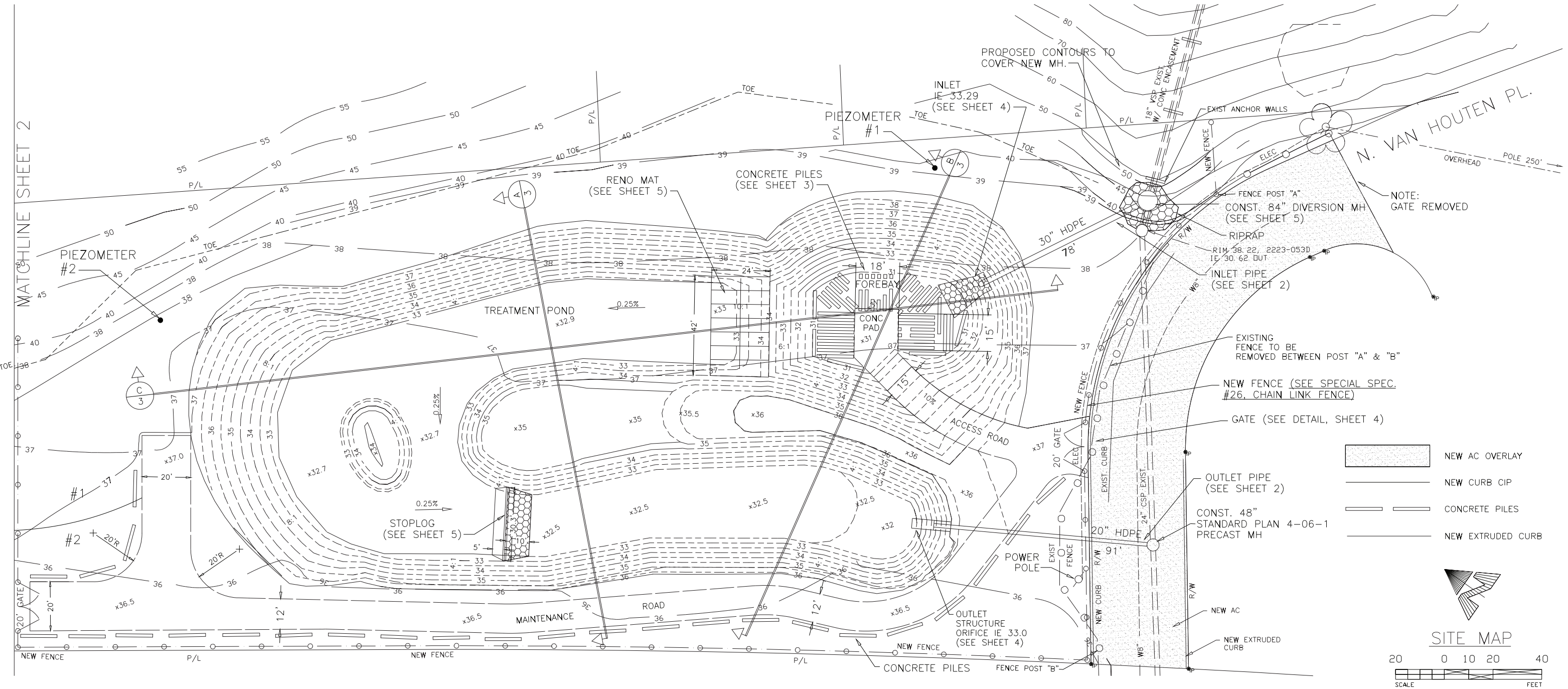
CITY ENGINEER REG. PROF. ENGR. NO. 8845

AS-BUILT

FISKE 'B' BASIN POLLUTION REDUCTION FACILITY

COVER SHEET

1/4 SECTION 2223/2224
JOB NO. 5730
SHEET NO. 1 OF 11



ORIGINAL DESIGN SIGNED BY: Michelle W Lostra

Bureau of Enviornmental Services

NO.	DATE	DESCRIPTION	APPD.
REVISION			

XREF(S) USED:

ROTATION ANGLE: 55D

CONSTRUCTED BY Brundidge Construction

PROJECT COMPLETED 7/31/97

MAP CORRECTED BY Sam Dueck CHECKED BY CStark

FINAL MAP DATA

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DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND

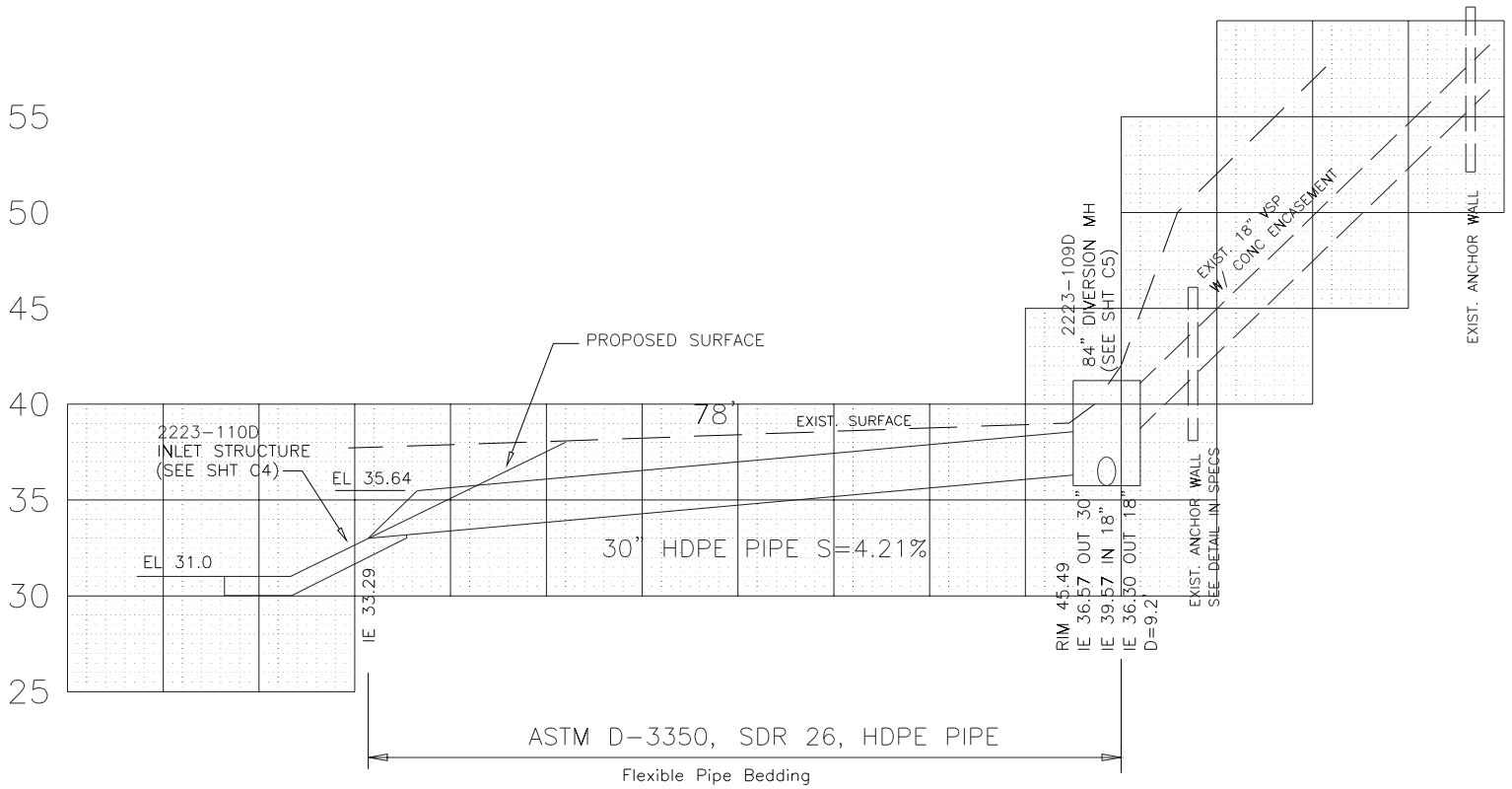
ENVIRONMENTAL SERVICES

AS-BUILT

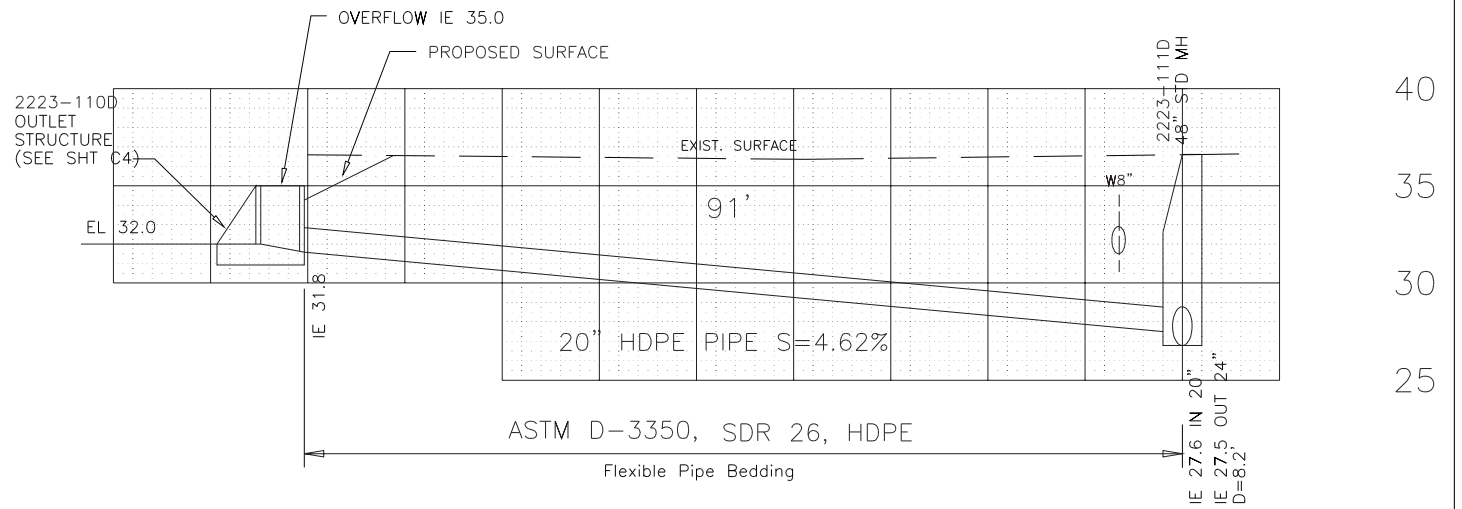
FISKE 'B' BASIN POLLUTION REDUCTION FACILITY

SITE PLAN

1/4 SECTION	2223
JOB NO.	5730
SHEET NO.	2 OF 11

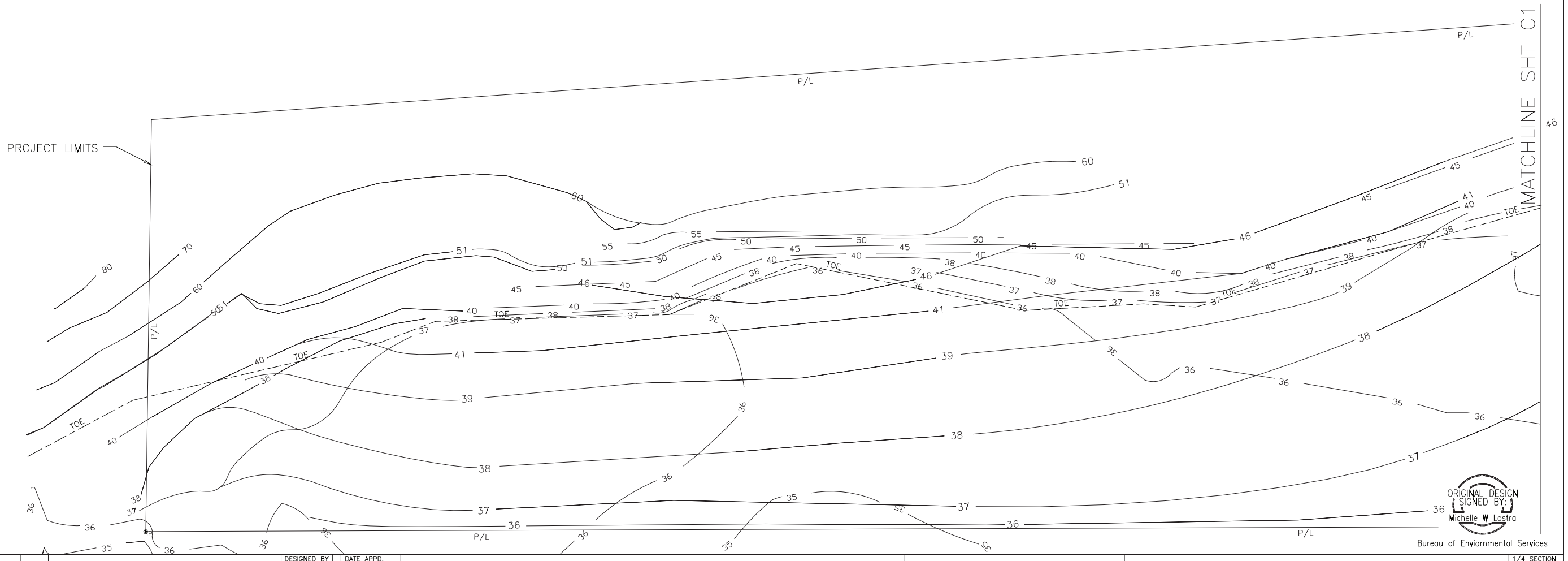


INLET PIPE



OUTLET PIPE

PROFILE: HORIZ: 1"=10'
VERT: 1"=5'



SITE MAP

20 0 10 20 40

SCALE FEET

ORIGINAL DESIGN
SIGNED BY:
Michelle W Lostra

Bureau of Enviornmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE: 55D
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
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CHECKED BY	WWL	CONST. MGR.	AB		
DESIGN MGR.	JH	CADD MGR.			

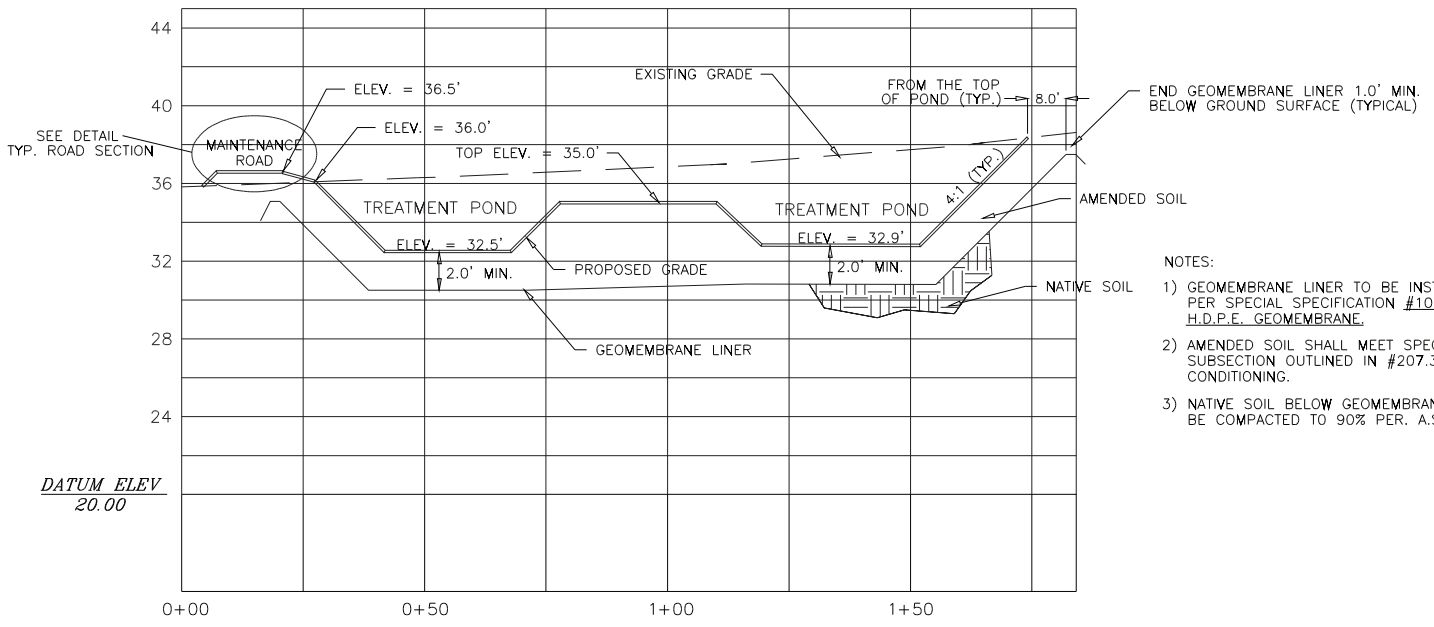
CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

GRADING PLAN (NORTH) & PIPE PROFILES
BRUNDIDGE CIVIL AS-BUILTS

1/4 SECTION	2223
JOB NO.	5730
SHEET NO.	3 OF 11

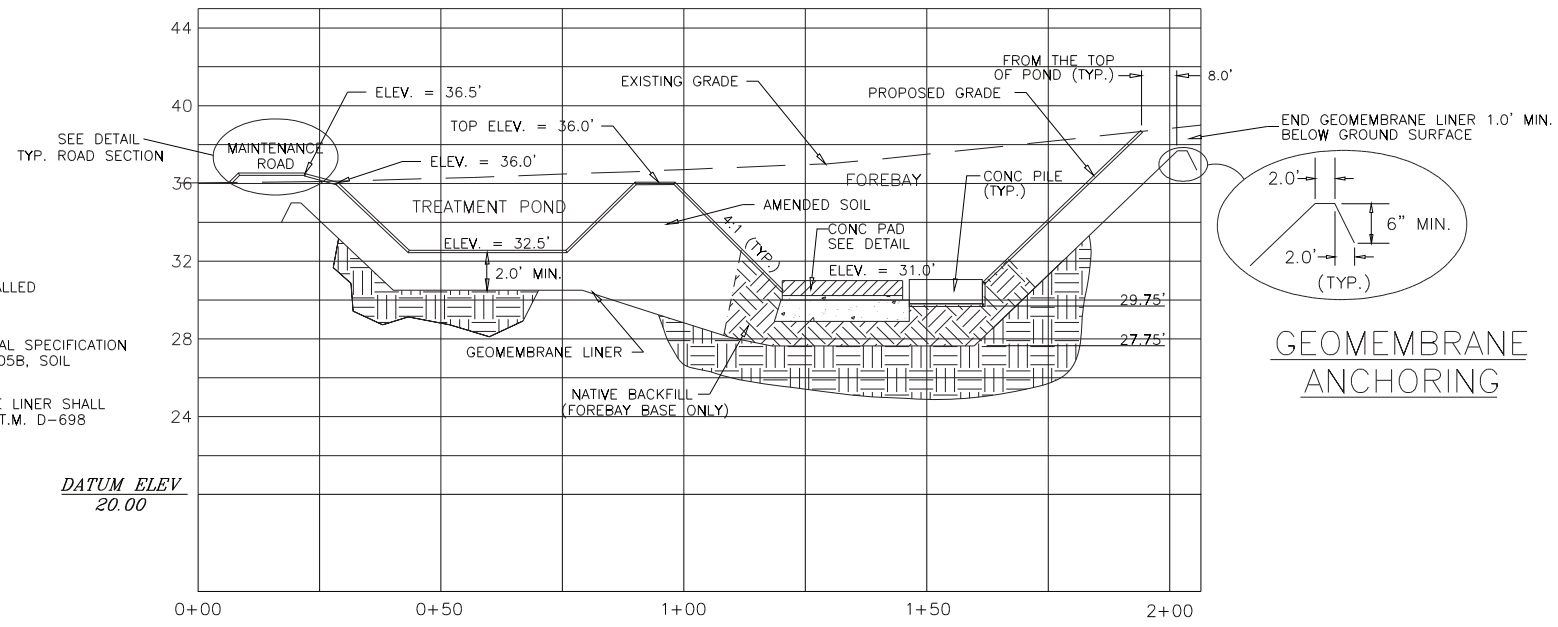


NOTES:

1) GEOMEMBRANE LINER TO BE INSTALLED PER SPECIAL SPECIFICATION #10, H.D.P.E. GEOMEMBRANE.
2) AMENDED SOIL SHALL MEET SPECIAL SPECIFICATION SUBSECTION OUTLINED IN #207.3.05B, SOIL CONDITIONING.
3) NATIVE SOIL BELOW GEOMEMBRANE LINER SHALL BE COMPACTED TO 90% PER. A.S.T.M. D-698

SECTION - A

N.T.S.



GEOMEMBRANE ANCHORING

SECTION - B

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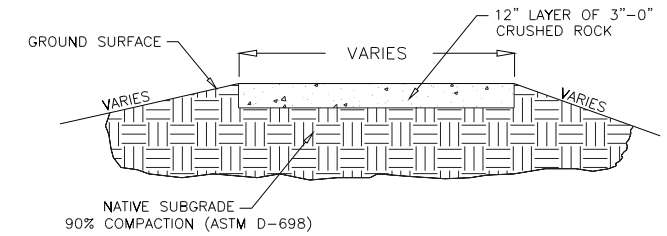

TYP. ROAD SECTION

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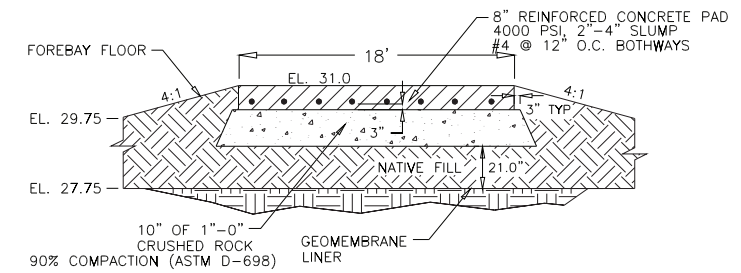

CONCRETE PAD X-SECTION

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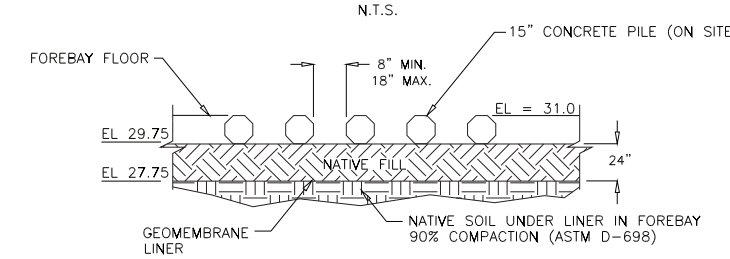
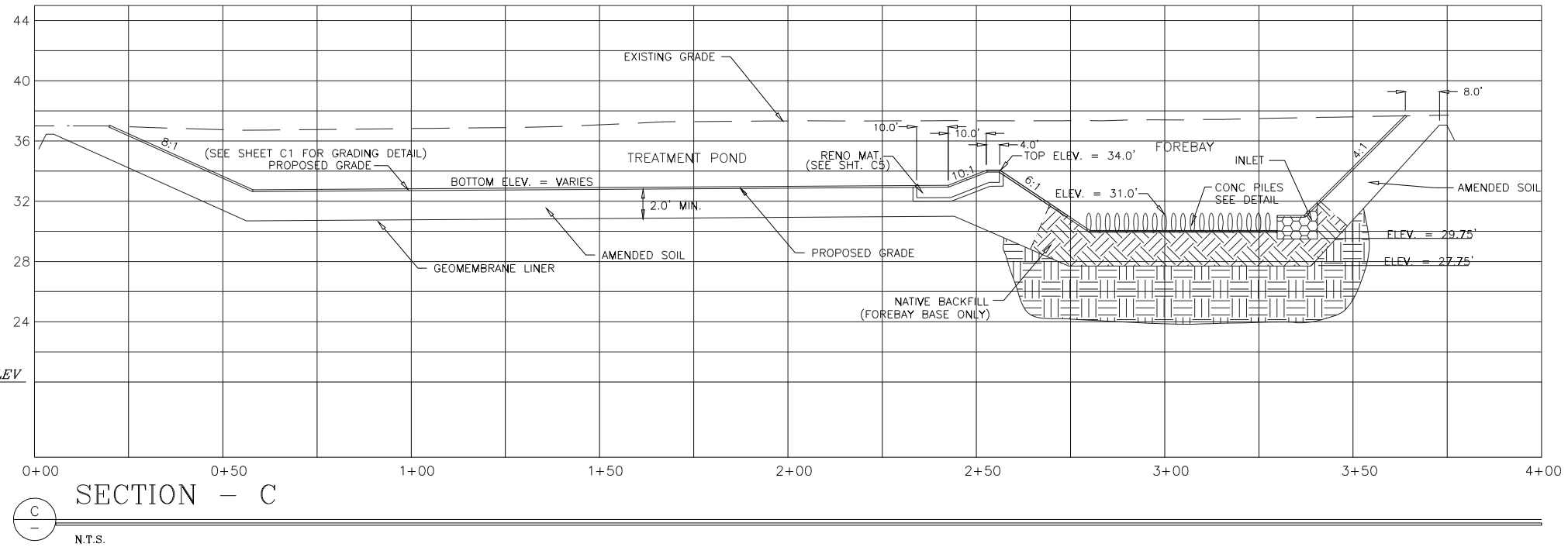


CONCRETE PILE DETAIL

N.T.S.

NOTE: PILES SHALL BE PLACED OVER THE LINER USING AN APPROVED BRIDLE, AND AS INSTRUCTED BY THE ENGINEER.

ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Environmental Services



SECTION - C

N.T.S.

POLLUTION REDUCTION FACILITY CROSS SECTIONS

NO.	DATE	DESCRIPTION	APPD.
REVISION			

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c04.dwg, 12/18/98 at 12:39

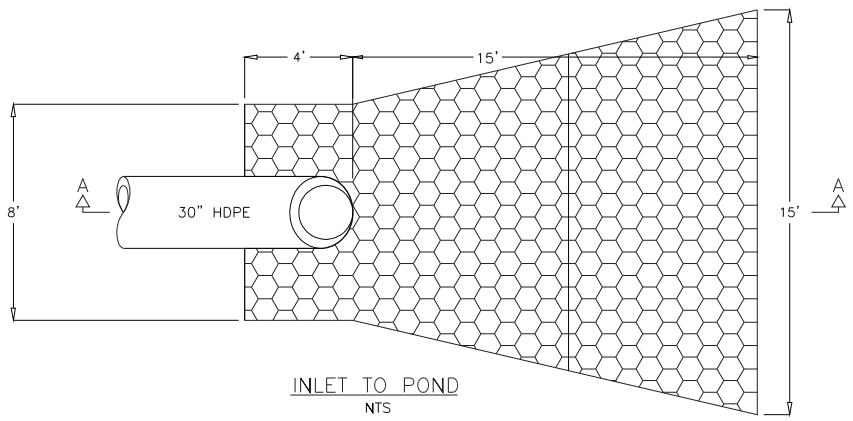
DESIGNED BY	LMC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR.	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

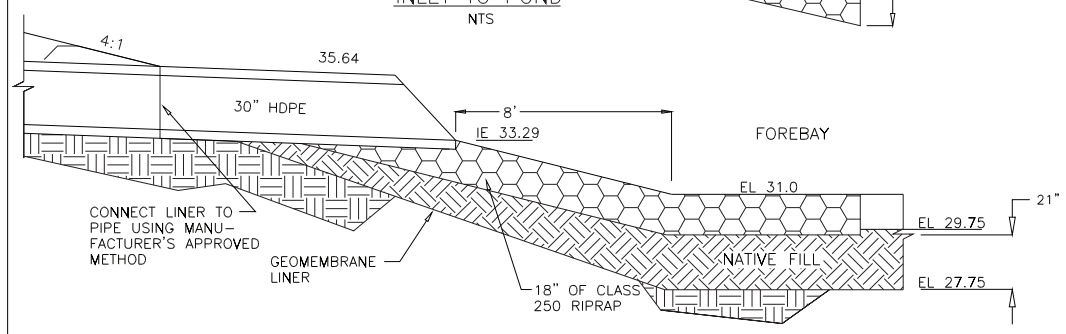
FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

CROSS SECTIONS

1/4 SECTION	
JOB NO.	5730
SHEET NO.	4 OF 11

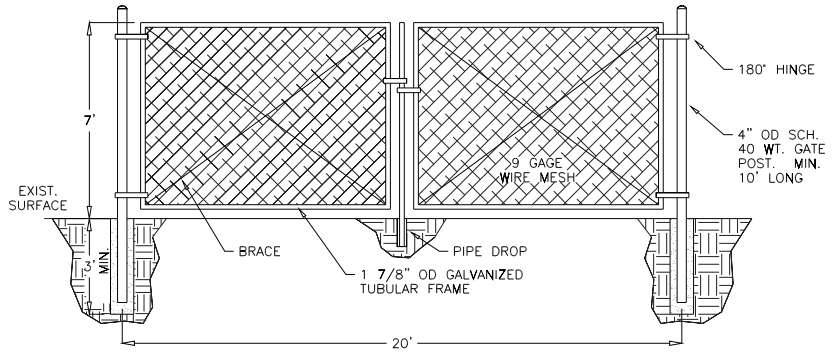


INLET TO POND
NTS

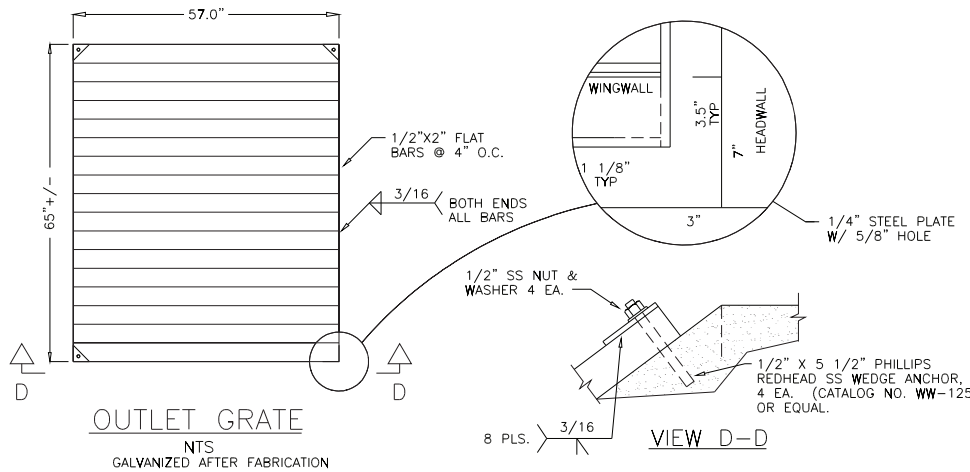


PROFILE (SECTION A-A)
NTS

INLET STRUCTURE

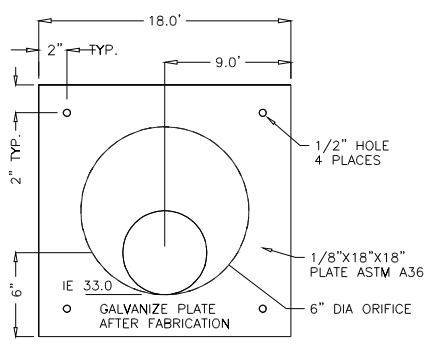


FENCE-DOUBLE DRIVE GATE
NTS

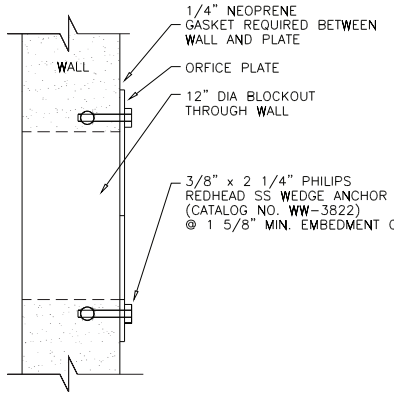


OUTLET GRATE
NTS
GALVANIZED AFTER FABRICATION

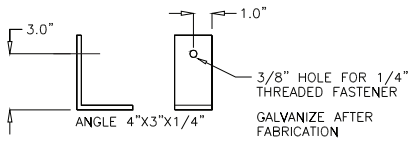
VIEW D-D



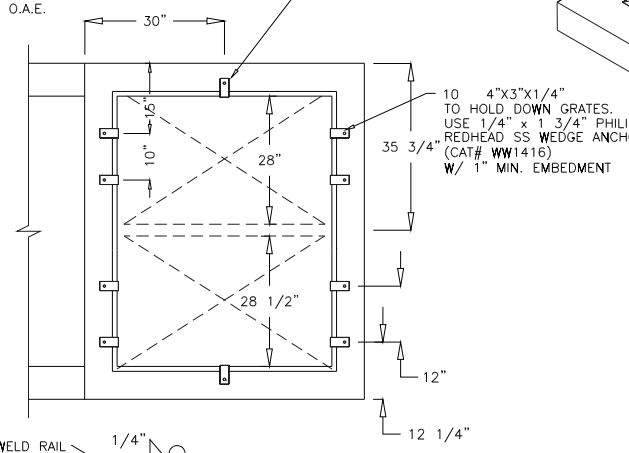
ORIFICE PLATE
NTS

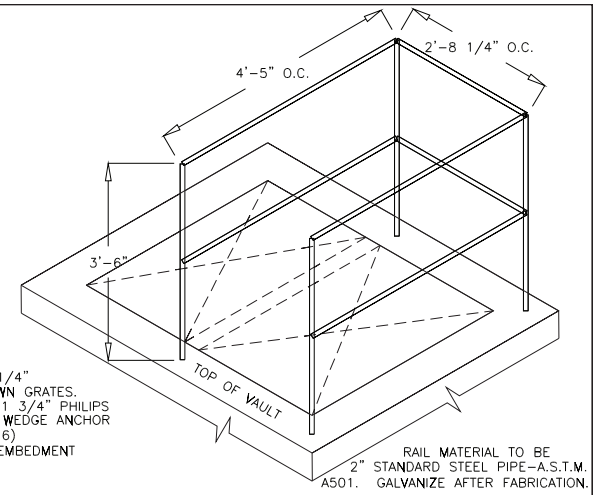


SECTION
NTS

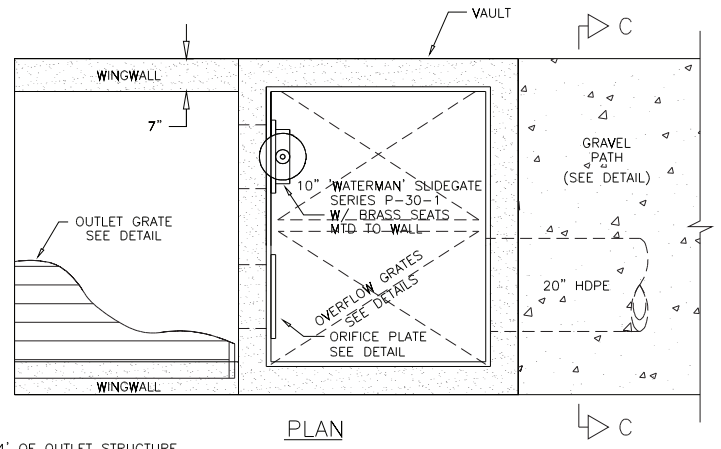


GRATE RESTRAINT





SAFETY RAIL



PLAN

NOTES:

1. SOIL WITHIN 4' OF OUTLET STRUCTURE SHALL BE NATIVE MATERIAL ONLY AND COMPACTED TO 90%.

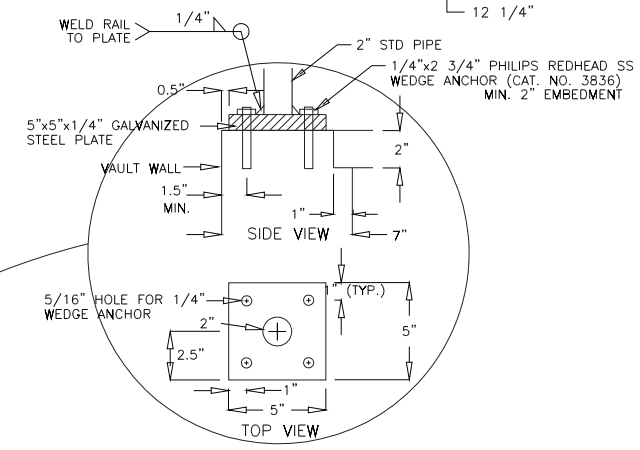
2. ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENT OF ASTM C-478. ALL POURED IN PLACE CONCRETE SHALL BE 28 DAY STRENGTH OF 4000 PSI AND 4" OR LESS SLUMP.

3. ALL THREADED FASTENERS TO BE STAINLESS STEEL.

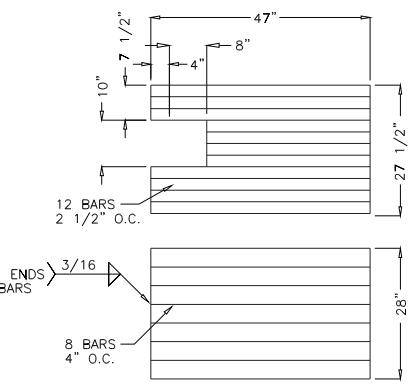
4. ALL GRATE MATERIAL TO BE NEW STRUCTURAL STEEL ASTM A36, 1/2"X2" FLAT BAR.

5. BOTTOM OF VAULT TO BE SLOPED 12:1 TOWARD 18" OUTLET PIPE.

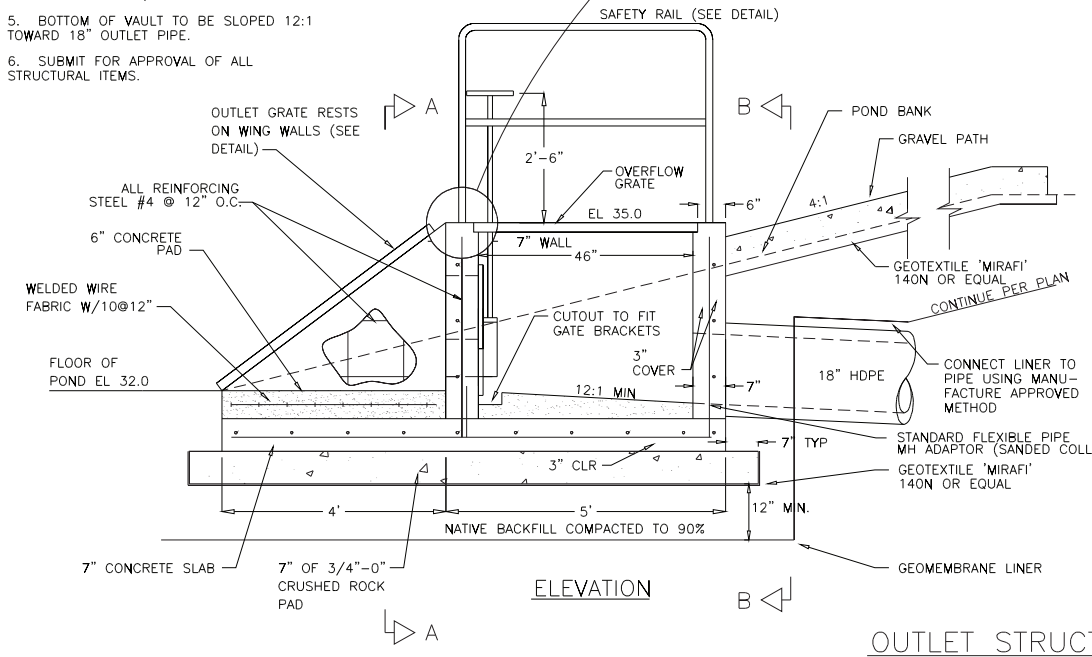
6. SUBMIT FOR APPROVAL OF ALL STRUCTURAL ITEMS.



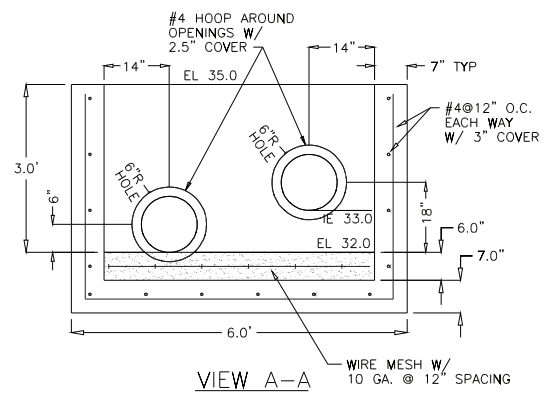
RAIL CONNECTION



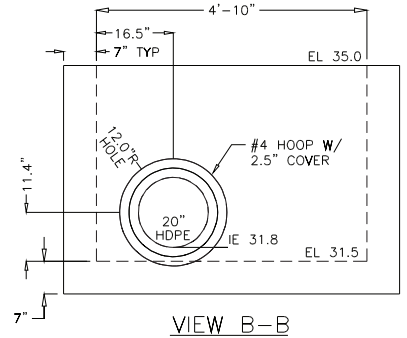
OVERFLOW GRATES
DIMENSIONS ARE C.C.
GALVANIZE AFTER FABRICATION



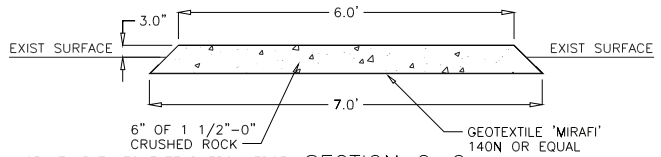
ELEVATION



VIEW A-A



VIEW B-B



SECTION C-C
GRAVEL PATH

OUTLET STRUCTURE
NTS

ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Enviornmental Services

NO.	DATE	DESCRIPTION	APPD.

REVISION

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c05.dwg, 12/18/98 at 12:36

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

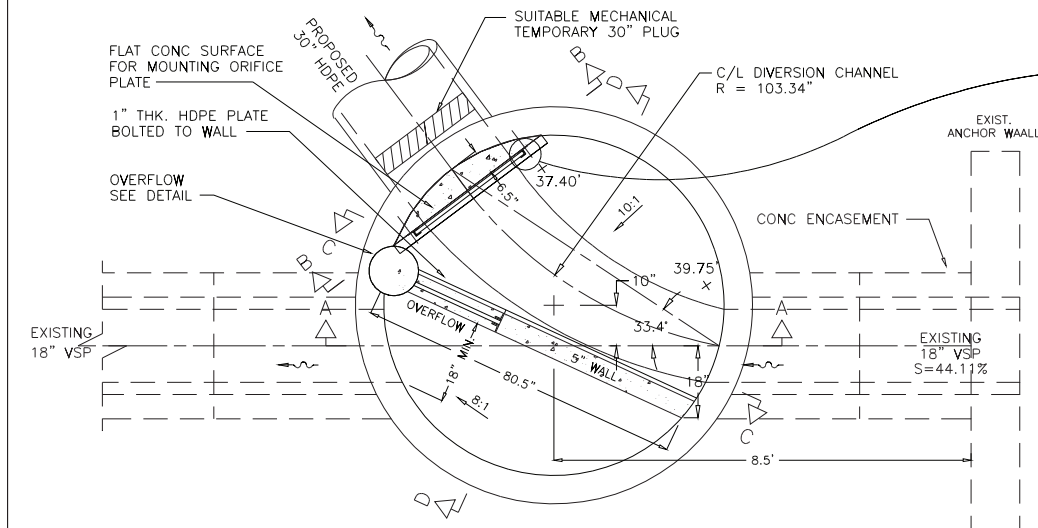
FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

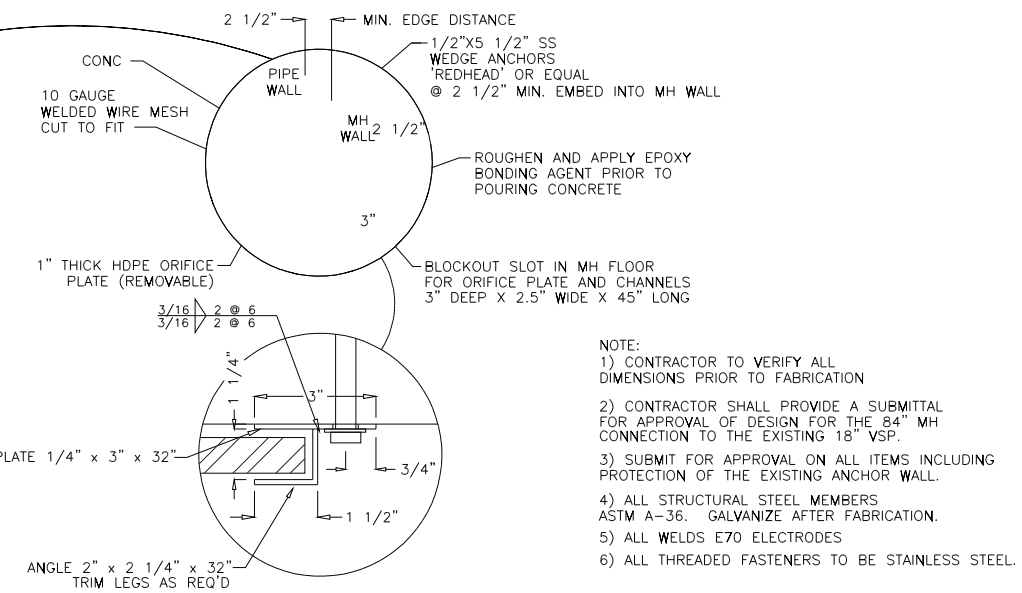
BRUNDIDGE CIVIL AS-BUILTS
INLET & OUTLET DETAILS

1/4 SECTION

JOB NO. 5730

SHEET NO. 5 OF 11





NOTE:
1) CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO FABRICATION

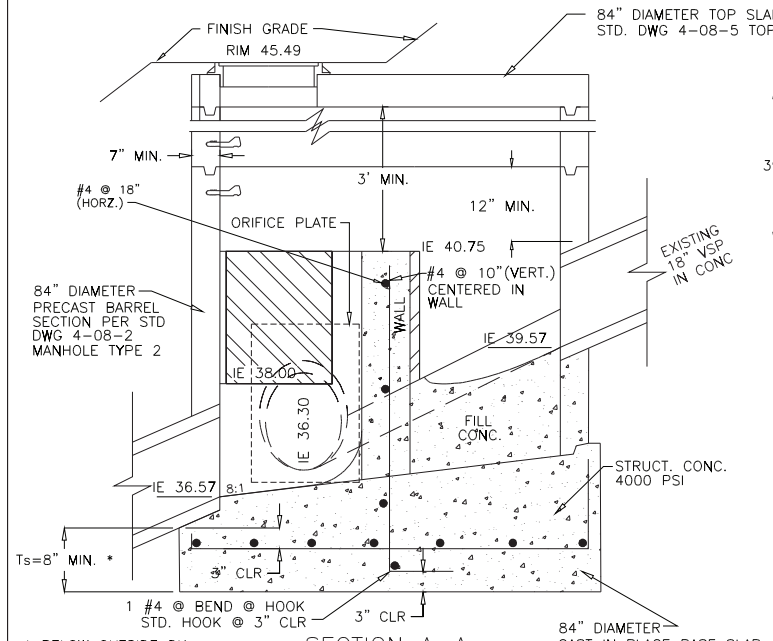
2) CONTRACTOR SHALL PROVIDE A SUBMITTAL FOR APPROVAL OF DESIGN FOR THE 84" MH CONNECTION TO THE EXISTING 18" VSP.

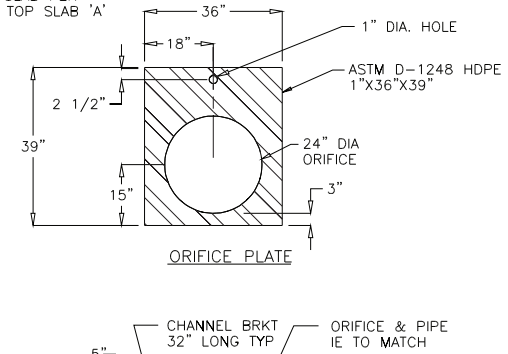
3) SUBMIT FOR APPROVAL ON ALL ITEMS INCLUDING PROTECTION OF THE EXISTING ANCHOR WALL.

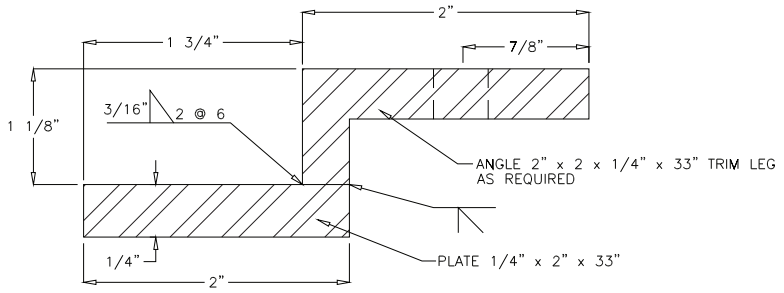
4) ALL STRUCTURAL STEEL MEMBERS ASTM A-36. GALVANIZE AFTER FABRICATION.

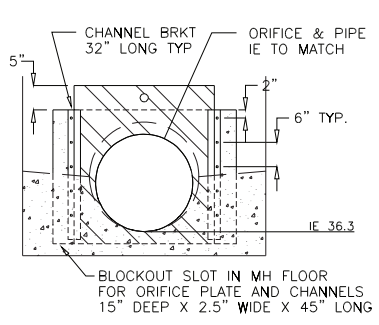
5) ALL WELDS E70 ELECTRODES

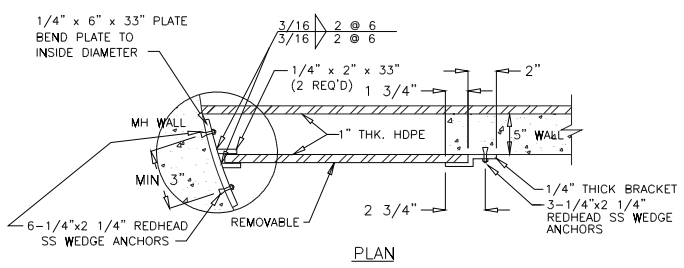
6) ALL THREADED FASTENERS TO BE STAINLESS STEEL.

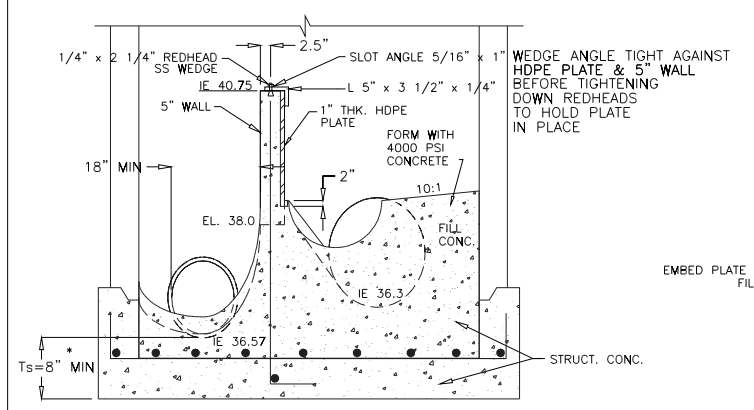


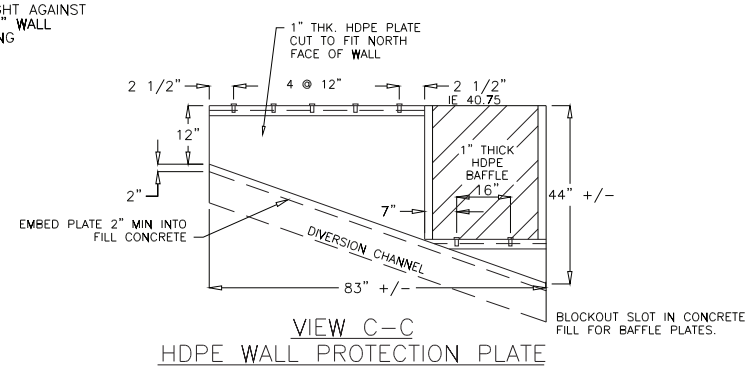


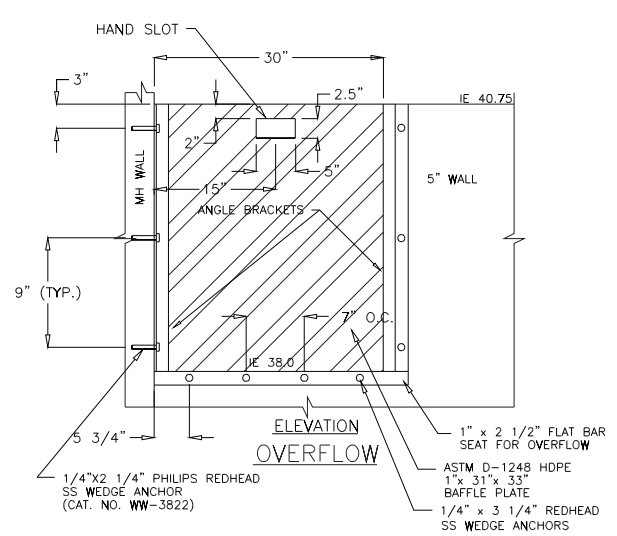




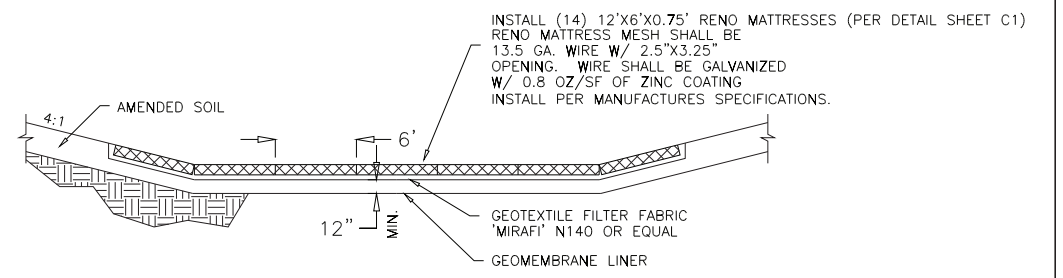


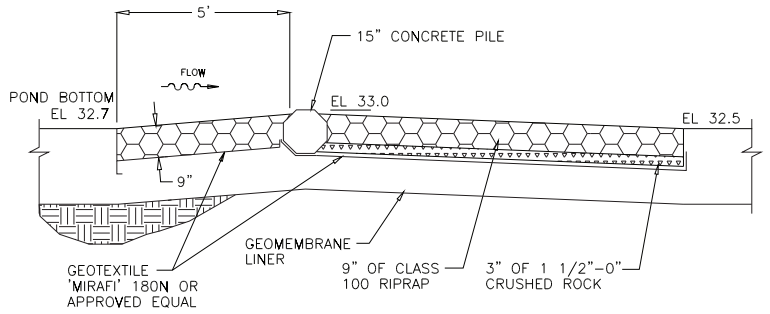


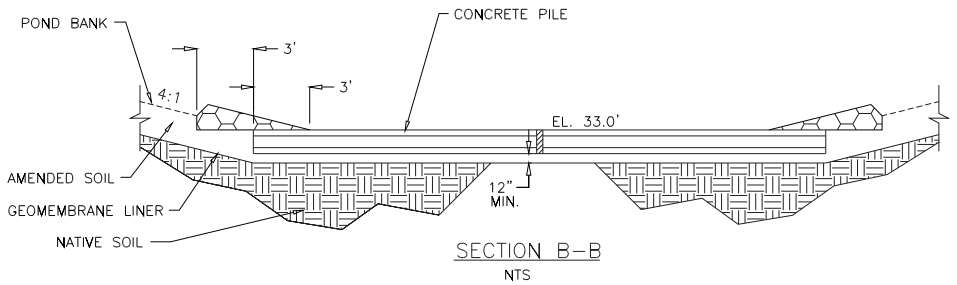


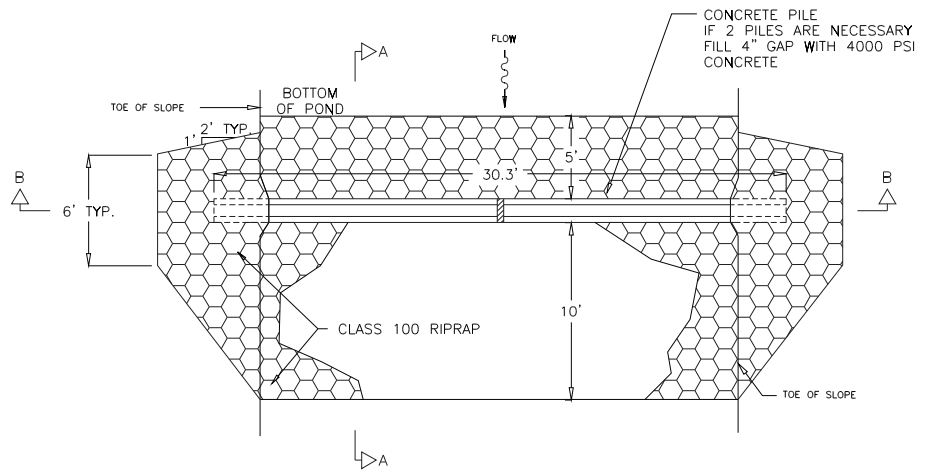


* "N.T.S." (ON ALL SECTIONS)









ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Enviornmental Services

NO.	DATE	DESCRIPTION	APPD.

REVISION

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c06.dwg, 12/18/98 at 12:27

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

BRUNDIDGE CIVIL AS-BUILTS
DIVERSION MH DETAILS

1/4 SECTION	
JOB NO.	5730
SHEET NO.	6 OF 11

WETLAND GRASSES ON POND

PROTIME 500, WETLAND GRASS MIX @6#/1000 SQ FT

UPLAND GRASS MIX

PROTIME 504, UPLAND GRASS MIX @6#/1000 SQ FT

WETLAND EMERGENTS ON FLOOR OF PONDS & WETLAND GRASSES

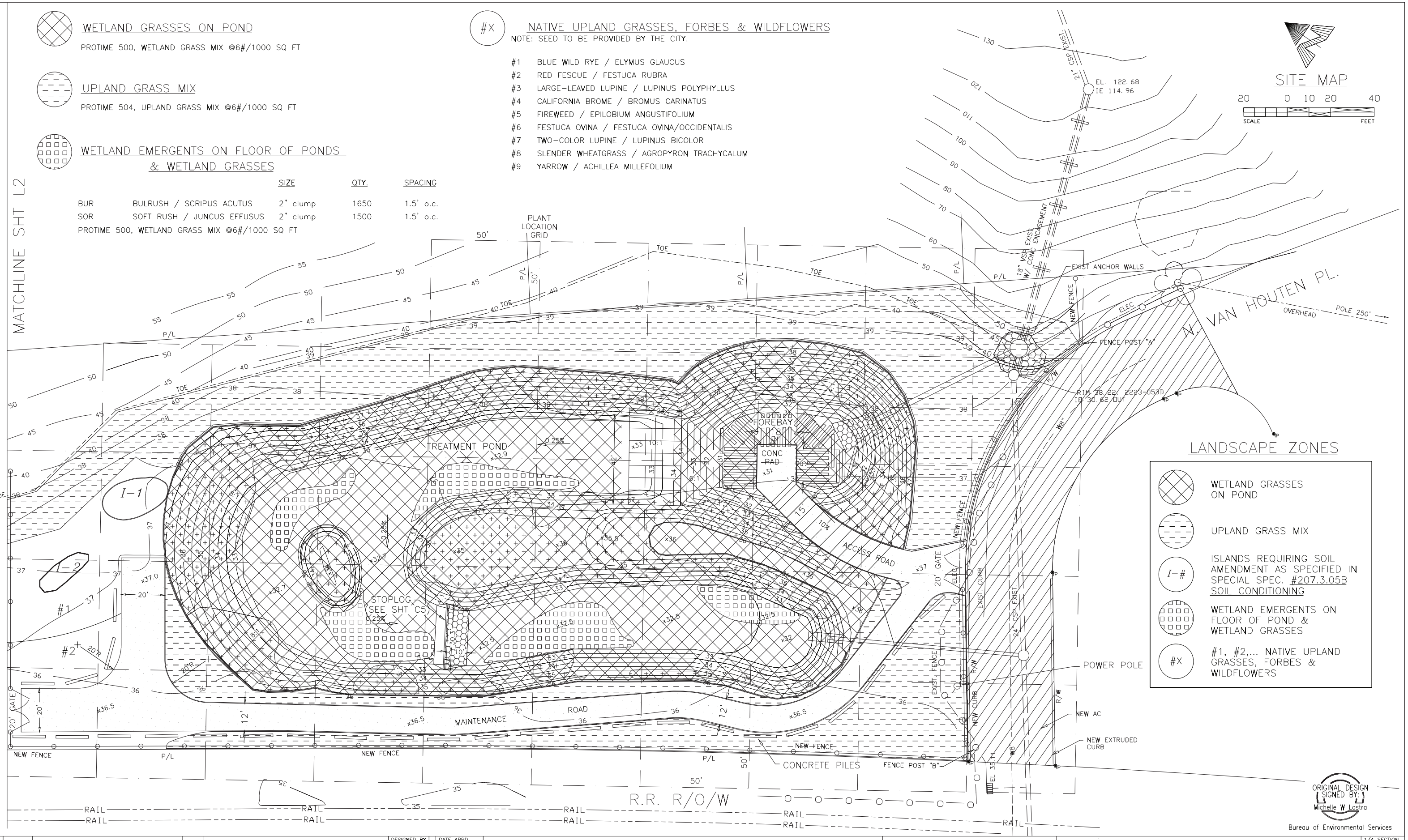
		SIZE	QTY.	SPACING
BUR	BULRUSH / SCRIPUS ACUTUS	2" clump	1650	1.5' o.c.
SOR	SOFT RUSH / JUNCUS EFFUSUS	2" clump	1500	1.5' o.c.

PROTIME 500, WETLAND GRASS MIX @6#/1000 SQ FT

#X NATIVE UPLAND GRASSES, FORBES & WILDFLOWERS

NOTE: SEED TO BE PROVIDED BY THE CITY.

#1	BLUE WILD RYE / ELYMUS GLAUCUS
#2	RED FESCUE / FESTUCA RUBRA
#3	LARGE-LEAVED LUPINE / LUPINUS POLYPHYLLUS
#4	CALIFORNIA BROME / BROMUS CARINATUS
#5	FIREWEED / EPILOBIUM ANGUSTIFOLIUM
#6	FESTUCA OVINA / FESTUCA OVINA/OCCIDENTALIS
#7	TWO-COLOR LUPINE / LUPINUS BICOLOR
#8	SLENDER WHEATGRASS / AGROPYRON TRACHYCALUM
#9	YARROW / ACHILLEA MILLEFOLIUM



SITE MAP

20 0 10 20 40

SCALE FEET

LANDSCAPE ZONES

- WETLAND GRASSES ON POND
- UPLAND GRASS MIX
- I-# ISLANDS REQUIRING SOIL AMENDMENT AS SPECIFIED IN SPECIAL SPEC. #207.3.05B SOIL CONDITIONING
- WETLAND EMERGENTS ON FLOOR OF POND & WETLAND GRASSES
- #X #1, #2,... NATIVE UPLAND GRASSES, FORBES & WILDFLOWERS

ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE: 55D
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c07.dwg, 12/18/98 at 12:25

DESIGNED BY	LMC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

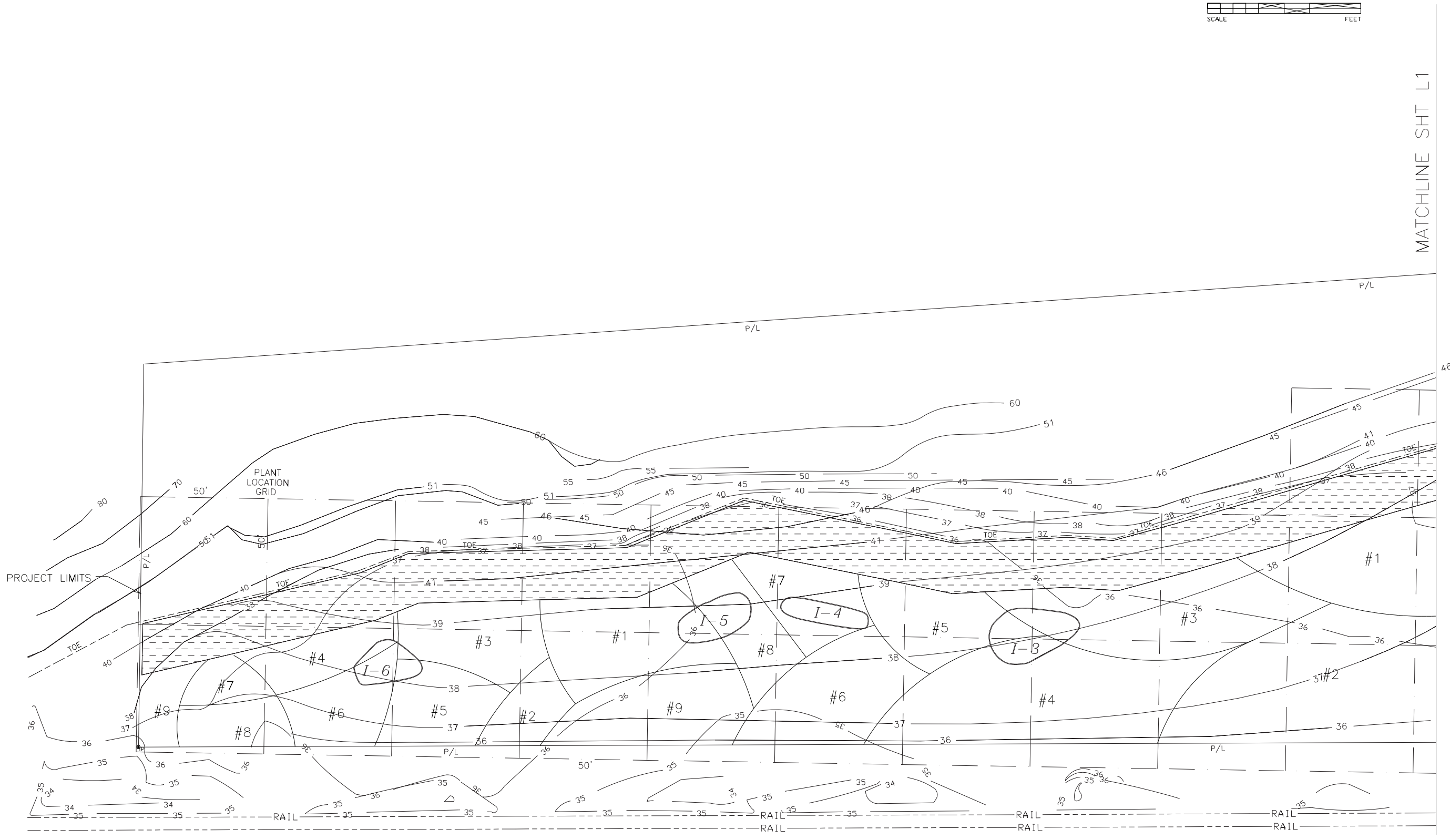
LANDSCAPE PLAN (SOUTH)

1/4 SECTION	2223
JOB NO.	5730
SHEET NO.	7 OF 11

SITE MAP

20 0 10 20 40

SCALE FEET



ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE: 55D
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c08.dwg, 12/18/98 at 12:15

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	WWL
CHECKED BY	WWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

LANDSCAPE PLAN (NORTH)

1/4 SECTION	JOB NO.	SHEET NO.
2223	5730	8 OF 11

NOTE:
ALL TRENCHES FOR IRRIGATION PIPE INSTALLED BELOW EL. 35' SHALL BE HAND DUG.

MATCHLINE SHT L4

PLANT LOCATION GRID

TREATMENT POND

18' FOREBAY

CONC PAD

STOPLOG (SEE SHT C5)

ROAD

ACCESS ROAD

MAINLINE

2" MAINTENANCE

3/4" XCZ-75 DRIP CONTROL ZONE KIT

ENCASE MAINLINE BENEATH ROAD WITH 4" DIP PER. STD 402.2.05, DUCTILE IRON PIPE.

CONCRETE PILES

R.R. R/O/W

RAIL

059D
EL. 122.68
IE 114.96

21" CSP EXIST.

18" VSP EXIST. W/ CONC ENCASEMENT

24" CSP EXIST.

W8"

EXIST ANCHOR WALLS

NEW FENCE

EXIST. FENCE

FENCE POST "A"

FENCE POST "B"

109D

053D
RIM 38.22, 2223-053D
IE 30.62 OUT

N. VAN HOUTEN PL.

OVERHEAD

POLE 250'

ELEC

R/W

EXIST. CURB

NEW CURB

NEW EXTRUDED CURB

20' GATE

POWER POLE
111D

NOTE:
CONNECT TO EXISTING 8" WATER LINE

NEW AC

EL 35.11

2223-001D

IRRIGATION LEGEND

- M — CITY WATER METER, 1 1/2"
- BACKFLOW PREVENTION DEVICE, 'FEBCO' 805Y 1 1/4"
- 1.5" 'RAINBIRD' PEB ELECTRIC CONTROL VALVE (UNLESS NOTED AS XCZ-75 DRIP CONTROL ZONE KIT)
- 'RAINBIRD' 1" 44NP QUICK COUPLER VALVE
- 'CHAMPION' 3/4" STRAIGHT GLOBE VALVE, DRAIN VALVE
- 360° 180° 'RAINBIRD' 204S PJ MAXIBIRD IMPACT SPRINKLER HEAD, MOUNTED ON FIXED RISER
- C — 'RAINBIRD' ESP-12C CONTROLLER

NOTE: USE SCHEDULE 40 PVC FOR ALL IRRIGATION PIPES

IRRIGATION PLAN

20 0 10 20 40
SCALE FEET

ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra

Bureau of Evironmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE: 55D
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c09.dwg, 12/18/98 at 12:08

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR.	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

IRRIGATION LAYOUT (SOUTH)

1/4 SECTION 2223
JOB NO. 5730
SHEET NO. 9 OF 11

IRRIGATION LEGEND

- [M] CITY WATER METER, 1 1/2"
- [⊠] BACKFLOW PREVENTION DEVICE, 'FEBCO' 805Y 1 1/4"
- ⊕ 1.5" 'RAINBIRD' PEB ELECTRIC CONTROL VALVE (UNLESS NOTED AS XCZ-75 DRIP CONTROL ZONE KIT)
- ⊙ 'RAINBIRD' 1" 44NP QUICK COUPLER VALUE
- △ 'CHAMPION' 3/4" STRAIGHT GLOBE VALVE, DRAIN VALVE
- ○ 360° ⌓ 180° 'RAINBIRD' 204S PJ MAXIBIRD IMPACT SPRINKLER HEAD, MOUNTED ON FIXED RISER
- [C] 'RAINBIRD' ESP-12C CONTROLLER

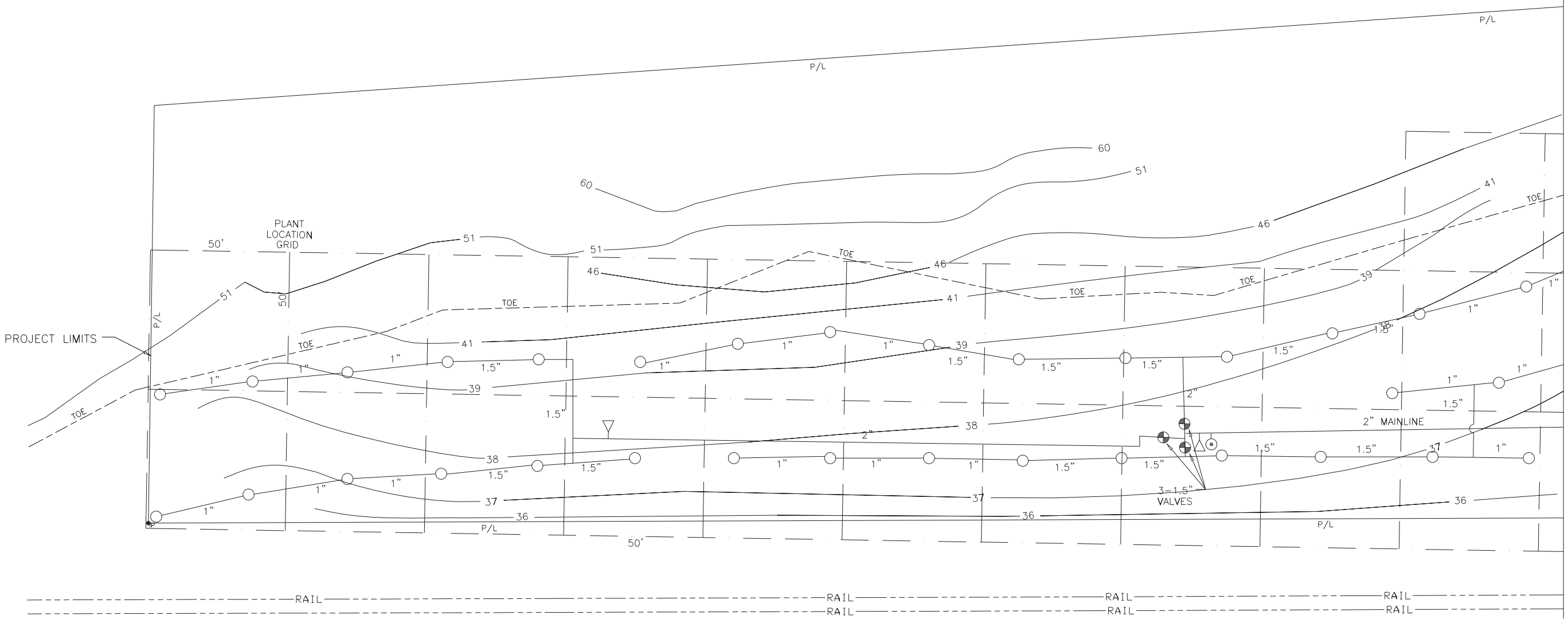
NOTE: USE SCHEDULE 40 PVC FOR ALL IRRIGATION PIPES

NOTE:
ALL TRENCHES FOR IRRIGATION PIPE INSTALLED BELOW EL. 35 SHALL BE HAND DUG.

IRRIGATION PLAN

20 0 10 20 40
SCALE FEET

MATCHLINE SHT L3



ORIGINAL DESIGN SIGNED BY: Michelle W Lostra
Bureau of Enviornmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE: 55D
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA
5730c10.dwg, 12/18/98 at 11:55

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	JDC	PROGRAM MGR	MWL
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	JH	CADD MGR.	

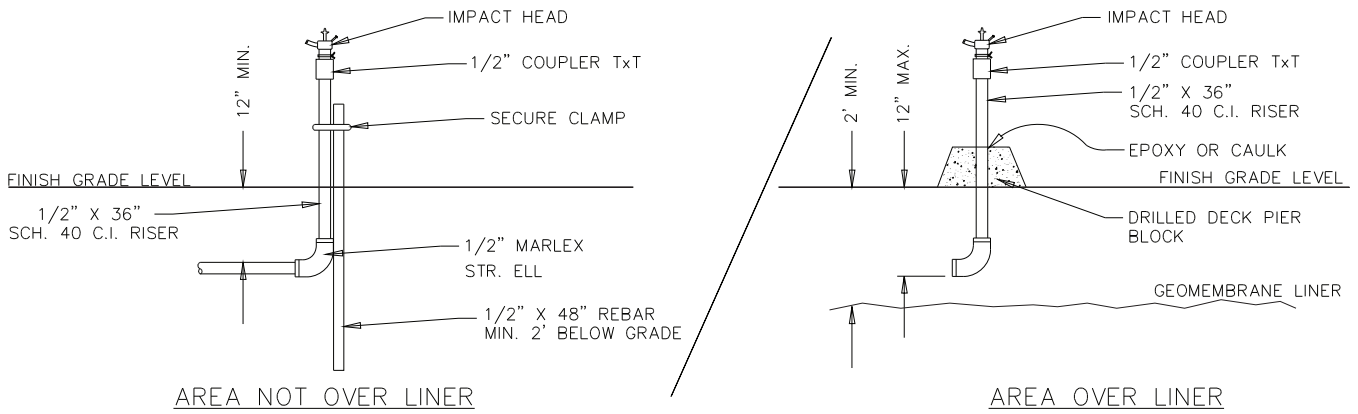
CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

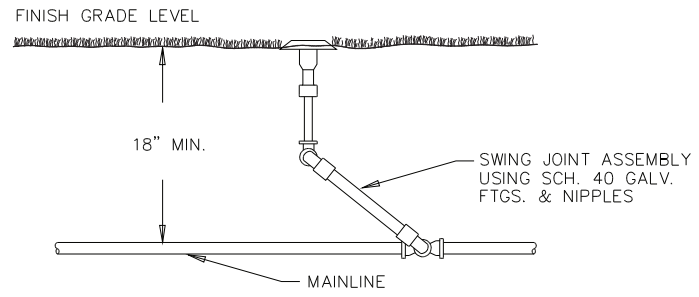
IRRIGATION LAYOUT (NORTH)

1/4 SECTION	2223
JOB NO.	5730
SHEET NO.	10 OF 11



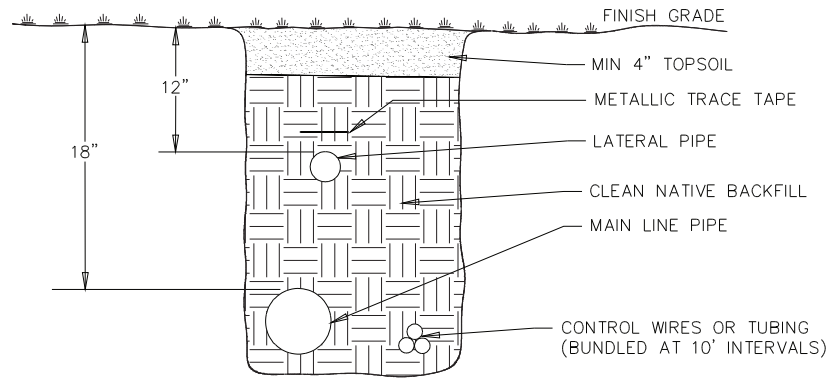
IMPACT HEAD RISER DETAIL

N.T.S.



QUICK-COUPLING VALVE

N.T.S.

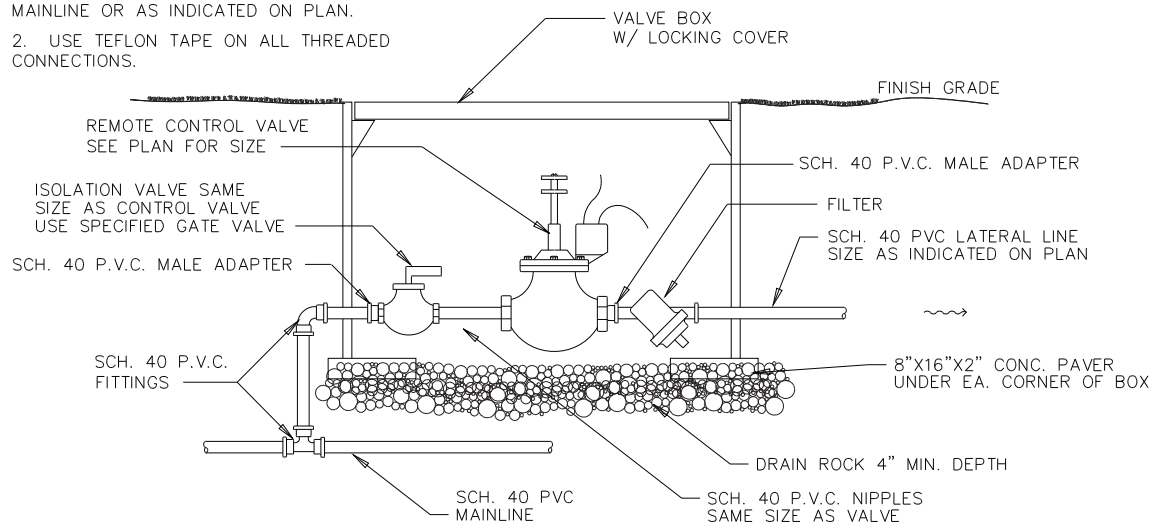


TYPICAL TRENCH DETAIL

N.T.S.

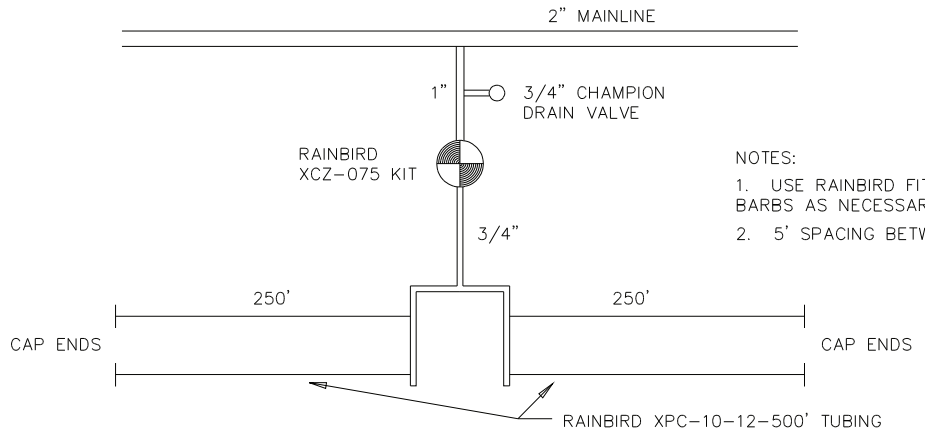
NOTES:

1. PVC PIPE AND FITTINGS UP STREAM OF ISOLATION VALE TO BE SAME SIZE AS MAINLINE OR AS INDICATED ON PLAN.
2. USE TEFLON TAPE ON ALL THREADED CONNECTIONS.



REMOTE CONTROL VALVE (DRIP IRRIGATION)

N.T.S.



NOTES:

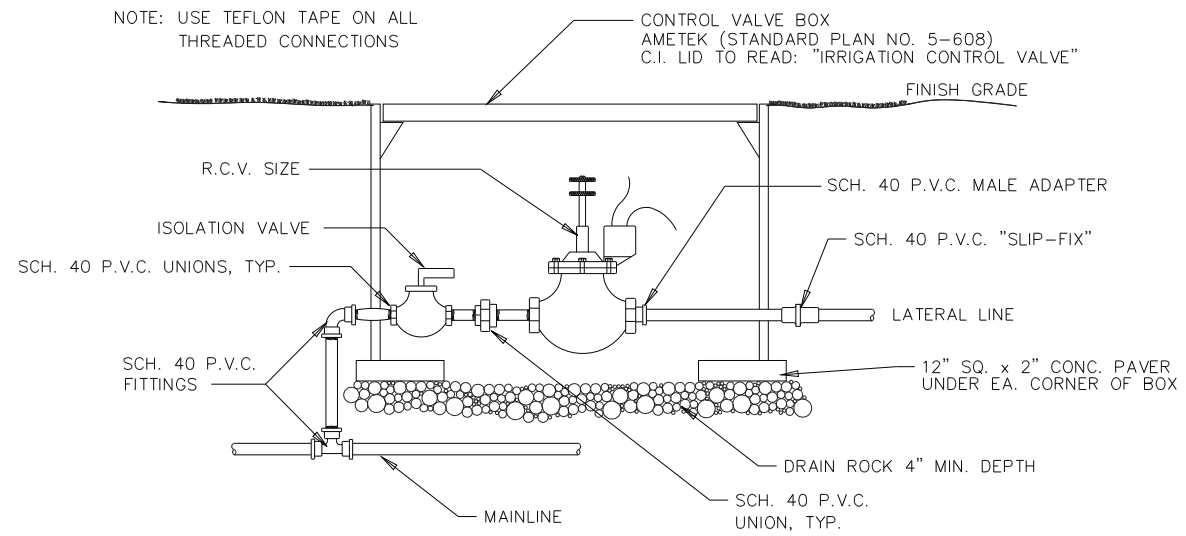
1. USE RAINBIRD FITTINGS AND BARBS AS NECESSARY.
2. 5' SPACING BETWEEN DRIP LINES

DRIP LINE DETAILS

N.T.S.

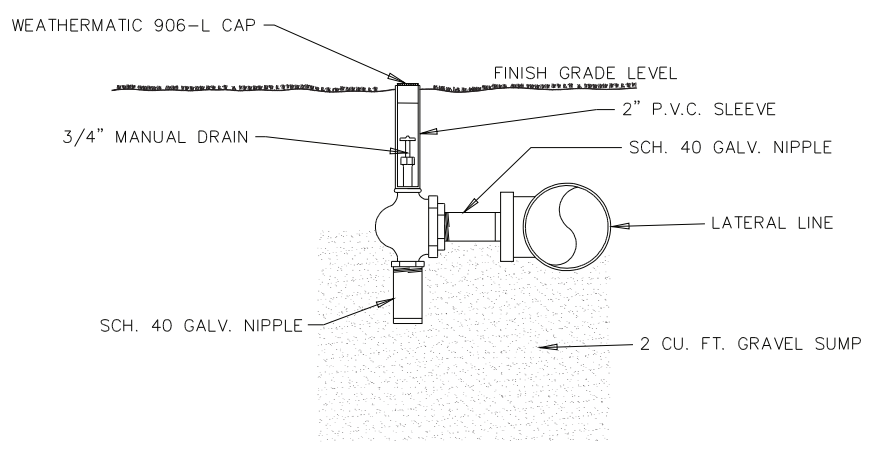
NOTE:

1) THE CONTRACTOR WILL BE RESPONSIBLE TO INSURE THAT THE INTEGRITY OF THE GEOMEMBRANE LINER BE MAINTAINED DURING INSTALLATION OF THE IRRIGATION SYSTEM.
2) ALL TRENCHES FOR THE IRRIGATION SYSTEM INSTALLED BELOW CONTOUR EL. 35' SHALL BE HAND DUG.



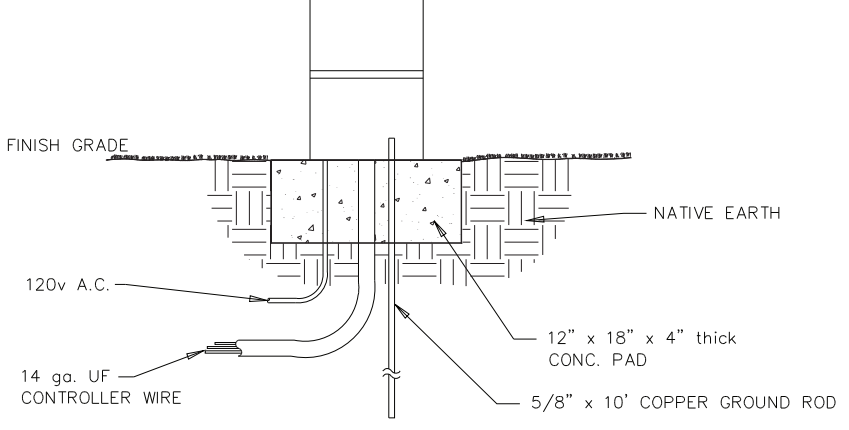
REMOTE CONTROL VALVE

N.T.S.



MANUAL DRAIN

N.T.S.



CONTROLLER PEDESTAL

N.T.S.

ORIGINAL DESIGN SIGNED BY:
Michelle W Lostra
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	BY	APP'D
		REVISION		

5730c11.dgn 2/18/98 at 11:48

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Brundidge Construction
PROJECT COMPLETED 7/31/97
MAP CORRECTED BY Sam Dueck CHECKED BY CStark
FINAL MAP DATA

DESIGNED BY	LWC	DATE APPD.	
DRAWN BY	DJM	PROGRAM MGR	
CHECKED BY	MWL	CONST. MGR.	AB
DESIGN MGR.	LWH	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

FISKE 'B' BASIN
POLLUTION REDUCTION FACILITY

IRRIGATION DETAILS

1/4 SECTION

JOB NO. 5730

SHEET NO. 11 OF 11

Basin 49 Stormwater Pond As-Built Drawings

VICINITY MAP

NO SCALE

POTENTIAL UNDERGROUND FACILITY OWNERS
" ONE CALL "
UTILITIES NOTIFICATION CENTER
246-6699

AT & T	CITY WATER
CHEVRON PIPELINE	GTE
NW NATURAL GAS	NW PIPELINE
OLYMPIC PIPELINE	PGE
SANTA FE PIPELINE	PP & L
SPRINT	STATE HWYS
ELECTRIC LIGHTWAVE	US WEST
WESTERN UNION	
COLUMBIA CATV (HAYDEN IS)	
PARAGON CATV (EASTSIDE)	
TCI CATV (WESTSIDE)	

CITY FIRE ALARM	823-4013
CITY IRRIGATION	823-1610
CITY SEWERS	823-1779
CITY STREET LIGHTS	823-5217
CITY TRAFFIC SIGNALS	823-5185
CITY STREET TREES	823-4489
PGE (EMERGENCY ONLY)	464-7777

NOTICE TO EXCAVATORS:
IN ORDER TO PROTECT UNDERGROUND FACILITIES, EXCAVATORS PERFORMING WORK SHOWN ON THESE PLANS MUST COMPLY WITH THE PROVISIONS OF ORS 757.541 TO 757.571.

LEGEND (THIS SHEET)

- INTERCEPTOR SEWER
- COMBINED SEWERS
- SANITARY SEWER
- STORM SEWER
- PROPOSED STORM SEWER
- WATER QUALITY FACILITY
- PROPOSED VEGETATED SWALE
- 3 SHEET NUMBER
- DRAINAGE BOUNDARY
- 14 DELETED SHEET NUMBER (VEGETATED SWALES AND FIELD INLETS DELETED ON THIS SHEET.)

SHEET INDEX

ST. JOHNS 'B' BASIN DRAINAGE SYSTEM

400 0 200 400 800
SCALE FEET

GENERAL NOTES (PLAN AND PROFILE SHEETS):

1. ALL INLETS SHALL BE SINGLE INLETS PER STANDARD PLAN NO. 4-30, UNLESS OTHERWISE NOTED.
2. CONSTRUCT CONCRETE DOUBLE INLET SIDE-BY-SIDE PER STANDARD PLAN 4-31-2.
3. CONSTRUCT TWO SINGLE INLETS END-TO-END PER STANDARD PLAN 4-30.
4. ALL LEADS FROM SINGLE INLETS SHALL BE 10" A.S.T.M. C-14 CL3 CSP WITH CLASS 'C' BEDDING. ALL LEADS FROM DOUBLE INLETS SHALL BE 12" A.S.T.M. C-76 CL IV CSP WITH CLASS 'C' BEDDING, UNLESS OTHERWISE NOTED.
5. EXISTING GRADES SHOWN ON PROFILES ARE TAKEN ALONG THE STREET CENTERLINE OR RIGHT-OF-WAY ELEVATIONS.
6. ALL HOUSE BRANCHES SHALL BE 6" A.S.T.M. C-14 CL3 CSP WITH CLASS C BEDDING, UNLESS OTHERWISE NOTED.
7. CONSTRUCT MANHOLES LESS THAN 5' DEEP TO INVERT WITH A STANDARD FLAT TOP SLAB IN LIEU OF A CONE.
8. CONSTRUCT OUTSIDE DROP CONNECTION PER SPECIAL DETAILS.
9. REMOVE EXISTING INLET AND REPAVE, SEE SPECIAL SPECIFICATIONS.
10. SAVE ALL TREES UNLESS OTHERWISE NOTED.
11. ALL MANHOLES SHALL BE 48" PRECAST CONCRETE PER STANDARD PLAN NUMBER 4-06-1 OR 4-06-3, UNLESS OTHERWISE NOTED.
12. CONNECT TO EXISTING INLET, UNLESS OTHERWISE NOTED.
13. CONSTRUCT FIELD INLET PER STANDARD PLAN NO. 4-33-1.
14. D= DEPTH OF MH; S=DISTANCE TO FIRST STEP (SHOWN IN PROFILE)

LEGEND (PLAN AND PROFILE SHEETS)

- STORM WATER INLET
- FIRE HYDRANT
- WATER VALVE
- GAS VALVE
- WATER METER
- MAIL BOX
- SIGN OR POST
- WATER
- SWAMP
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- POWER VAULT
- POWER TRANSFORMER
- POLE ANCHOR
- END OF CULVERT
- AIR VALVE MANHOLE
- DISTILLING MANHOLE
- SAMPLING MANHOLE
- CLEAN OUT
- WATER MANHOLE
- WATER BLOWOFF
- POWER POLE
- LIGHT
- POWER POLE W/ LIGHT
- REGISTRATION TICK TO TOPOG. OVERLAY
- FENCE
- RETAINING WALL
- GUARD RAIL
- EDGE OF PAVEMENT
- CURB
- EDGE OF DRIVEWAY
- CONCRETE PAD
- TREE
- DITCH OR STREAM ; LAKE
- RAILROAD
- STRUCTURE
- UNIDENTIFIED UTILITY OR OBJECT
- EXISTING SANITARY SEWER
- EXISTING INTERCEPTOR SEWER
- EXISTING FORCE MAIN
- EXISTING PUMP STATION
- EXISTING STORM SEWER
- EXISTING COMBINED SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED INTERCEPTOR SEWER
- PROPOSED FORCE MAIN
- PROPOSED PUMP STATION
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- SOIL TEST BORING
- SOIL TEST BORING W/ PIEZOMETER
- SOIL TEST PIT
- EXISTING DIVERSION MANHOLE
- PROPOSED SEDIMENTATION MH AND SUMP
- INSIDE DROP MANHOLE
- OUTSIDE DROP MANHOLE
- PERMANENT PLUG
- BENCH MARK
- SERVICE LINE PIPE (HOUSE BRANCHES)
- SEPTIC TANK
- CESS POOL
- PROPOSED STORM INLET
- CONTROL POINT
- IRON PIPE OR IRON ROD

ORIGINAL DESIGN SIGNED BY:
James K. Soli

Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.

REVISION

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Alliance Corp.
PROJECT COMPLETED 8/1/1995
MAP CORRECTED BY Parametrix CHECKED BY CStark
FINAL MAP DATA
5147C01.dwg, 07/28/99 at 09:14

DESIGNED BY	JG	DATE APPD.	
DRAWN BY	BRF/DDT	PROGRAM MGR	
CHECKED BY	JJS	CONST. MGR.	PGG
DESIGN MGR.	ETS	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

MIKE LINDBERG, COMMISSIONER
VICTOR RHODES, PE, CITY ENGINEER

APPROVALS

ORIGINAL DESIGN
SIGNED BY: Paul Gibbon for LAK No.15801
ENGINEERING SERVICES PRINCIPAL ENGINEER
REG. PROF. ENGR. NO.

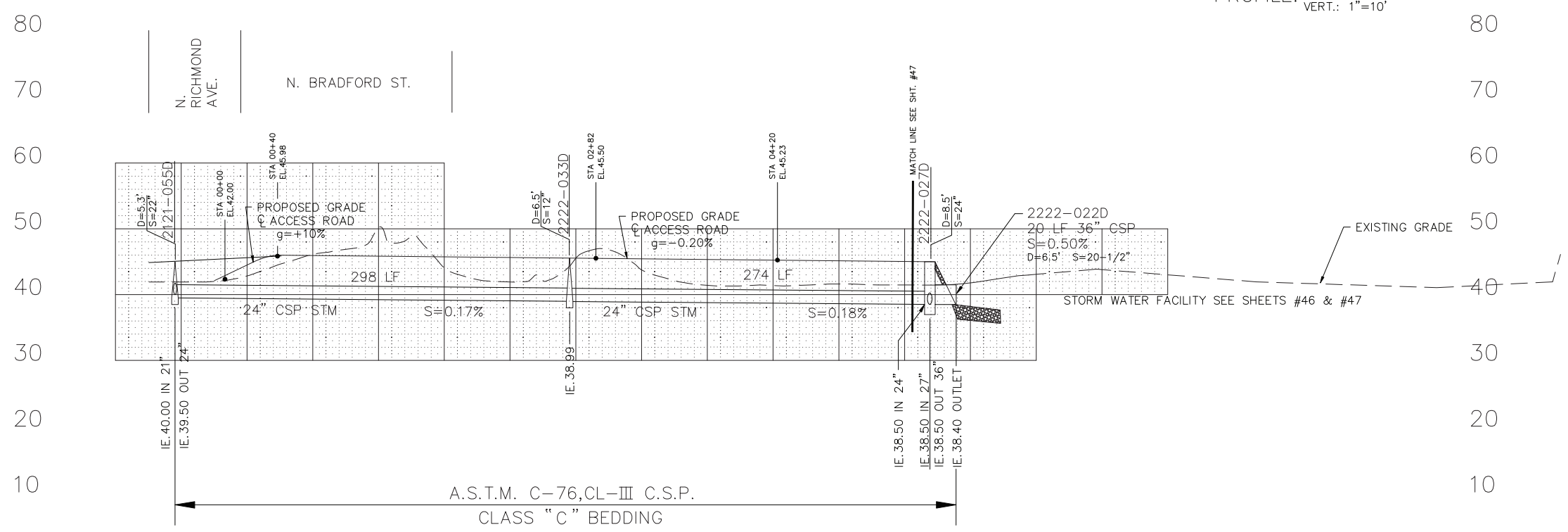
CITY ENGINEER REG. PROF. ENGR. NO. 8845

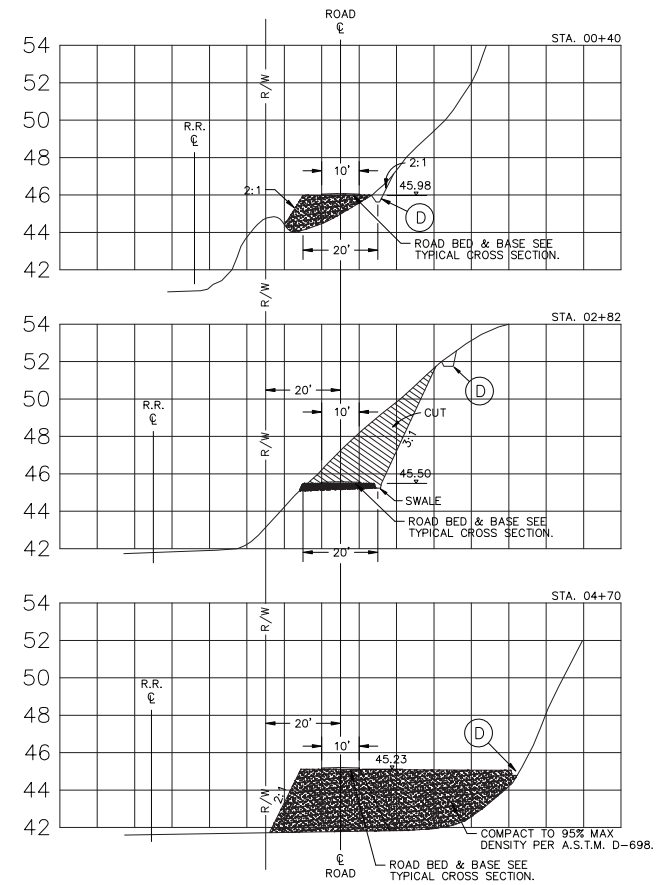
AS-BUILT

ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER
SEPARATION PROJECT

1/4 SECTION	VARIES
JOB NO.	5147
SHEET NO.	1 of 47

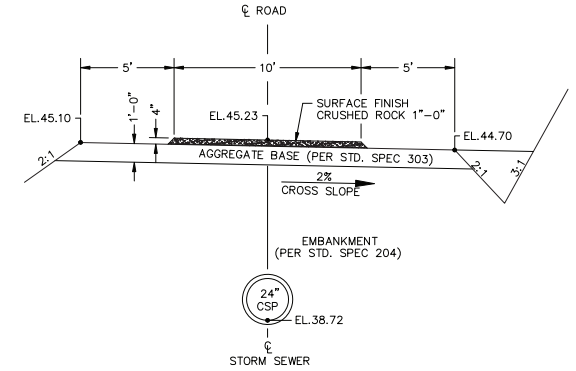
PROFILE: HORIZ.: 1"=50'
VERT.: 1"=10'





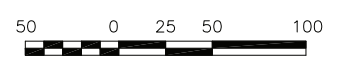
ACCESS ROAD CROSS SECTIONS

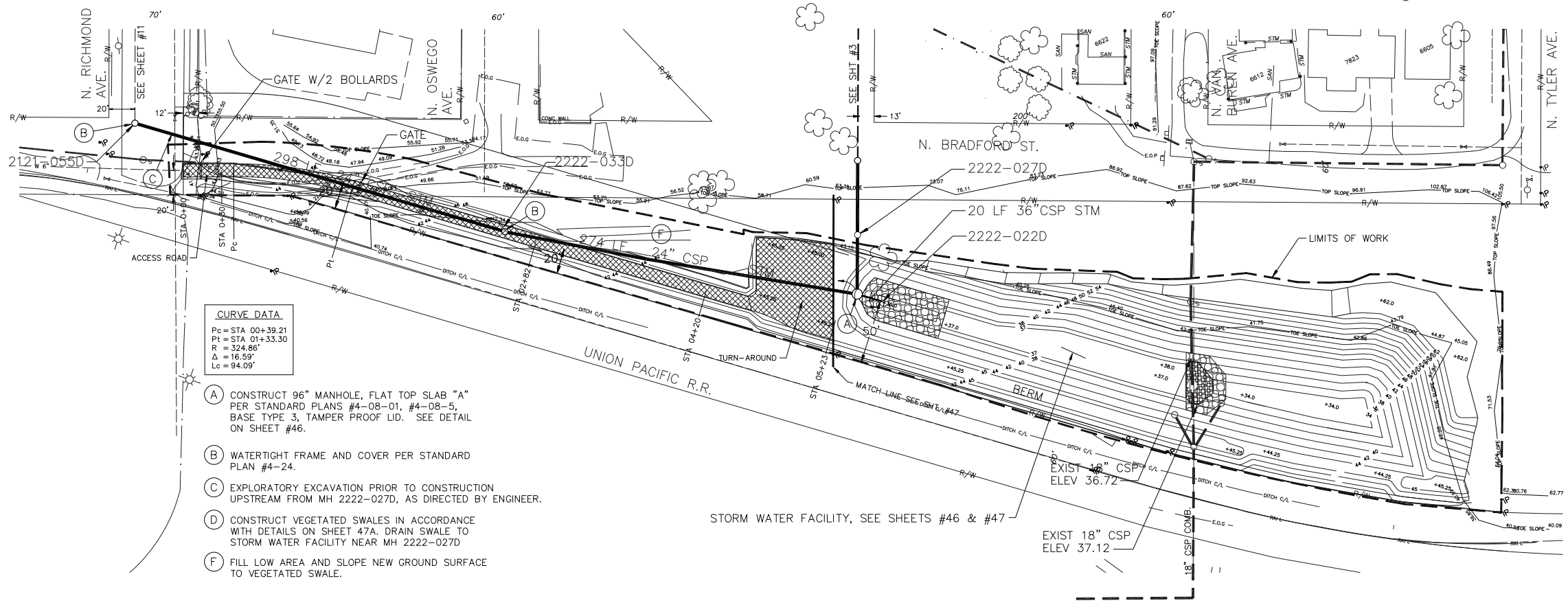
SCALE: HORIZ: 1" = 25'
VERT: 1" = 5'



ROAD BED & BASE TYPICAL CROSS SECTION AT STATION 04+20

APPLIES FROM STA. 00+00 TO STA. 05+23.





ORIGINAL DESIGN SIGNED BY:
James K. Soli
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Alliance Corp.
PROJECT COMPLETED 8/1/1995
MAP CORRECTED BY Parametrix CHECKED BY CStark
FINAL MAP DATA
5147c02.dwg, 06/22/99 at 15:39

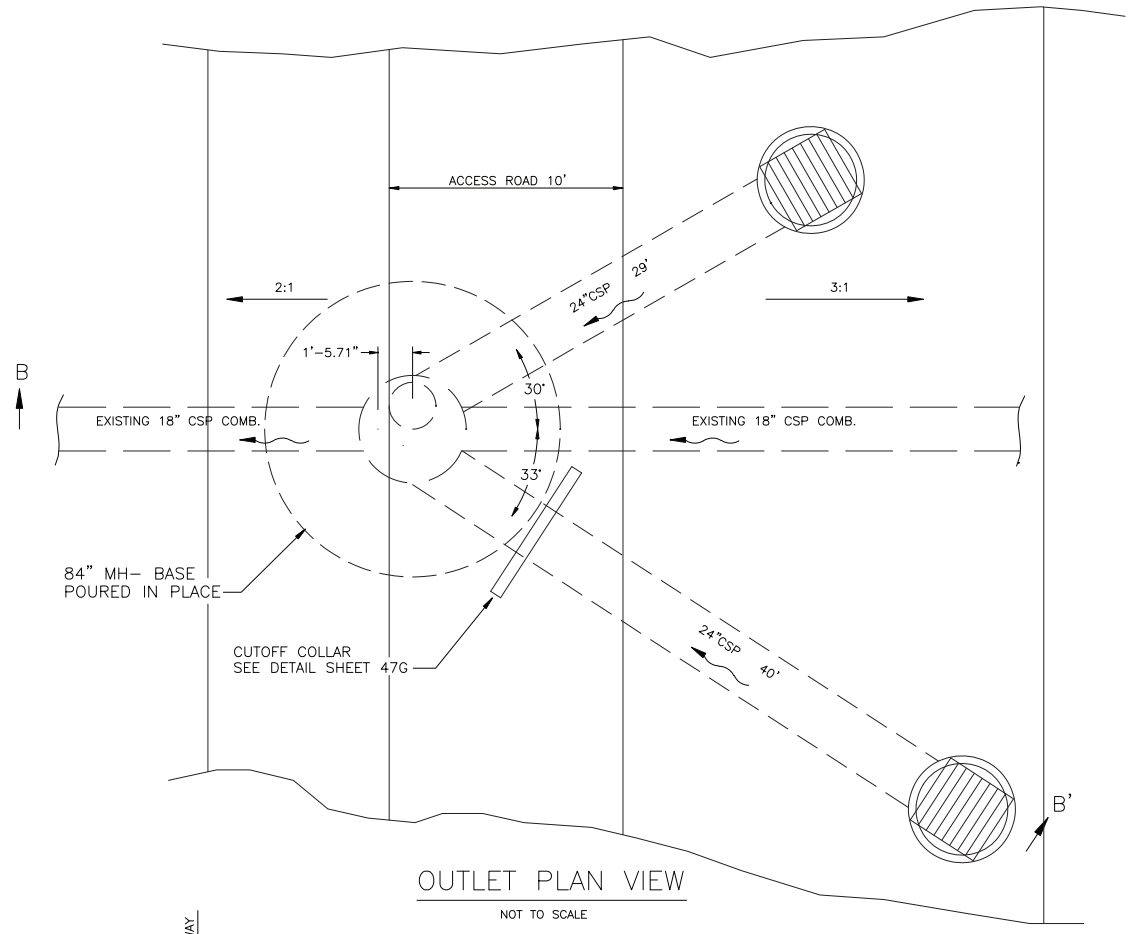
DESIGNED BY	JG	DATE APPD.	
DRAWN BY	BRF	PROGRAM MGR	
CHECKED BY	JKS	CONST. MGR.	PG
DESIGN MGR.	ETS	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

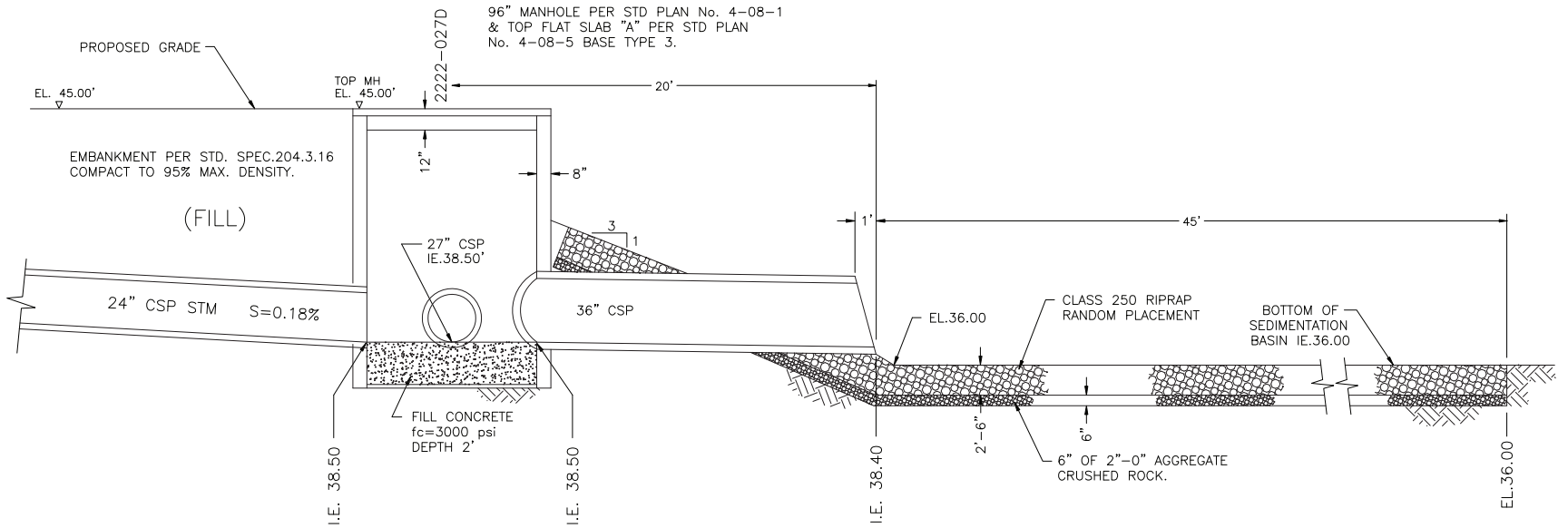
ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER SEPARATION PROJECT

1/4 SECTION	2222
JOB NO.	5147
SHEET NO.	2 OF 47



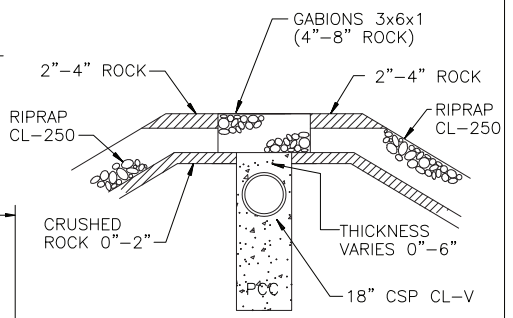
OUTLET PLAN VIEW

NOT TO SCALE



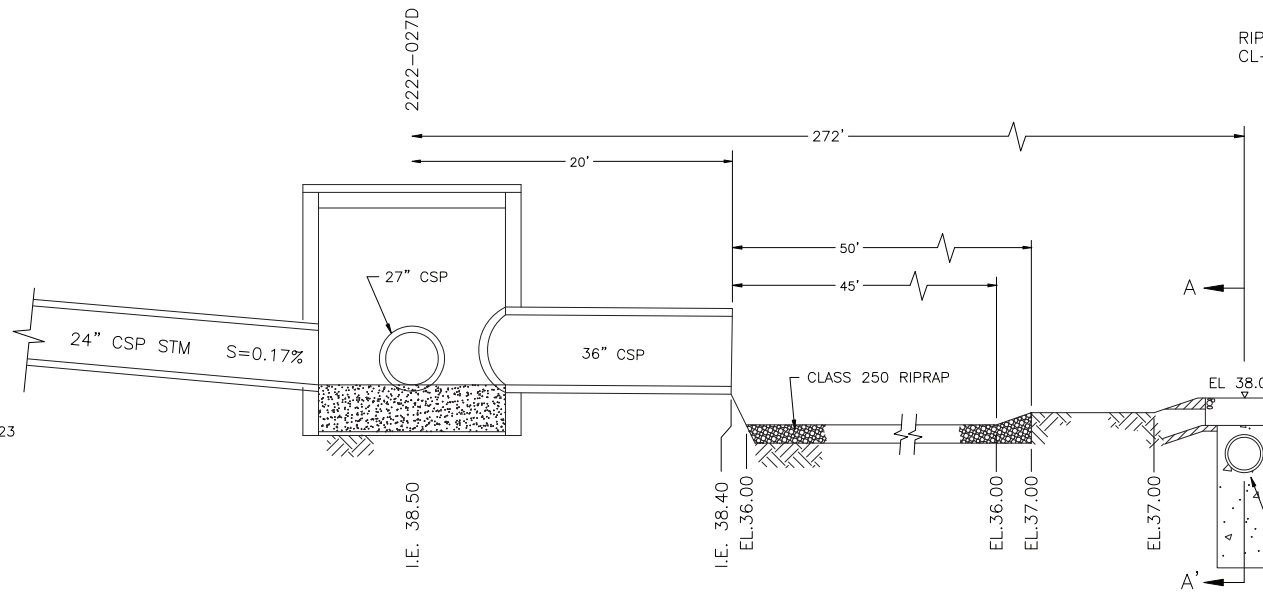
MH-49-00 ENERGY DISSIPATOR

NOT TO SCALE



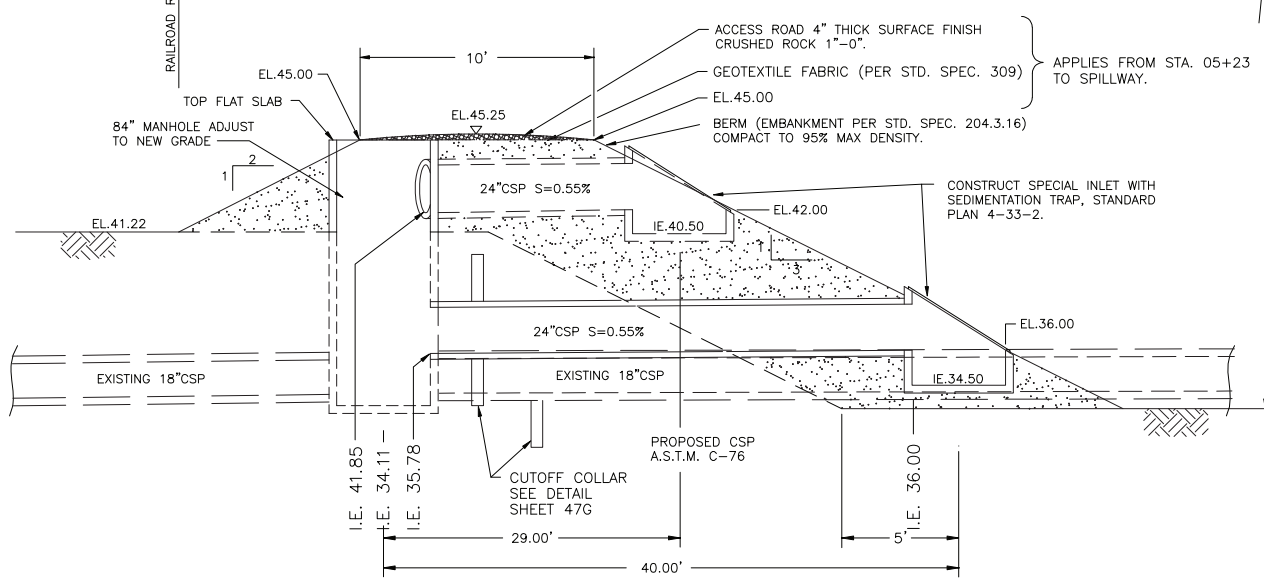
DETAIL 'A'

NOT TO SCALE



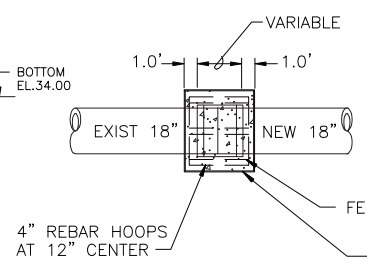
PROFILE

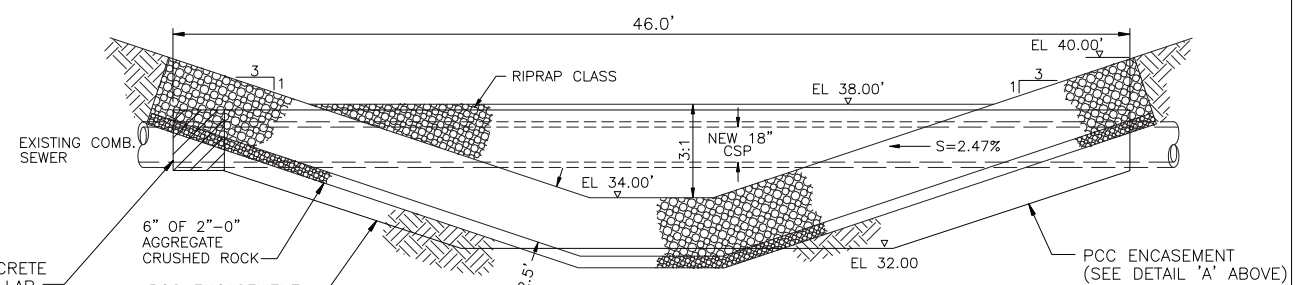
NOT TO SCALE



OVERFLOW AND NORMAL FLOW OUTLET
CROSS SECTION B-B'

NOT TO SCALE





NEW 18" CSP - CL V SEWER
CROSS SECTION A-A'

NOT TO SCALE

DETAILS - STORM WATER FACILITY AT N. VAN BUREN AVE.

ORIGINAL DESIGN SIGNED BY:
James K. Soli

Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Alliance Corp.
PROJECT COMPLETED 8/1/1995
MAP CORRECTED BY Parametrix CHECKED BY CStark
FINAL MAP DATA
5147C46, 09/24/97 at 11:58

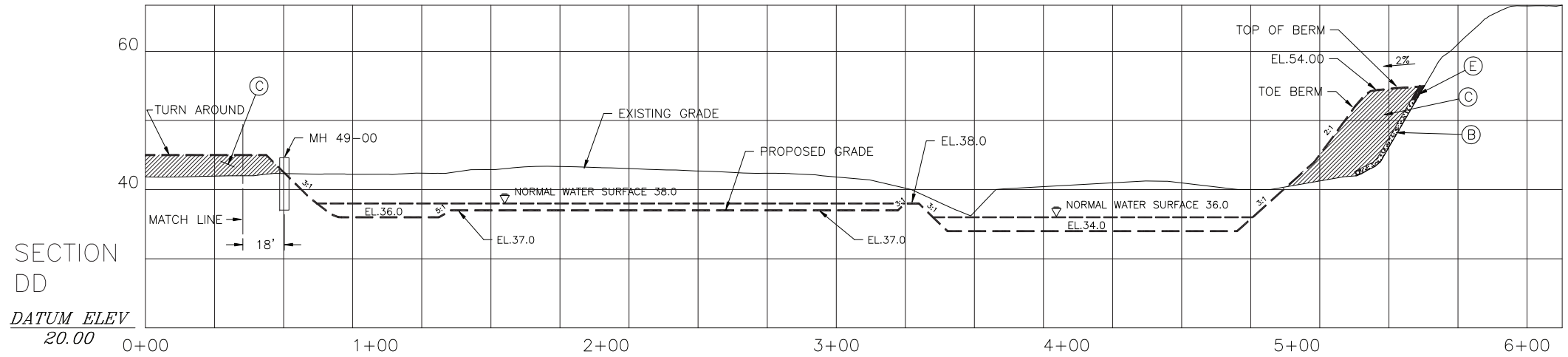
DESIGNED BY	JG	DATE APPD.	
DRAWN BY	BRF	PROGRAM MGR	
CHECKED BY	JKS	CONST. MGR.	PG
DESIGN MGR.	ETS	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER
SEPARATION PROJECT

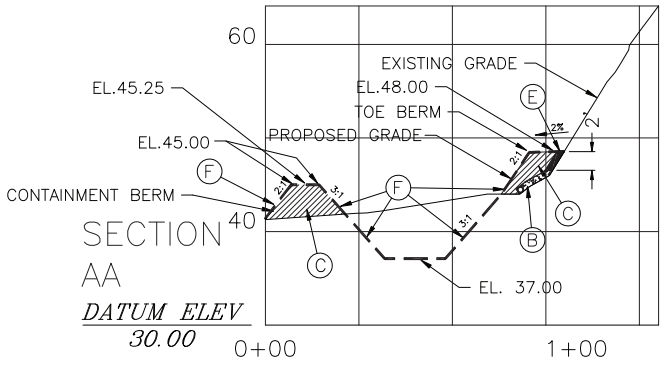
1/4 SECTION	
JOB NO.	5147
SHEET NO.	46 OF 47



SECTION DD

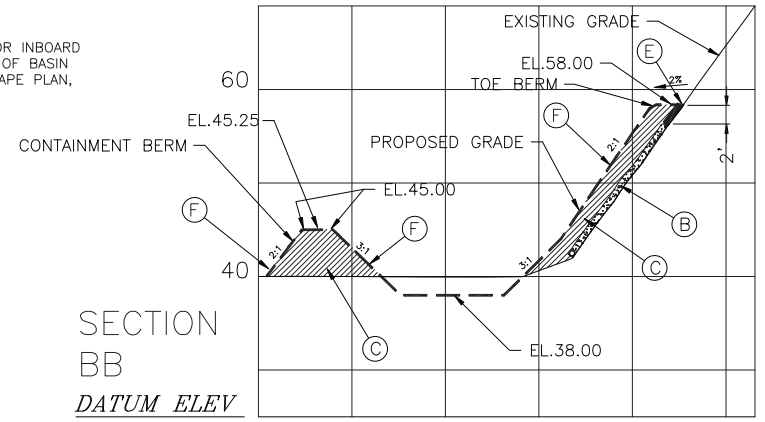
DATUM ELEV 20.00

PROFILE: HORIZ: 1"=30'
VERT: 1"=10'



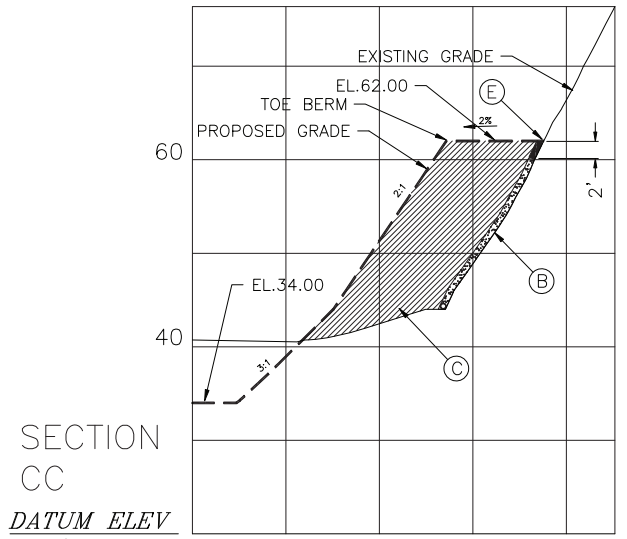
SECTION AA

DATUM ELEV 30.00



SECTION BB

DATUM ELEV 25.00



SECTION CC

DATUM ELEV 20.00

(E) SILTY MATERIAL OR TOPSOIL, AS APPROVED BY ENGINEER PRIOR TO PLACEMENT.

(F) 12 INCH THICKNESS OF TOPSOIL AS APPROVED BY ENGINEER PRIOR TO PLACEMENT, ON ALL SLOPES ABOVE ELEVATION 37.00. DO NOT PLACE TOPSOIL ON ACCESS ROAD OR TURN ARPOUND. IN RIPRAP AREAS FILL VOID OF RIPRAP WITH TOPSOIL.

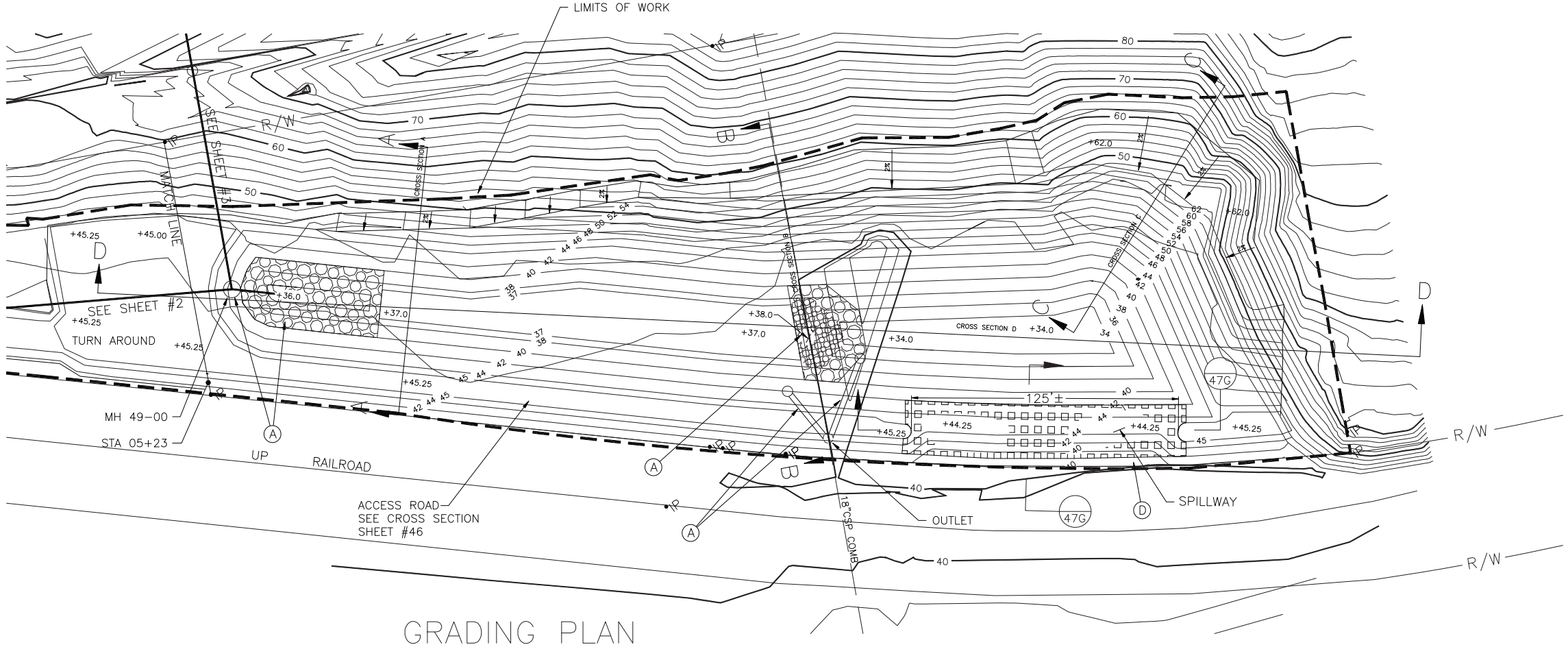
(A) DETAILS, SEE SHEET #46

(B) SUBDRAINS, SEE DETAIL ON SHEET #47-A.

(C) COMPACT TO A MIMIMUM OF 95% OF STANDARD PROCTOR MAXIMUM DENSITY BY ASTM D 698. ALL FILL MATERIALS SHALL BE APPROVED BY ENGINEER PRIOR TO PLACEMENT.

(D) SPILLWAY EROSION CONTROL PER SPECIAL SPECIFICATION.

NOTE: PERMANENT EROSION CONTROL FOR INBOARD AND OUTBOARD SLOPES, BOTTOM OF BASIN AND TOP OF BERMS PER LANDSCAPE PLAN, SEE SHEET #47-E.



GRADING PLAN

30 0 15 30 60

SCALE FEET

ORIGINAL DESIGN SIGNED BY: William F. Ryan
Bureau of Environmental Services

ORIGINAL DESIGN SIGNED BY: James K. Soli
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

XREF(S) USED:
ROTATION ANGLE:
CONSTRUCTED BY Alliance Corp.
PROJECT COMPLETED 8/1/1995
MAP CORRECTED BY Parametrix CHECKED BY CStark
FINAL MAP DATA
5147C47, 09/24/97 at 12:29

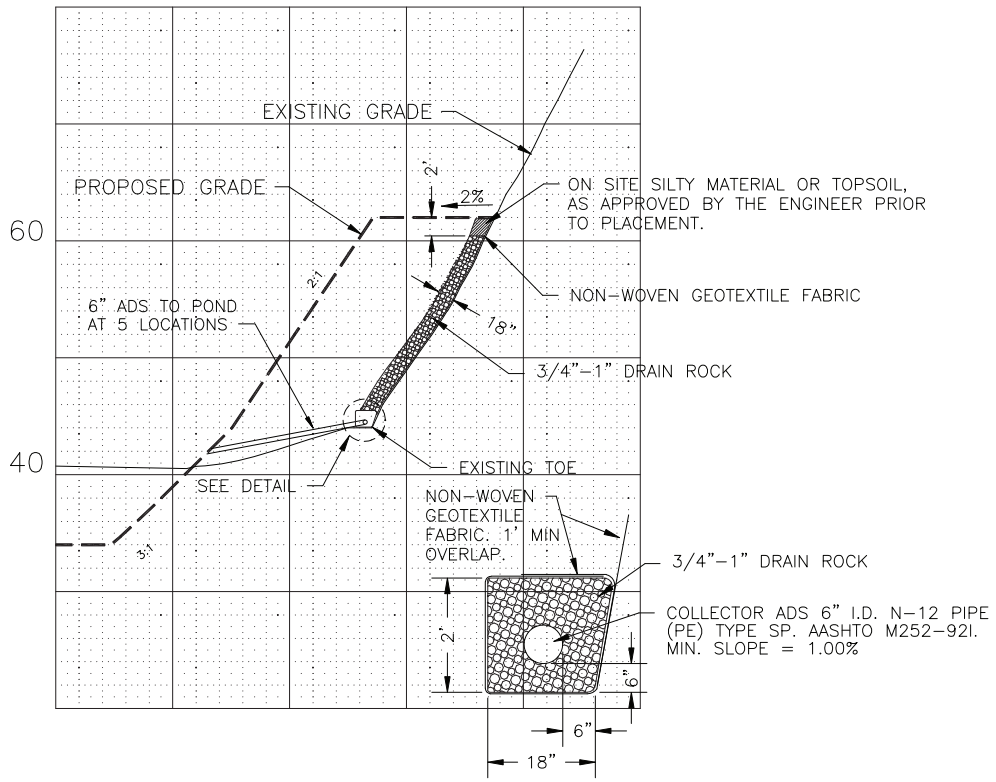
DESIGNED BY	JG	DATE APPD.	
DRAWN BY	BRF	PROGRAM MGR	
CHECKED BY	JKS	CONST. MGR.	PG
DESIGN MGR.	ETS	CADD MGR.	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

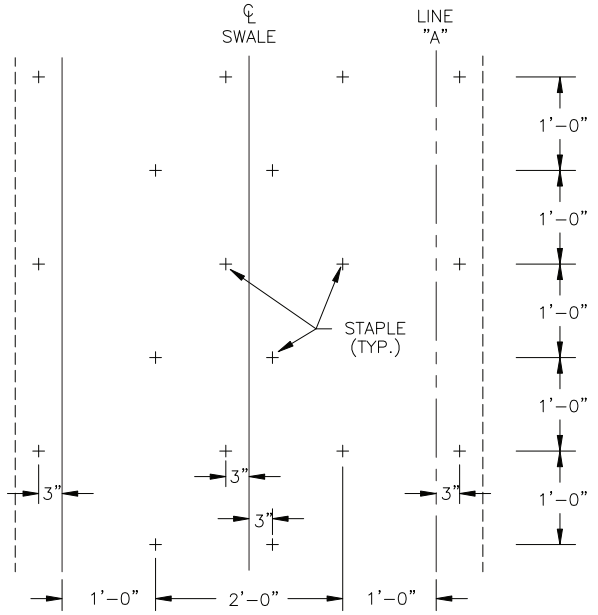
ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER
SEPARATION PROJECT

1/4 SECTION	2222
JOB NO.	5147
SHEET NO.	47 of 47

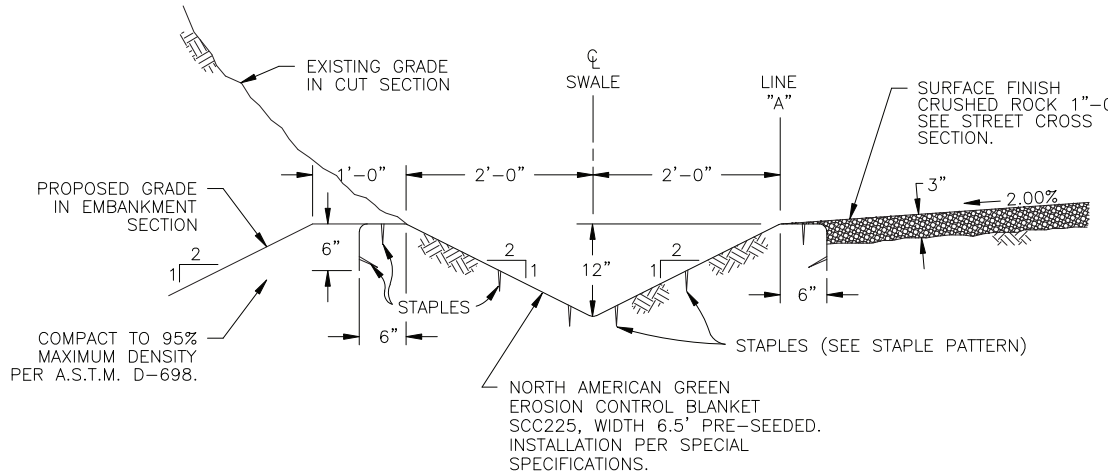


CROSS-SECTION DETAIL
SUBDRAIN IN TOE BERM

NOT TO SCALE



STAPLE PATTERN
EROSION CONTROL BLANKET



TYPICAL CROSS SECTION

DETAILS
VEGETATED SWALE

NOT TO SCALE

ORIGINAL DESIGN SIGNED BY: William F. Ryan
Bureau of Environmental Services

ORIGINAL DESIGN SIGNED BY: James K. Soli
Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

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CHECKED BY	JKS	CONST. MGR.	PG
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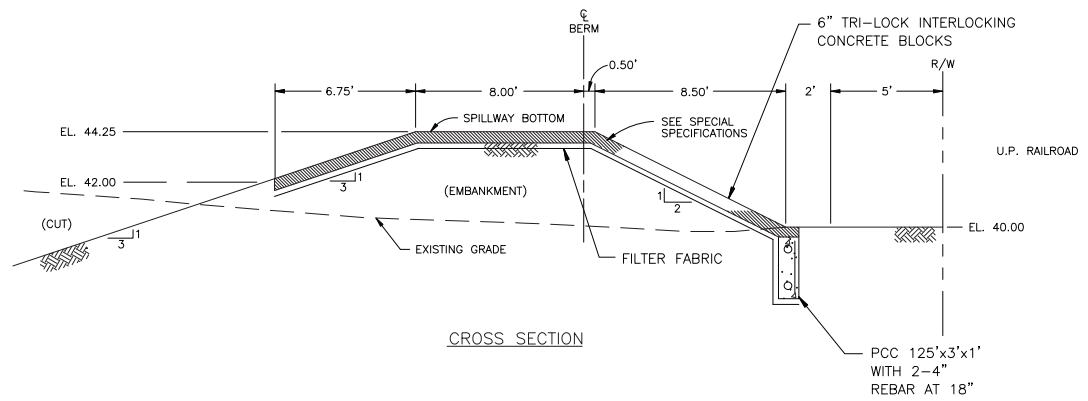
CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER SEPARATION PROJECT

1/4 SECTION	
JOB NO.	5147
SHEET NO.	47A
OF	47



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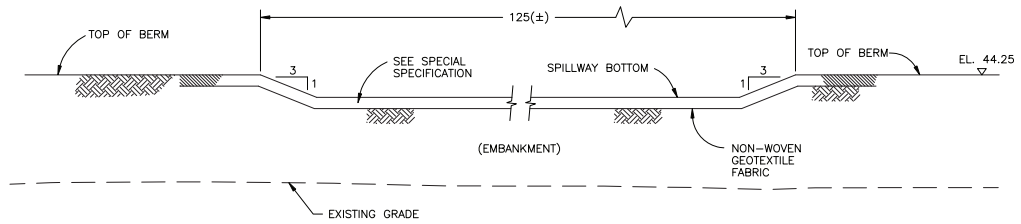

LONGITUDINAL SECTION

SPILLWAY DETAILS

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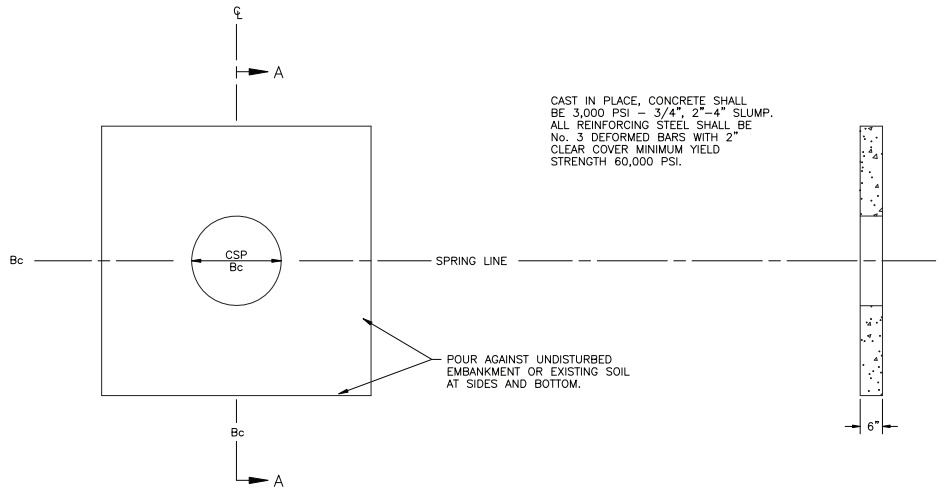

PLAN VIEW

SECTION A-A

CUTOFF COLLAR DETAIL

NOT TO SCALE

ORIGINAL DESIGN SIGNED BY:
James K. Soli

Bureau of Environmental Services

NO.	DATE	DESCRIPTION	APPD.

REVISION

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CITY OF PORTLAND
ENVIRONMENTAL SERVICES

AS-BUILT

ST. JOHNS
'B' BASIN DRAINAGE SYSTEM
COMBINATION SEWER SEPARATION PROJECT

1/4 SECTION

JOB NO. 5147

SHEET NO. 47G OF 47

APPENDIX B

Health and Safety Plan

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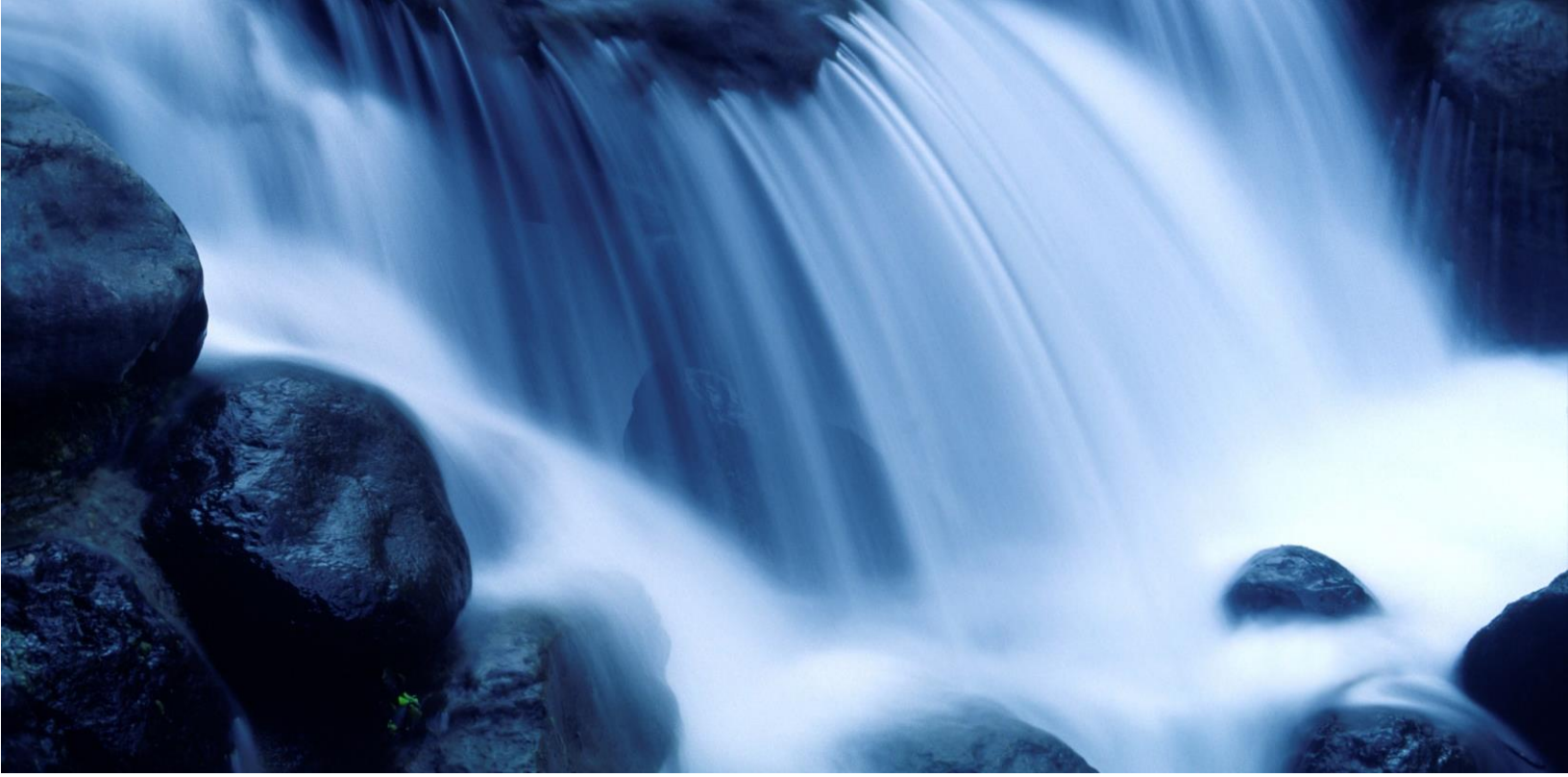

Appendix B of Sampling and Analysis Plan

GSI Site-Specific Health and Safety Plan

City of Portland, Portland Harbor Study Area

Source Control Effectiveness Monitoring Project

September 2023

Prepared by:

GSI Water Solutions, Inc.

55 SW Yamhill St., Suite 300, Portland, OR, 97204

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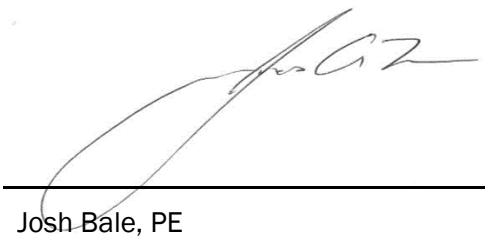
Site-Specific
Health and Safety Plan



Josh Bale, PE
HASP Preparer

Prepared for:

City of Portland

Prepared by:

GSI Water Solutions, Inc.
55 SW Yamhill Street, Suite 300
Portland, Oregon 97204

Chris Martin, PE
HASP Reviewer

Josh Bale, PE
Principal Engineer

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Contents

Tables

Attachments

Abbreviations and Acronyms

°F	degrees Fahrenheit
AED	automated external defibrillator
AHA	activity hazard analysis
CFR	Code of Federal Regulations
COC	contaminant of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DEQ	Oregon Department of Environmental Quality
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
GFCI	ground fault circuit interrupter
GSI	GSI Water Solutions, Inc.
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	Health and Safety Plan
LOTO	lockout/tag-out
mph	miles per hour
NRC	National Response Center
OSHA	U.S. Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PE	Professional Engineer
PFD	personal flotation device
PM	Project Manager
PPE	personal protective equipment
Site	Portland Harbor
SAIF	State Accident Insurance Fund Corporation
SAP	field sampling plan
SDS	safety data sheets
SSO	Site Safety Officer
STSC	Safety Trained Supervisor - Construction
SZ	Support Zone

SECTION 1: **Emergency Action Plan**

1.1 Emergency Services and Contacts

In case of emergencies, call 911.

Always use an ambulance to go to the closest hospital (Table 1) for life-threatening injuries.

Table 1. Emergency Contacts

Emergency Service or Contact	Name	Phone Number
Local Police	Multnomah County Sheriff's Office	911 (emergency) 503.988.5300 (non-emergency)
Local Ambulance	American Medical Response	911 (emergency)
Local Fire Department	Portland Fire & Rescue Station 13 Portland Fire & Rescue Station 26	911 (emergency) 503.823.3700 (non-emergency)
Local Hospital	**Legacy Emanuel** 2801 N Gantenbein Ave. Portland, OR 97227	911 (emergency) 503.413.2200 (non-emergency)
Local Urgent Care	**Legacy-GoHealth Urgent Care**	971.202.2910
GSI Safety Chairperson	Kathy Roush	Office: 971.200.8527 Cell: 919.605.6644
GSI Incident Intervention	WorkCare	888.449.7787
Poison Control Center	—	800.222.1222
Oregon Emergency Response System (to report a hazardous spill to the state agency)	—	911 (emergency) 800.452.0311 (non-emergency)
National Response Center (NRC) (to report a hazardous spill)	—	800.424.8802
State Reporting Agency (Oregon Occupational Safety and Health [OSHA])	—	800.321.6742 (Oregon)
Consultant Project Manager	Josh Bale (GSI Water Solutions, Inc.)	Cell: 530.276.4188
Site Safety Officer	Andrew Blake (Succeed Environmental Consultants, LLC)	Cell: 971.371.0404
Client Group Name Project Coordinator	Kyle Haggart (City of Portland)	Cell: 503.865.6887

Note

— = not applicable

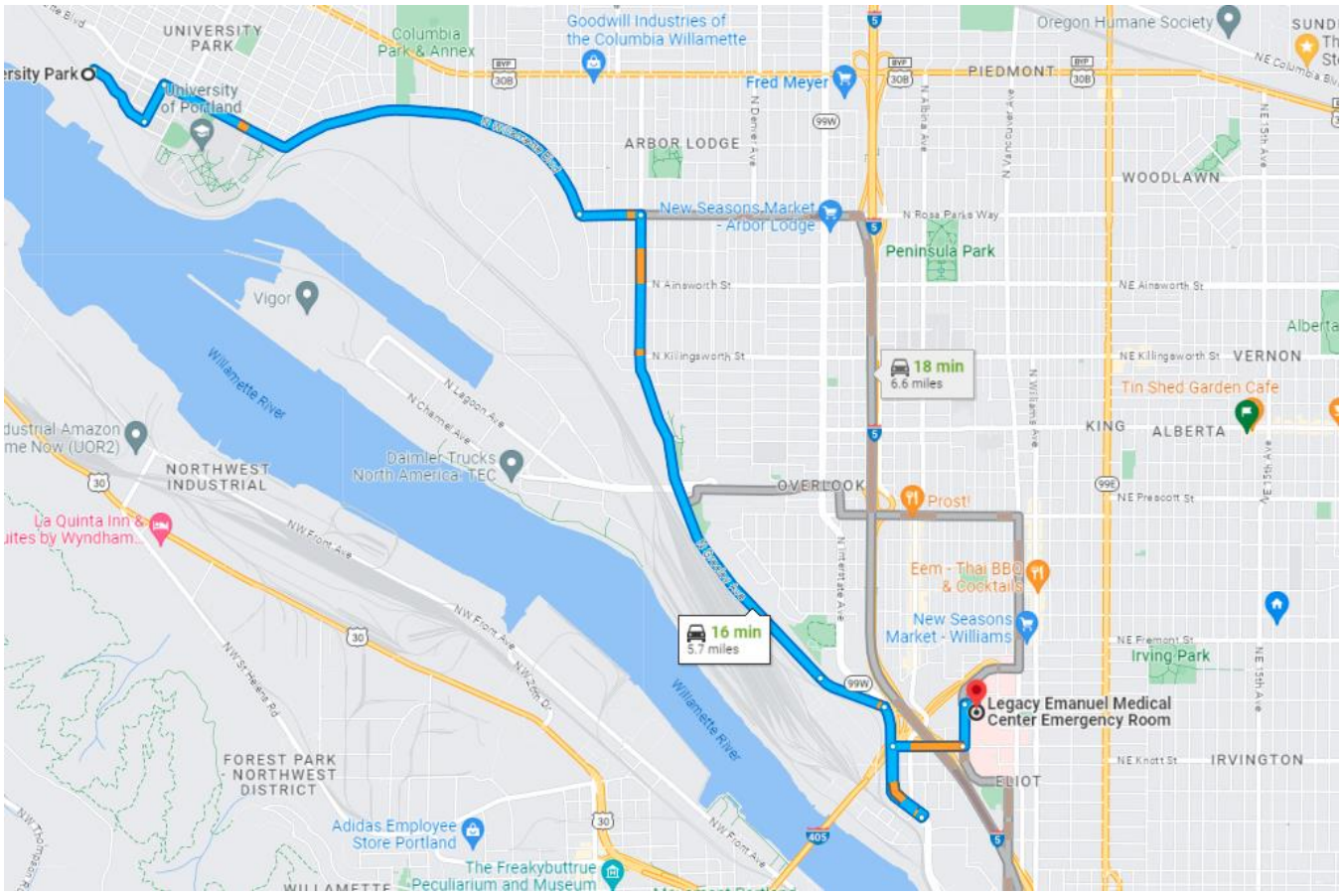
1.2 Hospital Location and Directions Map

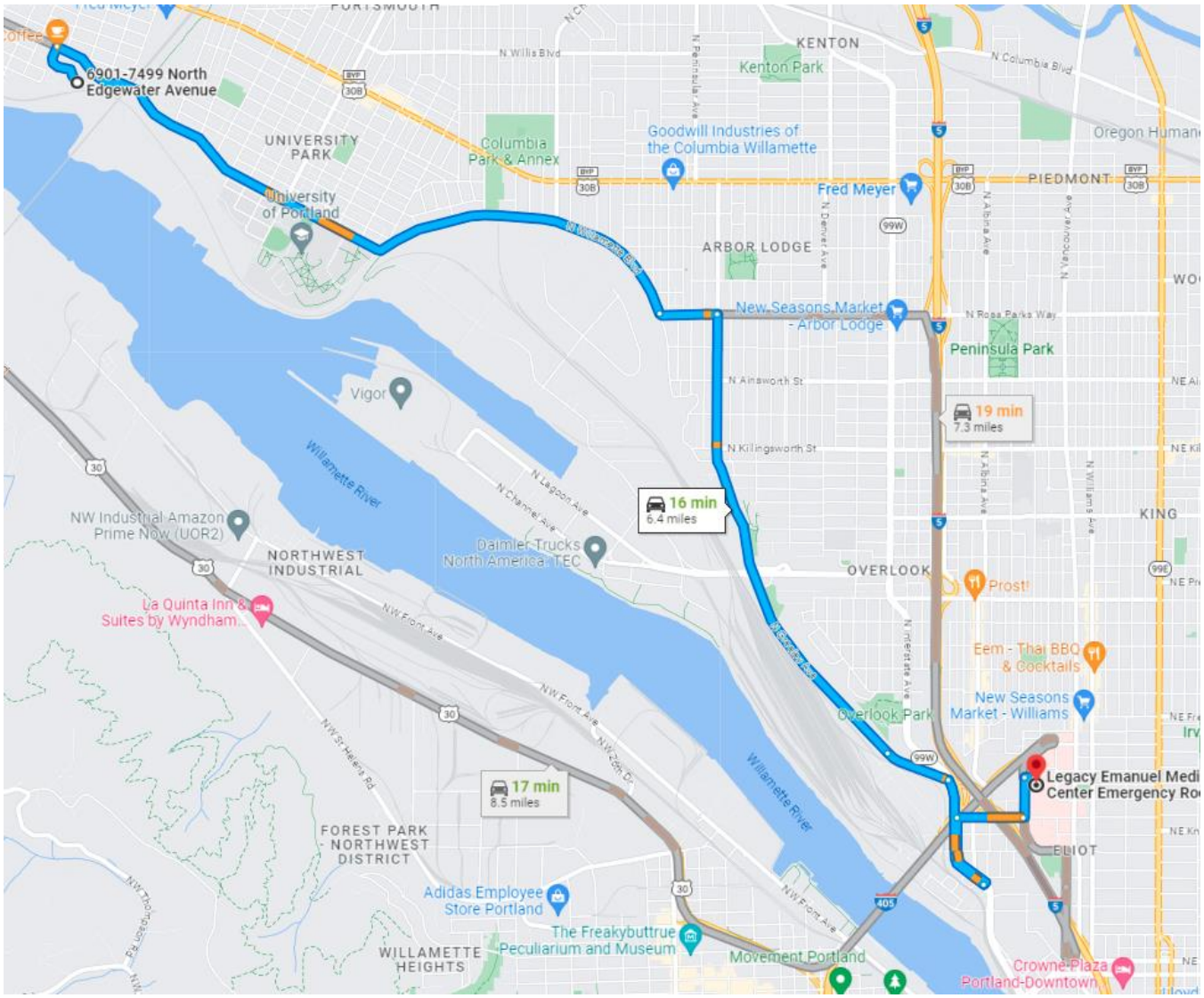
1.2.1 From Basin 48 and 49 Sampling Locations

The muster point for Basin 48 and 49 sampling work will be at the north side of the UPRR road crossings to the north of the sampling location. EMS should be directed to meet personnel near these points.

Driving directions to the nearest emergency medical facility (5.7 or 6.4 miles) from the sampling location parking areas to Legacy Emanuel Medical Center (2801 N Gantenbein Ave., Portland, Oregon 97227):

1. Head north on N Van Houten Pl. toward N Willamette Blvd (0.4 mile) or head north on N Edgewater Blvd towards N. Willamette Blvd (0.2 mile)
2. Continue on N Willamette Blvd until it turns into N Greeley Ave., then N Interstate Ave., then turn left onto N Albina Ave. (4.8 miles or 5.7 miles).
3. Turn right onto N Graham St. (0.5 mile).
4. Turn right into the hospital parking lot (100 feet).





The trip from the utility parking lot to Legacy Emanuel Medical Center takes an average of 15 to 20 minutes, depending on time of day and traffic conditions. Personnel should check road conditions on a map application immediately prior to transport to hospital.

To facilitate EMS in locating the field team, one person (when available) should meet EMS at the railroad track crossing point.

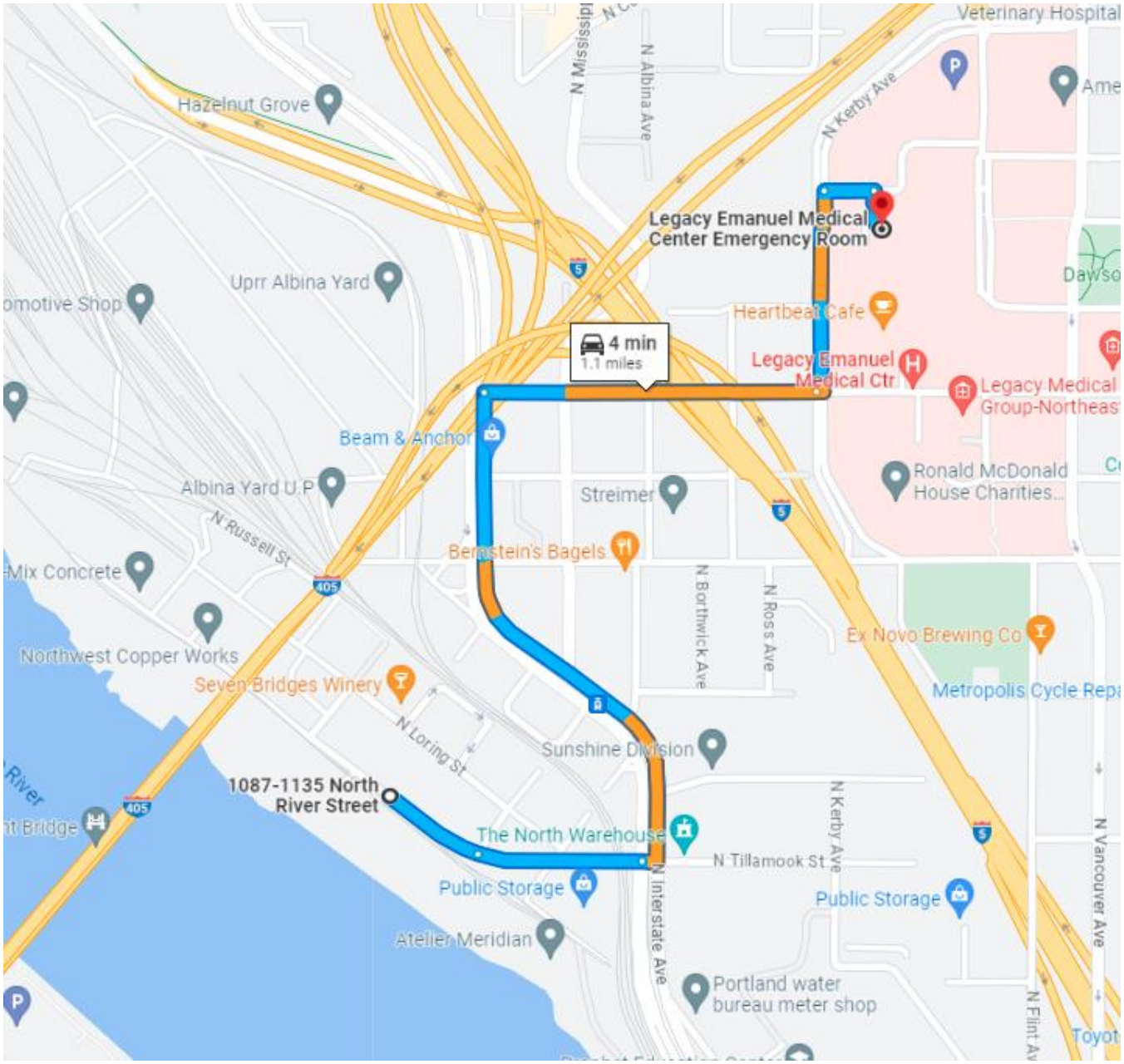
1.2.2 From Basin 43/44/45 Sampling Locations

The muster point for Basins 43 through 45 sampling work will be along N River Street. EMS should be directed to meet personnel at the sampling location or the entrance gate to secured areas.

Driving directions to the nearest emergency medical facility (approximately 1.1 miles) from the International Raw Materials parking lot to Legacy Good Samaritan Medical Center (1015 NW 22nd Ave., Portland, Oregon 97210):

1. Head southeast on N River St. toward N Lewis Avenue (distance varies).
2. Continue on N Tillamook St. then left onto N. Interstate Ave (0.1 mile).
3. Turn right onto N Graham St. (0.2 mile).

4. Turn left onto N. Krby Ave (0.2 mile).
5. Turn rigth onto N. Morris St. (200 feet).
6. Turn right into the hospital parking lot (100 feet).



The trip from the parking area to Legacy Good Samaritan Medical Center takes an average of 5 to 8 minutes, depending on time of day and traffic conditions. Personnel should check road conditions on a map application immediately prior to transport to hospital.

To facilitate EMS in locating the field team, one person (when available) should meet EMS at the entrance to secured areas, where necessary.

1.3 Emergency Procedures

In the event of emergency, personnel will be instructed to leave the area immediately and the Site Safety Officer (SSO) will contact the appropriate emergency response providers listed in Table 1 in Section 1.1 of this Health and Safety Plan (HASP). Directions to the nearest medical facility from the muster point for are provided in Section 1.2 of this HASP. An Incident Report Form will be completed when there is an accident (see Section 13 and Attachment 1).

Field personnel will be trained in first aid procedures (including cardiopulmonary resuscitation [CPR]) and will have access to a first aid kit. The first aid kit will be located to sampling activities in an unlocked location.

In the event of an occupational accident or incident, please indicate to the medical facility that this is a Workers' Compensation case, that your employer is GSI Water Solutions, Inc. (GSI), and that the insurance administrator for Workers' Compensation claims is State Accident Insurance Fund (SAIF) Corporation. Subcontractors should follow their company policies related to injury reporting. All subcontractors must follow company protocols for occupational injury and accident reporting.

1.4 Emergency Supplies and Equipment List

Table 2 lists needed equipment, locations, and notes for use.

Table 2. Safety and Other Equipment Locations

Equipment	Location and Notes
First aid kit	Required for all work.
Class ABC fire extinguisher	Required for all work.
Whistle/air horn	Recommended.
Eye wash station	Required for all work.
Wheel chocks	Required on vehicles parked in areas on steep slopes. Emergency brake must be used at all times.
Flashlights, head lamps	Required when working between dusk and dawn. Lighting support also required when visibility is less than 5 foot-candles within 3 feet of worker.

SECTION 2: **Organizational Structure**

This site-specific HASP has been developed for conducting stormwater monitoring at City outfall basins in the Portland Harbor Study Area on behalf of the City of Portland in accordance with OSHA 29 Code of Federal Regulations (CFR) 1910 and 1926, and the GSI Health and Safety Policy (GSI, 2020). This HASP covers potential field hazards associated with the tasks necessary to complete the Scope of Work for all Site support activities, including sampling, surveying, technical field support to the client, and field reconnaissance.

Site Name and Address	Portland Harbor Study Area, Portland, OR		
Project Name	Source Control Effectiveness Monitoring Project	**Project Number**	0110.162
Date	September 2023	**Revision Number**	1

2.1 Project Team Organization and Authorities

Table 3 provides project roles and responsibilities for field staff members and subcontractors relative to this HASP.

Table 3. Project Roles and Responsibilities

Name	Role	Responsibility
Josh Bale (GSI Water Solutions, Inc.)	Project Manager (PM)	The PM has overall responsibility for the delivery of the project and management of all members of the team, including external advisors and subcontractors. The PM is the point of contact for the client and regulatory agencies with respect to implementation of this HASP. The PM has the responsibility and authority to direct all work operations, oversee and coordinate safety and health functions with the Site Safety Officer and ensures the implementation of HASP requirements and procedures in the field.
Andrew Blake (Succeed Environmental Consultants, LLC)	Site Safety Officer (SSO)	The SSO has full responsibility and authority to develop and implement this HASP and to verify compliance. The SSO is at the Site or readily accessible to the Site during all work operations and has the authority to halt work if unsafe conditions are observed or suspected.

Name	Role	Responsibility
Subcontractors	Field Activities	With the exception of subcontractors specifically identified above as part of the management team, subcontractors will be responsible for their own HASPs. However, even sampling support subcontractors are required to maintain a corporate-level or site-specific HASP that covers field sampling and investigation activities. HASPs must meet or exceed the minimum requirements identified by OSHA 29 CFR 1910 and 1926. Subcontractors must ensure the developed HASP complies with the minimum requirements associated with this HASP, including using the proper personal protective equipment (PPE), reporting unsafe acts and conditions, and following the work and safety and health instructions of the PM, SSO, and site-specific HASP and protocols

Notes
All personnel requiring access to controlled work areas must have completed the appropriate training. If field personnel change, substitutions will be made with similarly qualified personnel.
CFR = Code of Federal Regulations
HASP = Health and Safety Plan
Site = Mid-Willamette Valley Intermodal Center Site
TBD = To be determined

Any modifications to this HASP will be recorded in Section 2.4, Table 4, of this HASP.

2.2 Stop Work Authority

All workers have "Stop Work Authority" to immediately stop work if they believe that a particular task is being performed in an unsafe manner. This authority may be exercised at any time by anyone working at the Site without repercussions or retribution. If individuals observe hazards for which they are unprepared, they will withdraw from the area to reevaluate the task and develop appropriate safety precautions before proceeding. The GSI Site Safety Officer will be contacted to determine next steps and this HASP will be revised accordingly.

2.3 Limitations

This HASP was prepared exclusively for the City of Portland by GSI in accordance with OSHA 29 CFR 1910 and 1926, and the GSI Health and Safety Policy (GSI, 2020). This HASP covers known field hazards associated with the tasks necessary to conduct stormwater monitoring at City outfall basins in the Portland Harbor Study Area. The quality of information herein is consistent with the level of effort required for GSI services and is based on (1) information available at the time of preparation; (2) data supplied by outside sources; and (3) the assumptions, conditions, and qualifications set forth in this HASP. This HASP is intended to be used by field personnel for sampling, surveying, technical field support to the client, and site reconnaissance only. Any other use of, or reliance on, this HASP by GSI or any third party is at that party's sole risk.

The information contained herein is relevant to Site conditions known at the time of the HASP development. In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the information contained in this HASP may not be valid. If additional information becomes available, it should be provided to GSI to modify the HASP as necessary.

2.4 Approvals and Modifications

City of Portland or a designated representative is responsible for the approval of this plan and any future modifications after preparation. Modifications will be documented in Table 4.

Table 4. Record of Modifications and Version Control

Section Revised	Page #	Description of Changes	Author	Date Issued	Reviewed By
N/A	Throughout	Update for 2023 sampling season	J. Bale	September 6, 2023	C. Martin

SECTION 3: **Site Description and Scope of Work**

3.1 Site Description

The work areas are located at manholes near the east shoreline of the Portland Harbor Superfund Site, Portland, Oregon 97227 for Outfalls 43, 44, 45, 48, and 49.

Staff will not enter stormwater sampling areas without pre-approval from the City of Portland. The PM will coordinate access with designated site representatives, prior to commencing work.

3.2 Scope of Work

This HASP covers actions to be taken for conducting stormwater monitoring at City outfall basins in the Portland Harbor Study Area. Stormwater grab samples will be collected from the designated basin-scale monitoring locations during a storm event (ideally early in the rainy season).

3.3 Locations of Nearest Facilities

The locations of facilities, such as restrooms, are noted in Table 5.

Table 5. Locations of Nearest Facilities

Facility	Notes
Telephone	Employees should keep fully charged cell phones.
Water Source	Employees will be provided access to clean drinking water. The SSO will ensure that a sufficient water supply is maintained.
Restroom	Location will vary and will be identified in the field before work commences. Public restrooms are available at some parks near work areas.
Personal Hygiene	Hand wash stations, hand washing water and soap, and/or hand wipes will be supplied at all times. Personnel must not eat food, drink, or smoke around work areas.

Notes

SSO = Site Safety Officer

3.4 Site Access

Vehicle access to the Site varies as sampling points are located at several locations along the east side of the Willamette River in the Portland Harbor Study Area. The Portland Harbor Study Area and access points are shown on the *2023-2024 Outfall Effectiveness Monitoring Sampling and Analysis Plan*.

SECTION 4: **Safe Work Practices**

As much as possible, all field activities will be conducted during daylight hours. However, as it is possible stormwater sampling work may occur at night, support lighting will be required when work is conducted between dusk and dawn.

4.1 Accident Prevention

The SSO and all employees will inspect the work area and/or Site daily to identify and correct any unsafe conditions. Field personnel and subcontractors should inspect the work area thoroughly before leaving the Site. Adherence to the safe work practices and procedures outlined in this HASP and attachments will assist with accident prevention.

Access will be limited to all controlled areas via the prescribed administrative (certifications) and engineering (barricades) controls, as described above. All project-area staff and visitors will note arrival and departure times on a field log maintained by the SSO.

- All unsafe conditions will be corrected immediately. All unsafe conditions not in the scope of the project will be reported to the SSO and the condition corrected.
- Where portable electric tools and appliances can be used (where there is no potential for flammable or explosive conditions), they will be equipped with three-wire grounded power and extension cords to prevent electrical shock. Use of a ground-fault circuit interrupter (GFCI) to prevent electrical shock is required.
- Store tools in clean, secure areas so that they will not be damaged, lost, or stolen.
- All equipment, tools, and property will be secured, as needed, at the end of each day.
- Maintain good housekeeping practices to prevent slips, trips, and falls.

4.2 Personal Conduct

- Unauthorized personnel are not allowed at the Site.
- Personnel under the obvious influence of alcohol or controlled substances are not allowed at the Site; those taking medications that could impact ability to safely perform work must notify the SSO before beginning work.
- All Site personnel will familiarize themselves with Site safe work practices and the emergency procedures during daily tailgate and pre-work safety meetings.
- No “horseplay” or unsafe actions or activities will be allowed.

4.3 Vehicular Use

The following requirements shall be observed when operating and in the vicinity of motor vehicles:

- On public roads, adhere to traffic regulations and speed limits.
- Within the boundaries of private facilities, comply with site requirements for motor vehicles.
- Inspect the driving area for access, soft ground, and obstacles or sharp objects that may damage the vehicle.
- Where possible, move the vehicle to be close to the sampling location.
- If possible, drive in and out of the location, rather than reversing. If reversing is necessary, use a spotter as a guide.
- Use wheel chocks when parked on steep slopes.

- Before exiting a vehicle, shift into park, set the parking/emergency brake, and shut off the engine.
- Never leave a running vehicle UNATTENDED.
- Do not fuel engines while the vehicle is running.
- Install adequate roads, signs, lights, and devices, where applicable.
- Cell phone use while driving is not permitted.
- Employees who are passengers or drivers of vehicles will wear their seat belts any time the vehicle is in motion.

4.4 Slips/Trips/Falls

Good housekeeping practices should be used at all times to minimize trip hazards and falls. Extra caution should be taken when work on unstable surfaces, uneven terrain, steep grades, and elevated surfaces cannot be avoided. Fall protection must be provided when working on heights of 6 feet or more. Refer to OSHA fall protection requirements for varying heights and conditions. Refer to the Information on Slips, Trips, and Falls fact sheet for further information (Attachment 3).

4.5 Blood-borne Pathogens

First aid responders have the potential to be exposed to blood-borne pathogens. The potential for exposure to blood-borne pathogens exclusive of an emergency response is not anticipated. When rendering first aid in situations where exposure to bodily fluids or blood may occur, responders will wear, at a minimum, latex or nitrile gloves, and a face shield or safety glasses. Employees are not required to administer first aid. Employees are required to immediately assess any emergency situation and seek professional assistance as appropriate.

4.6 Manually Lifting Hazards

Assess the load to be lifted, loaded, pushed, or pulled. Solicit help if the load cannot be safely moved by one person or if handling the load is too awkward. Consider breaking loads into pieces and taking multiple trips. Lift with the knees and hold load close to body. Make sure footing is firm, the path is clear, and avoid twisting. Use these techniques when setting a load down.

4.7 Sharp Objects

Sharp objects are broadly defined; the potential hazards are specific to each work area. Sharp objects may include, but are not limited to, nails, exposed metal edges, metal shards, exposed rebar, broken glass, and sharps. Employees should look for and scan the work area for the presence of sharp objects to avoid contact (such as stepping or sitting on the sharp objects) and potential injury. Remove or protect other workers from exposure to hazards from sharps, where possible and safe to perform. Particular care should be taken in areas where debris is present. If sharps are present, steel-shanked boots should be considered where they provide increased worker protection. Leather gloves should be worn at all times when moving or coming into contact with materials that pose a cut or puncture risk. When possible, use tools such as rakes and shovels to avoid direct handling of debris when moving it.

4.8 Sanitation

Potable drinking water will be supplied in tightly closed containers and will be clearly marked for its intended use. If vehicles are available for use by field crews, restrooms and a field washing area with potable water

will be available within a reasonable distance from the Site. If sanitary facilities are not located within a reasonable distance, portable facilities will be installed for use by field employees.

Note that Attachment 10, Novel Coronavirus Guidelines, includes specific protocols to follow for sanitation and hygiene to prevent the spread of Coronavirus Disease 2019 (COVID-19). These protocols must be followed until the Consultant Project Manager or designee indicates otherwise.

4.9 Illumination

When fieldwork is to be conducted before dawn or after dusk, or when light conditions are less than 5 foot-candles, illumination in all Sites and access pathways to those areas will be maintained with facility lighting, temporary light plants, equipment-mounted lighting systems, or similar equipment, such that illumination at 5 foot-candles or above is provided. When and where possible, walking and working surfaces should be cleared before engaging in low-light activities.

4.10 Weather Conditions

Weather is always a potential safety factor in performing work in outdoors. To ensure worker safety, the minimum safety rules outlined in Sections 4.16.1 and 4.16.2 will be implemented. Modification of work limitations due to weather can only be approved by the SSO or PM.

4.10.1 Lightning

The 30-30 rule is a common rule used for lightning safety and is defined as follows: If lighting is seen, count to 30 seconds. If thunder is heard within 30 seconds (assumes lighting is within 6 miles), workers will shelter in place. Workers in the uplands will shelter in buildings or vehicles. Workers performing overwater work will shelter in the cabs of overwater platforms, tugs, or vessels. Sheltering in place will end 30 minutes after the last lighting with thunder occurring within 30 seconds. Weather apps such as Spark can also be used to determine whether lightning is within 6 miles of the Site. Refer to Lightning Safety When Working Outdoors (Attachment 4).

4.10.2 Cold Stress/Hypothermia

Drink plenty of fluids (not caffeinated), wear clothing appropriate for the weather conditions, and wear multiple layers. Avoid cotton clothing when possible. Monitor workers for signs of cold stress. Refer to Protecting Workers from Cold Stress (Attachment 5).

Freezing temperatures as defined as <35°F, as some areas freeze at higher air temperatures higher than 32°F. Check local weather for wind chill ("real-feel") conditions. No overwater work will be performed when temperatures are below freezing without prior approval by the SSO. If work occurs in conditions of below-freezing temperatures, salt or ice melt should be used on overwater platform, barge, and vessel decks and extreme care must be taken to prevent slips, trips, and falls. Upland work will be performed with pre-approval by the SSO only.

4.11 Hazardous Insects/Plants/Animals

Project-area hazards may include bees, snakes, spiders, and ticks. Workers should do the following: (1) avoid contact or seek medical attention if necessary; (2) wear insect repellent, as appropriate; and (3) survey the area for poison oak and use appropriate caution.

4.12 Electrical Hazards

Electrical equipment should be inspected to ensure it is in safe working order before use. Equipment should be grounded and operated under dry conditions. Where portable electric tools and appliances can be used (in areas where there is no potential for flammable or explosive conditions), they will be equipped exclusively with three-wire grounded power and extension cords to prevent electrical shock. Use of a GFCI is required to prevent electrical shock.

4.13 Unknown Chemical Exposure

Work will be stopped if visual or olfactory observations indicate unanticipated conditions. Worker PPE will be reassessed and the SSO will determine whether additional personnel monitoring is required before resuming work.

4.14 Trenches/Vaults/Confined Spaces

OSHA defines a confined space as (1) being large enough for an employee to enter and perform work (2) having limited or restricted means for entry or exit; and (3) not designed for continuous occupancy. This describes many areas that a worker may encounter on a daily basis, such as vaults or trenches.

It is against GSI policy for field personnel to enter confined spaces. No field personnel shall enter a confined space or trench for any reason without prior approval and completion of an OSHA-compliant confined space entry training.

SECTION 5: **Training Program**

All GSI employees and subcontractors performing work under GSI's HASP or a HASP consistent with GSI requirements are required to have the following training to be working in the Site (Table 6). Copies of training certificates and training records will be kept at GSI's Portland office. Field projects will not be approved to take place in the absence of adequate documentation.

Table 6. Training Requirements

Type of Current Certificate	Yes	No	Trained Field Employees
First Aid/CPR/AED	X		Required for all field personnel. First aid/CPR/AED training is provided to allow employees to voluntarily administer first aid or medical assistance to family, friends, or coworkers as Good Samaritans.[1] Field employees are not required to administer first aid. Field employees are required to immediately assess any emergency situation and seek professional assistance as appropriate.

Notes

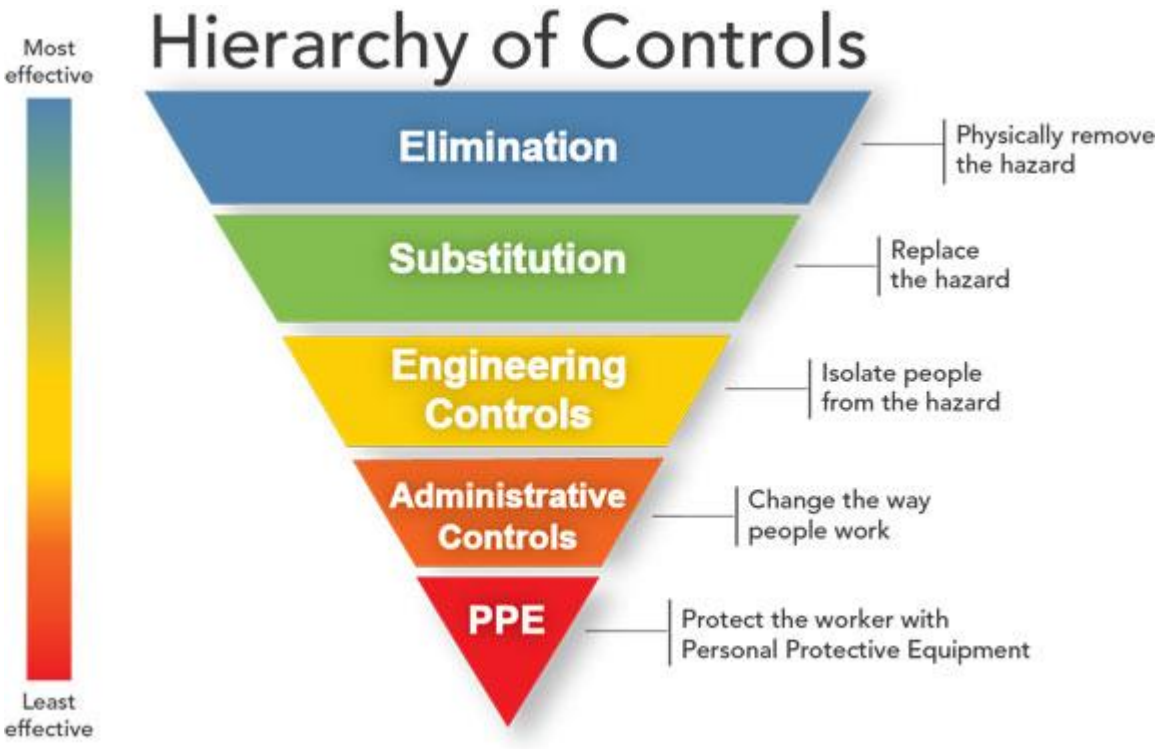
[1] The "Good Samaritan" law in Oregon (Oregon Revised Statute 30.800) maintains that people who provide emergency medical assistance without the expectation of compensation (i.e., acting as Good Samaritans) are not liable for damages for providing the emergency medical assistance.

AED = automated external defibrillator
CPR = cardiopulmonary resuscitation
GSI = Groundwater Solutions, Inc.
HAZWOPER = Hazardous Waste Operations and Emergency Response
OSHA = Occupational Safety and Health Administration
SSO = Site Safety Officer

SECTION 6: **Site Controls**

6.1 Hierarchy of Controls

Best practices for safe working environments include implementing a hierarchy of controls that, when used together, can provide redundant and/or complementary layers of protection for workers. Controls at the top of the hierarchy, such as elimination of the hazard, are potentially more effective and protective than controls at the bottom (see below).



In some cases, using controls closer to the top of the hierarchy may reduce the intensity of the controls at the bottom, thus reducing the possibility of corollary risks. For example, eliminating an exposure risk may reduce the requirement for a Tyvek[1] coverall—the use of which requires monitoring for thermal stress.

Because elimination or substitution of hazards may not be feasible at the Site, engineering controls (such as barriers and additional ventilation) may be needed to reduce exposure. Thermal control measures are an example of administrative control over how a task is done. PPE, while most common, is the least effective control in some cases and should be the LAST OPTION for minimizing exposure to hazards.

6.2 Management of Change

This HASP is intended to be site-specific and therefore responsive to actual site conditions, contract requirements, regulatory requirements, hazards, scope of work, and related conditions. For any number of reasons, it may be necessary to re-assess and revise plans. GSI detects changing, unrecognized, or new conditions through key processes such as project-area monitoring, employee observations, and inspections. Routine changes in conditions are addressed through hazard analysis and revised plans.

[1] Tyvek is a registered trademark of DuPont.

6.3 Barriers and Signs

Barricades, traffic cones, and/or markings or caution tape will be used at a safe distance from excavations, pits, hazardous areas, driller working areas, and moving equipment to prevent unauthorized access to work areas from vehicular and pedestrian traffic. Barriers will be appropriate for the level of work activity and anticipated traffic. Signage or work boundary delineation will be installed as necessary.

6.4 Potential Chemical Hazards and Controls

Based on potential activities to be conducted at the Site or adjacent to the Site, chemicals or classes of contaminants of concern (COCs) identified onsite or anticipated to be present onsite in storm water include the following:

- Metals
- Polycyclic aromatic hydrocarbons (PAHs) and phthalates
- Polychlorinated biphenyls (PCBs)

Chemicals used on this project for decontamination purposes include:

- Alconox detergent or similar

Nearly all COCs that personnel may potentially contact are bound in a damp/saturated matrix (sediment) or in liquid form (stormwater). Nonetheless, these compounds are potentially hazardous and exposure by all routes should be minimized.

Hazardous material container(s) must be properly labeled with the identity of the hazardous chemical(s) and appropriate hazardous warning information. The SSO will obtain copies of safety data sheets (SDSs) for any hazardous materials in use at the Site. The SDSs will be attached to this HASP as Attachment 6. The SSO will orient GSI employees and subcontractors to the potential hazards posed by chemicals used and present onsite.

6.5 Potential Chemical Exposure Pathways

The primary routes of exposure for Site chemicals include skin contact with contaminated materials and ingestion of materials from hand-to-mouth contact due to inadequate personal hygiene. To minimize these exposure pathways, all required PPE—as determined by the activity hazard analyses (AHAs)—will be worn and personal hygiene will be carefully monitored. AHAs will be developed by the SSO upon approval of the Pre-Design Investigation Work Plan and prior to commencing work. AHAs will be attached to this HASP. See Section 12.1 for more information.

SECTION 7: **Personal Protective Equipment**

7.1 Levels of Protection

Initial levels of protection for the Site may vary depending on the task. All personnel entering controlled work zones initially will be required to wear the OSHA-approved level of protection as specified in this plan in Table 7.

Protection may be upgraded or downgraded depending on monitoring data (compared with action levels) and project-area conditions, as determined by the SSO. Table 7 and the following sections outline the minimum guidelines for each level of protection that is assigned or potentially assigned.

Table 6. PPE to be Used at the Site

Personal Protective Equipment[1]	Field Work	Sample Processing
Steel-toed boots (leather or neoprene safety, slip- and chemical-resistant, waterproof)	X	X
Steel-shanked boots should be considered where they provide increased worker protection against a cut or puncture risk	X	X
Gloves (such as leather or nitrile)	X	X
Eye/face protection (safety glasses, goggles, or face shield)	X	X
Hard hat	X	X
Splash protection (polyvinyl chloride [PVC] bibs/aprons, or Tyvek coverall)		As necessary
Hearing protection	As necessary	As necessary
Heavyweight rain gear (if raining)	As necessary	As necessary

Note

[1]During sampling activities, workers will wear gloves and personal protective equipment (PPE) appropriate for the expected contaminants that may be encountered. When selecting PPE, consider potential exposure routes associated with the contaminant (e.g., inhalation, ingestion, skin contact).

7.2 Chemical Splashing

Care should be taken during sample collection activities to prevent liquids from splashing onto skin, clothing, and face. Sampling equipment should be handled carefully (e.g., placed, opened, moved) to prevent splashing. If splashing occurs, the area should be rinsed with clean water and dried, when possible. Safety glasses should be worn during sampling activities and during any activities with splash potential. Consider goggles or face shields and aprons where hazardous liquids are used, if applicable.

7.3 PPE Failure/Chemical Exposure

In the event of PPE failure, the worker and/or buddy will cease work and perform personal decontamination procedures (Section 8). Refer to the SDS (Attachment 6) and Section 1 if emergency medical response is needed. If chemicals contact the eyes, irrigate for 15 minutes and consult a physician.

7.4 PPE Inspection, Storage, and Maintenance

Reusable PPE will be decontaminated, inspected, and maintained, as necessary after each use. Personal equipment (e.g., hard hat, steel-toed boots) will be properly stored by the employee/subcontractor. The SSO will periodically inventory the disposable and reusable PPE at the Site and will replenish stocks in a timely manner.

SECTION 8: Decontamination and Disposal Procedures

Procedures for the decontamination of sampling tools and other related equipment will be specified in Field Sampling and Analysis Plans and/or Quality Assurance Project Plans developed. General procedures are summarized in Table 8 below. Note that separate areas should be established for personnel, sampling, and heavy equipment decontamination (discussed in Section 6.3).

8.1 Personnel Decontamination Procedures

Field personnel will wash hands and face after removing PPE. Steps for personnel decontamination are listed in Table 8.

Table 7. Equipment and Procedures for Personnel Decontamination

Equipment	Decontamination Solution	Procedures	
		Intermediate[1]	Final[2]
▪ Long-handled, soft-bristled brushes ▪ Galvanized wash tubs or equivalent ▪ Pump-activated sprayer ▪ Plastic sheeting ▪ Paper towels ▪ Duct tape	▪ Alconox or similar ▪ Tap water for rinsing	1. Wash boots with Alconox solution, as needed. 2. Remove and dispose of gloves.	1. Segregate equipment (for instruments and equipment requiring special decontamination; see the FSP). 2. Wash boots with Alconox solution. 3. Remove and dispose of gloves. 4. Field wash for personal hygiene.

Notes
[1] Intermediate decontamination is for periodic exits from the work zone during sample transport and management or for short breaks.
[2] Final decontamination is performed before eating, when taking cool-down breaks, and when exiting the Site.

8.2 Equipment Decontamination

All equipment that will potentially contact samples will be decontaminated before and after sampling events according to procedures specified in the FSP. Heavy equipment in direct contact with sediments, soil, and/or water, such as the drill rig augers and backhoe buckets, will be decontaminated by the subcontractor.

8.3 Emergency Decontamination

In the event of an accident or incident in which work must cease and staff must exit the EZ, emergency decontamination should be performed to the greatest extent feasible. In an emergency, the primary concern is to prevent the loss of life or severe injury. If immediate medical attention is required to save a life, decontamination should be delayed until the victim is stabilized. If the decontamination can be performed without interfering with essential life-saving techniques or first aid, or if a worker has been contaminated

with an extremely toxic or corrosive material that could cause severe illness or loss of life, decontamination must be performed immediately. If an emergency resulting from a heat-related illness develops, protective equipment should be removed carefully from the victim as soon as possible.

Any time emergency decontamination methods must be used, an incident report (see Attachment 1) must be completed by the SSO and submitted to GSI's Safety Committee.

8.4 Disposal Procedures

Soils and wastes generated from sampling events will be characterized in advance to determine appropriate disposal procedures. Waste PPE, including used nitrile gloves, will be contained in garbage bags and disposed with common waste. All visibly impacted soil or sediments and water generated during drilling and sampling will be contained in 55-gallon drums and drummed materials will be profiled to evaluate disposal options. Construction of temporary waste collection stations, when required, will be the responsibility of the SSO.

SECTION 9: **Communications**

9.1 Kickoff Meeting

A project kickoff meeting will be conducted prior to the start of any project work.

9.2 Daily Tailgate Safety Meetings

Tailgate safety meetings will be conducted by the SSO each morning before work begins, or before the following:

- A change of work tasks or conditions
- When new employees join the crew
- If project-area conditions change unexpectedly
- When a specific task or location poses a safety hazard
- To review proper use of PPE

Topics of discussion will include work tasks and designated PPE, emergency procedures, evacuation routes, instruction in the use of safety equipment (as required), prior safety problems, and similar topics. These meetings must be documented in the field notebook or a Tailgate Safety Meeting Checklist (to be developed based on field efforts planned).

9.3 Buddy System

The "buddy system" will be used during field activities. Each person will observe his/her buddy for symptoms of chemical exposure or cold stress/hypothermia and will assess any emergency situation and seek professional assistance as appropriate. A cell phone will be maintained at the Site for emergency use.

9.4 Emergency Communications

Table 9 presents emergency hand and horn signals that will be used, as necessary, where verbal communication is limited.

Table 8. Emergency Signals

Hand and Horn Signal	Meaning
Thumbs up	OK; understand
Thumbs down	No; negative
Grasping buddy's wrist	Leave Site now
Hands on top of head	Need assistance
Horn - one long blast	Evacuate Site
Horn - two short blasts	All clear; return to Site

SECTION 10: **Safety Planning and Observation**

10.1 Activity Hazard Identification and Analysis

GSI's AHA focuses on the relationship between the worker, the task, the tools, and the work environment. Once those relationships have been identified, project controls are implemented to eliminate or reduce job hazards to an acceptable risk level.

The AHA begins with an assessment of the environment in which the work will be performed and the tasks to be conducted. Tasks are reviewed or observed to identify hazards. Hazard identification is the product of a root cause analysis combined with a risk analysis. GSI's AHA examines the problems that could occur and assesses the likelihood that the problem will occur. The AHAs for the planned upcoming efforts will be attached to this HASP.

All employees will be expected to assess emergency conditions and have the authority to issue stop-work or evacuation instructions based on the situation and their best professional judgment. Emergency procedures will be discussed during daily safety briefings. Emergency evacuation may occur as the result of a medical emergency (life-threatening) or site condition (e.g., seismic event, spills, nearby train derailment

10.2 Behavior-Based Safety

The purpose of GSI's behavior-based safety observation procedure is to build the company's safety culture by exercising a process of making observations, reinforcing exemplary behaviors, and correcting unsafe conditions and at-risk behaviors.

SECTION 11: **Accident Reporting and Record Keeping**

11.1 In Case of Emergency Injury or Illness

IN CASE OF EMERGENCY: CALL 911 AS SOON AS POSSIBLE

11.2 In Case of Non-Emergency Injury or Illness

At the onset of a non-emergency employee work-related injury or illness, GSI employees should first notify the supervisor on duty, then notify WorkCare at (888) 449-7787. GSI management will be contacted by WorkCare following the initial report. The employee is required to report (to the GSI SSO) all work-related and all non-work-related injuries that may affect their ability to safely perform their job.

After the initial report, the SSO or other designated GSI employee will immediately contact the PM, SSO, or GSI Health and Safety Manager to conduct an investigation jointly with the PM. The SSO or PM will complete the Incident Report Form (Attachment 1). These completed reports must be transmitted to the Safety Committee within 24 hours of an occurrence; a PDF file is acceptable. The Safety Committee will submit the appropriate reports to GSI's Human Resources Manager (for Workers' Compensation), and OSHA (as applicable).

11.3 In Case of Near-Miss Incident

All "near-miss" incidents (incidents with high likelihood of resulting in injury, illness, significant spill, or property damage), even in the absence of a resultant incident, should be reported to GSI management using the Near-Miss Report Form (Attachment 2). This provides safety tracking metrics to improve project safety in the future.

11.4 Subcontractor Accident Reporting

The foreman or field supervisor of subcontracting crews will investigate and complete an injury/illness report (similar in content to either the GSI Incident Report Form or the Near-Miss Report Form [Attachments 1 and 2, respectively]) in accordance with their internal company policy. This report must be transmitted to GSI within 24 hours of an incident.

11.5 Environmental Incidents and Property Damage

In case of environmental incidents or property damage, an Incident Report Form (Attachment 1) will be prepared by the SSO. Any damage, loss, or theft of property (items/tools/equipment) will be reported to the PM.

SECTION 12: **References**

GSI. 2020. Health and Safety Policy. Prepared by the GSI Safety Committee for GSI Water Solutions, Inc.

SECTION 13: **GSI Safety Committee Members and Contact Information**

Table 9. GSI Oregon Safety Committee Members

Person	Role	Contact Information
Kathy Roush	Chair (Management Representative)	Work: 971.200.8527 Cell: 919.605.6644
Josh Bale	Employee Representative	Work: 971.200.8502 Cell: 530.276.4188
Molly Monroe	Recorder	Work: 541.257.9002 Cell: 541.230.0578
Paige Blagg	Employee Representative	Cell: 805.234.8832
Chris Rhea	Employee Representative	Work: 971.200.8572 Cell: 503.349.2248
Katie Lippard	Employee Representative	Cell: 919.632.5872
Matt Thomas	Employee Representative	Work: 971.200.8537 x 158

Note
GSI = GSI Water Solutions, Inc.
H&S = Health and Safety
HASP = Health and Safety Plan

SECTION 14: **Signatures**

I have read, understood, and agree to abide by, the requirements presented in this Health and Safety Plan. I understand that if I recognize an unsafe condition affecting my work, I have the absolute right to stop work until the condition is corrected.

Name Printed	Signature	Date

ATTACHMENTS

ATTACHMENT 1

Incident Report Form

INCIDENT REPORT

Use this form to document information about an accident or incident. Fill out an investigation report as soon as possible. Note: this form is for use within your company. It is not intended to replace DCBS Form 801: *Worker's and Employer's Report of Occupational Injury or Disease*.

Employee(s) name(s): .....

Time & date of accident/incident: .....

Job title(s) and department(s): .....

Supervisor or lead person: .....

Witnesses: .....

Brief description of the accident or incident: .....

.....

Body part affected: .....

Did the injured employee(s) contact WorkCare? ( ) Yes ( ) No

Did WorkCare recommend the employee seek medical attention? ( ) Yes ( ) No

Did the injured employee(s) see a doctor? ( ) Yes ( ) No

If yes, did you file an employer's portion of a worker's compensation form? ( ) Yes ( ) No

Did the injured employee(s) go home during their work shift? ( ) Yes ( ) No

If yes, list the date and time injured employee(s) left job(s): .....

Supervisor's Comments: .....

.....

What could have been done to prevent this accident/incident? .....

.....

Have the unsafe conditions been corrected? ( ) Yes ( ) No

If yes, what has been done? .....

If no, what needs to be done? .....

Employer or Supervisor's signature:

Date:

Additional comments/notes: .....

.....

ATTACHMENT 2

Near-Miss Report Form

NEAR-MISS REPORT

1. Name of Employee Involved	2. Date of Near-Miss	3. Time of Near-Miss

4. Location/Site of Near-Miss Event

5. Other witnesses present at time of near-miss

6. Length of time employed by GSI

☐ < 6 months ☐ 6 months – 1 year ☐ 1 – 2 years

☐ 2 – 5 years ☐ Greater than 5 years

7. Employment Category

☐ Regular, Full-Time ☐ Regular, Part-Time

☐ Temporary/Seasonal Employee ☐ Non-Employee

8. Familiarity with Activities related to Near-Miss

☐ First Time performing ☐ Observed but never performed

☐ Limited to some familiarity ☐ Regularly perform

9. Phase of Work Day when Near-Miss Occurred

☐ Performing Duties during Standard Hours ☐ During meal/rest period

☐ Prior to Starting or At End of Work Day ☐ Working Overtime/Long hours

10. Describe the near-miss:

Description of Event: What was employee doing just before and at the time of the near-miss?

11. What happened or what work conditions contributed to the near miss (e.g., Object/Equipment/Substance)

12. Outcome of near-miss:

13. Task and Activity at Time of Near-Miss:

General type of task:_____

Specific activity:_____

Employee was working:

☐ Alone ☐ With crew or fellow worker ☐ Other: _____

14. Was proper Ergonomic support utilized? Explain

15. Supervision at time of accident

☐ Unsupervised ☐ Supervised

☐ Limited Supervision

16. Factors that contributed to near-miss – Please check all that apply

Hazard

- ☐ Not recognized/identified
- ☐ Identified, but not addressed
- ☐ Inadequately addressed

Work Procedures

- ☐ None developed
- ☐ Not followed
- ☐ Partially followed
- ☐ Not understood
- ☐ Not appropriate
- ☐ Not communicated
- ☐ Other

Training & Certification

- ☐ Insufficient training
- ☐ Circumstances not covered
- ☐ Ineffective training
- ☐ Worker not authorized
- ☐ Outdated Training

Communication

- ☐ Breakdown in verbal communication
- ☐ Breakdown in written communication
- ☐ Confusion after communication
- ☐ Other_____

Other

- ☐ Weather/temperature
- ☐ Extended work hours
- ☐ Worker fatigue
- ☐ Physical overexertion
- ☐ Work in elevated area
- ☐ Chemical Use
- ☐ Biological agent
- ☐ Radiation
- ☐ Electricity
- ☐ Mechanical
- ☐ Animals

Facilities/Equipment

- ☐ Personal protective equipment
- ☐ Faulty equipment
- ☐ Poor/inadequate maintenance
- ☐ Inappropriate use
- ☐ Missing guards
- ☐ Obsolete/antiquated
- ☐ Inadequate design
- ☐ Ergonomic factors
- ☐ Equipment failure
- ☐ Trip hazard
- ☐ Slip hazard
- ☐ Struck by
- ☐ Other_____

Additional Comments:

ATTACHMENT 3

Information on Slips, Trips, and Falls

FactSheet Slip, Trip, and Fall Prevention

Slips, trips, and falls account for a majority of general industry accidents. These accidents often cause lasting problems with daily activities, while 15% of these accidents are fatal. These incidents can be prevented through knowledge of common risk factors and the maintenance of a clean, safe work environment.

STEP 1: Be aware of the common risk factors for these injuries.

• Doorways	• Unsecured cables/cords in walkways
• Ramps	• Unguarded heights
• Cluttered hallways	• Unstable work surfaces
• Uneven surfaces	• Unsecured mats
• Areas prone to wetness or spills	• Smoke, steam, or dust obscuring your view
• Poor lighting	• Ladders
• Inattention to detail	• Stairs

What I need to do...

Notify my supervisor if or when I:

- Have problems walking or moving around.
- Experience frequent disorientation.
- Have vision problems that could prevent me from seeing hazards.
- Take medications that can cause dizziness.

STEP 2: Follow these tips to prevent slips, trips, and falls, and resultant injury.

1.	Clean up spills immediately.	**8.**	Remove tripping hazards from stairs and walkways.
2.	Stay off freshly mopped floors.	**9.**	Keep frequently used items in easily reachable areas.
3.	Secure any cords out of walkways.	**10.**	Check walkways and steps for obstructions.
4.	Use non-skid mats for slippery surfaces.	**11.**	Do not text while walking.
5.	Adjust gutter downspouts to drive water away from pathways.	**12.**	When using a ladder, always have at least three points of contact with the ladder.
6.	Wear shoes with good support and slip-resistant soles appropriate for the job task.	**13.**	Never stand on chair, table, or other surface on wheels.
7.	Ensure adequate lighting in work areas and hallways.	**14.**	Keep drawers/cabinet doors closed when not in use.

Inspect work areas monthly to identify hazards that could cause slips, trips, or falls. It is important that the indicated problems are addressed immediately.

References

National Safety Council: Slips, Trips, and Falls
http://www.nsc.org/NSCDocuments_Advocacy/Fact%20Sheets/Slips-Trips-and-Falls.pdf

OSHA Safety & Health Topics: Walking/Working Surfaces
https://www.osha.gov/SLTC/walkingworkingsurfaces/index.html

For more information on slip, trip, and fall prevention, contact the Office of Environmental Health & Safety at injuryprevention@usc.edu or (323) 442-2200.

USC Environmental Health & Safety

University Park Campus
3434 South Grand Ave, CAL 120
Los Angeles, CA 90089-2815

Health Sciences Campus
2001 N Soto St, SBA 329
Los Angeles, CA 90032

323.442.2200
injuryprevention@usc.edu
http://adminopsnet.usc.edu

08/2015

ATTACHMENT 4

OSHA Fact Sheet: Lightning Safety When Working Outdoors

FactSheet

Lightning Safety When Working Outdoors

Lightning strikes can severely injure or kill workers whose jobs involve working outdoors. Lightning is often overlooked as an occupational hazard, but employers need awareness about lightning hazards to ensure their workers' safety. This fact sheet provides employers and workers at outdoor worksites with lightning safety recommendations from the Occupational Safety and Health Administration (OSHA) and the National Oceanic and Atmospheric Administration (NOAA).

Introduction

Lightning is a dangerous natural force. Annually in the United States, cloud-to-ground lightning occurs 20 to 25 million times and over 300 people are struck by lightning. During the past 30 years, about 50 people, on average, have been killed by lightning strikes every year, and many more suffer permanent disabilities.

Precautions should be taken to prevent worker exposure to lightning. Employers should recognize lightning as an occupational hazard. Supervisors and workers at outdoor worksites should take lightning safety seriously.

Workers whose jobs involve working outdoors in open spaces, on or near tall objects, or near explosives or conductive materials (e.g., metal) have significant exposure to lightning risks. Worker activities at higher risk for lightning hazards include:

- Logging
- Explosives handling or storage
- Heavy equipment operation
- Roofing
- Construction (e.g., scaffolding)
- Building maintenance
- Power utility field repair
- Steel erection/telecommunications
- Farming and field labor
- Plumbing and pipe fitting
- Lawn services/landscaping
- Airport ground personnel operations
- Pool and beach lifeguarding

Photo: NOAA

Figure 1: Lightning strikes tall tree.

Reducing Lightning Hazards When Working Outdoors

Employers, supervisors, and workers should understand lightning risks, characteristics, and precautions to minimize workplace hazards. Lightning is unpredictable and can strike outside the heaviest rainfall areas or even up to 10 miles from any rainfall.

Many lightning victims are caught outside during a storm because they did not act promptly to get to a safe place, **or they go back outside too soon after a storm has passed**. If signs of approaching thunderstorms occur, workers should not begin any task they cannot quickly stop. Proper planning and safe practices can easily increase lightning safety when working outdoors.

When thunder roars, go indoors!

If you hear thunder, even a distant rumble, get to a safe place immediately.

Thunderstorms always include lightning. Any thunder you hear is caused by lightning!

NOAA advises that nowhere outside is safe when thunderstorms are in your area.

OSHA and NOAA recommend that employers and supervisors follow these lightning safety best practices for workers whose jobs involve working outdoors:

Check NOAA Weather Reports: Prior to beginning any outdoor work, employers and supervisors should check NOAA weather reports (weather.gov) and radio forecasts for all weather hazards. OSHA recommends that employers consider rescheduling jobs to avoid workers being caught outside in hazardous weather conditions. When working outdoors, supervisors and workers should continuously monitor weather conditions. Watch for darkening clouds and increasing wind speeds, which can indicate developing thunderstorms. Pay close attention to local television, radio, and Internet weather reports, forecasts, and emergency notifications regarding thunderstorm activity and severe weather.

Photo: NOAA

Figure 2: Lightning strikes a communications tower.

Seek Shelter in Buildings: Employers and supervisors should know and tell workers which buildings to go to after hearing thunder or seeing lightning. NOAA recommends seeking out fully enclosed buildings with electrical wiring and plumbing. Remain in the shelter for at least **30 minutes** after hearing the last sound of thunder.

Vehicles as Shelter: If safe building structures are not accessible, employers should guide workers to hard-topped metal vehicles with rolled up windows. Remain in the vehicle for at least **30 minutes** after hearing the last sound of thunder.

Phone Safety: After hearing thunder, do not use corded phones, except in an emergency. Cell phones and cordless phones may be used safely.

Emergency Action Plan

Employers should have a written Emergency Action Plan (EAP), as outlined in 29 CFR 1910.38 or 29 CFR 1926.35. The EAP should include a written lightning safety protocol for outdoor workers. This lightning safety protocol should:

- Inform supervisors and workers to take action after hearing thunder, seeing lightning, or perceiving any other warning signs of approaching thunderstorms.
- Indicate how workers are notified about lightning safety warnings.
- Identify locations and requirements for safe shelters.
- Indicate response times necessary for all workers to reach safe shelters.
- Specify approaches for determining when to suspend outdoor work activities, and when to resume outdoor work activities.
- Account for the time required to evacuate customers and members of the public, and the time needed for workers to reach safety.

Employers should also post information about lightning safety at outdoor worksites. All employees should be trained on how to follow the EAP, including the lightning safety procedures.

Photo: NOAA

Figure 3: Cranes are especially vulnerable to lightning.

What is lightning?

Lightning is a giant spark of electricity in the atmosphere between clouds or between a cloud and the ground.

Lightning can occur:

- Between the cloud and the ground (cloud-to-ground lightning)
- Within and between thunderstorm clouds (intra- and inter-cloud lightning)

For more information, see: www.nssl.noaa.gov/education/svrwx101/lightning/faq

Lightning Safety Training

Employers should adequately train all workers on lightning safety. Training should be provided for each outdoor worksite, so that supervisors and workers know in advance where a worksite's safe shelters are and the time it takes to reach them. Employers should train supervisors and workers to provide lightning safety warnings in sufficient time for everyone to reach a worksite's safe shelters and take other appropriate precautions.

Lightning Warning Systems

An employer's EAP may include lightning warning or detection systems, which can provide advance warning of lightning hazards. However, no systems can detect the "first strike," detect all lightning, or predict lightning strikes. NOAA recommends that employers first rely on NOAA weather reports, including NOAA Weather Radio All Hazards: www.nws.noaa.gov/nwr.

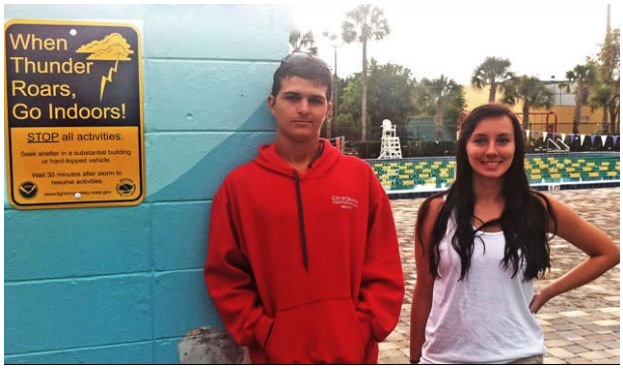


Photo: NOAA

Figure 4: Preparedness reduces lightning risks.

(For NOAA toolkits for organizations and large venues see: www.lightningsafety.noaa.gov/toolkits.shtml)

Commercial lightning detection and notification services are available to monitor for lightning activity. These notification services can send alerts when lightning activity develops or moves to within a certain range of a work site. In addition, these commercial systems can provide mapped locations of lightning strikes from an approaching storm. However, these systems cannot predict the first lightning strike. Consequently, it is important to watch the sky for storms developing overhead or nearby and get to a safe place prior to the first lightning strike.

Portable and hand-held lightning detectors function by detecting the electromagnetic signal from a nearby lightning strike and then processing the signal to estimate the distance to the lightning strike. These devices typically do not detect all strikes, cannot predict the first strike, cannot provide the location of a strike, and are less accurate than the commercial detection and notification systems. In some cases, simply listening for thunder or watching the sky may be a better indication of a developing or nearby storm.

For situations which require advance notice of thunderstorms, NOAA recommends monitoring forecasts and radar observations from either commercial weather services or NOAA to stay informed of changing weather conditions.

If Caught Outside in a Thunderstorm

If you find yourself caught outside during a thunderstorm, there may be nothing you can do to prevent being struck by lightning. There simply is no safe place outside in a thunderstorm. This is why it is very important to get to a safe place at the first signs of a thunderstorm. If you are caught outside follow NOAA's recommendations to decrease the risk of being struck.

- Lightning is likely to strike the tallest objects in a given area—you should not be the tallest object.
- Avoid isolated tall trees, hilltops, utility poles, cell phone towers, cranes, large equipment, ladders, scaffolding, or rooftops.
- Avoid open areas, such as fields. Never lie flat on the ground.
- Retreat to dense areas of smaller trees that are surrounded by larger trees, or retreat to low-lying areas (e.g., valleys, ditches) but watch for flooding.
- Avoid water, and immediately get out of and away from bodies of water (e.g., pools, lakes).

Water does not attract lightning, but it is an excellent conductor of electricity. For boating safety see NOAA PA 200252.

- Avoid wiring, plumbing, and fencing. Lightning can travel long distances through metal, which is an excellent conductor of electricity. Stay away from all metal objects, equipment, and surfaces that can conduct electricity.
- Do not shelter in sheds, pavilions, tents, or covered porches as they do not provide adequate protection from lightning.
- Seek fully-enclosed, substantial buildings with wiring and plumbing. In modern buildings, the *interior* wiring and plumbing will act as an earth ground. A building is a safe shelter as long as you are not in contact with anything that can conduct electricity (e.g., electrical equipment or cords, plumbing fixtures, corded phones). Do not lean against concrete walls or floors (which may have metal bars inside).

OSHA Standards

Under the General Duty Clause, Section 5(a)(1) of the *Occupational Safety and Health Act of 1970* (OSH Act), employers are required to provide their employees with a place of employment that "is free from recognizable hazards that are causing or likely to cause death or serious harm to employees." The courts have interpreted OSHA's general duty clause to mean that an employer has a legal obligation to provide a workplace free of conditions or activities that either the employer or industry recognizes as hazardous and that cause, or are likely to cause, death or serious physical harm to employees when there is a feasible method to abate the hazard. This includes lightning hazards that can cause death or serious bodily harm.

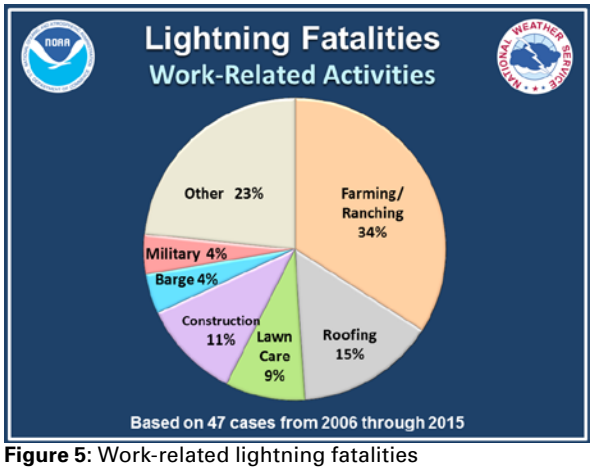


Figure 5: Work-related lightning fatalities

During storms or high winds, OSHA prohibits:

- work on or from scaffolds (29 CFR 1926.451(f)(12));
- crane hoists (29 CFR 1926.1431(k)(8)); and
- work on top of walls (29 CFR 1926.854(c)).

In these situations, scaffold work may continue only if a qualified person determines it is safe and personal fall protection or wind screens are provided. Crane hoists may continue only if a qualified person determines it is safe.

Helpful Resources

- NOAA Lightning Safety on the Job, www.lightningsafety.noaa.gov/job.shtml
- National Fire Protection Association (NFPA):
- *NFPA 780: Standard for the Installation of Lightning Protection Systems*, 2014 Edition, www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=780
- National Lightning Safety Institute, lightningsafety.com
- National Aeronautics and Space Administration (NASA), Global Hydrology Resource Center, Lightning and Atmospheric Electricity Research, thunder.msfc.nasa.gov
- Transportation Research Board of the National Academies,a*Protecting Airport Personnel from*
- *Lightning Strikes,* onlinepubs.trb.org/onlinepubs/acrp/acrp_iop_004.pdf

Contact NOAA

For information on lightning safety, or to obtain data, educational and outreach materials, and posters, visit NOAA's lightning safety website: www.lightningsafety.noaa.gov or the wrn program at noaa.gov/wrn. Contact NOAA at wrn.feedback@noaa.gov. Examples of data available from NOAA are provided below.

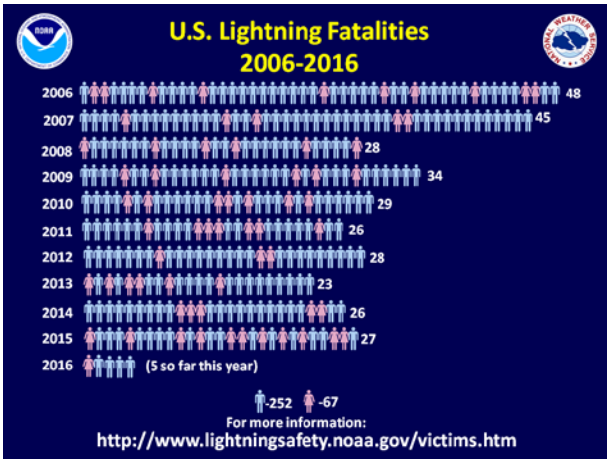


Figure 6: Annual lightning fatalities

Contact OSHA

For more information, to report an emergency, fatality, inpatient hospitalization, amputation, or loss of an eye, or to file a confidential compliant, or to request OSHA's free On-site Consultation Program services for small and medium-sized businesses, contact your nearest OSHA office, visit www.osha.gov, or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For more information, see OSHA's Workers page.

U.S. Department of Labor

Occupational Safety and Health Administration

OSHA - DTSEM FS-3863 05/2016

ATTACHMENT 5

OSHA Quick Card: Protecting Workers from Cold Stress

OSHA® QUICK CARD™

Protecting Workers from Cold Stress

Cold temperatures and increased wind speed (wind chill) cause heat to leave the body more quickly, putting workers at risk of cold stress. Anyone working in the cold may be at risk, e.g., workers in freezers, outdoor agriculture and construction.

Common Types of Cold Stress

Hypothermia

- Normal body temperature (98.6°F) drops to 95°F or less.
- **Mild Symptoms:** alert but shivering.
- **Moderate to Severe Symptoms:** shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.

Frostbite

- Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.
- **Symptoms**: numbness, reddened skin develops gray/white patches, feels firm/hard, and may blister.

Trench Foot (also known as Immersion Foot)

- Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.
- **Symptoms**: redness, swelling, numbness, and blisters.

Risk Factors

- Dressing improperly, wet clothing/skin, and exhaustion.

For Prevention, Your Employer Should:

- Train you on cold stress hazards and prevention.
- Provide engineering controls, e.g., radiant heaters.
- Gradually introduce workers to the cold; monitor workers; schedule breaks in warm areas.

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA 3156-02R 2014

WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Preventing Cold-related Illness, Injury, and Death among Workers

Summary

Workers, both indoors and outdoors, in services, transportation, agriculture, construction, and other industries may be exposed to environmental cold stress that can lead to thermal discomfort and in some cases even severe injuries, illnesses, or death. The National Institute for Occupational Safety and Health (NIOSH) recommends that employers implement a cold-related illness and injury prevention program that includes preventive measures such as using engineering controls, establishing work/rest schedules, training workers about the hazards of working in cold environments, and providing appropriate cold-weather gear.

Description of Exposure

Workers who work in cold environments may be at risk of cold stress. Exposure to cold can be an uncomfortable and potentially dangerous situation. Health emergencies can occur in people who work outdoors or in an area that is purposefully kept cold, poorly insulated, or without heat. People who have previously experienced frostbite, sedentary workers, and those with poor circulation may be especially susceptible. For indoor workers, work in cold, damp conditions can be uncomfortable and may lead to declining work performance (i.e., a decline in cognitive function and dexterity) or result in cold-related illness or injury. Cold-related conditions can also worsen musculoskeletal injuries and vascular disorders. For outdoor workers, what constitutes cold stress can vary across different areas of the country. In regions where workers are unaccustomed to winter weather, near freezing temperatures are considered factors for cold stress. Whenever outdoor temperatures drop substantially and wind speed increases, heat leaves the body more rapidly. According to the American Conference of Governmental Industrial Hygienists (ACGIH®) Threshold Limit Values (TLV®), workers should be protected from exposure to cold so that the deep core temperature does not fall below 96.8°F (36°C) and to prevent frostbite to body extremities [ACGIH 2019]. Serious health problems can occur when the body is unable to stay warm enough.

Photo by MarianVejcik/Getty Images

Cold-related Illnesses and Injuries

Cold-related illnesses and injuries include chilblains, trench foot, frostbite, and hypothermia.

Chilblains. Chilblains are the painful inflammation of small blood vessels in the skin that occur in response to repeated exposure to cold but nonfreezing temperatures. Small blood vessels in the skin may become permanently damaged by cold temperatures, resulting in redness and itching during additional exposures. Symptoms of chilblains include redness, itching, possible blistering, inflammation, and possible ulceration in severe cases.

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Trench Foot. Trench foot is an injury of the feet after prolonged exposure to wet and cold-related conditions. Trench foot occurs because wet feet lose heat faster than dry feet. To prevent heat loss, the body constricts blood vessels in the feet, and then the skin tissue begins to die. Symptoms of trench foot include reddening of the skin, numbness, leg cramps, swelling, tingling pain, blisters or ulcers, bleeding under the skin, and gangrene (e.g., foot turns purple, blue, or gray).

Frostbite. Frostbite is an injury caused by freezing of the skin and deeper tissues, resulting in the loss of feeling and color in the affected areas. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. Examples of risk factors for frostbite include contact with metal or water, dehydration, diabetes, smoking, alcohol abuse, sedating or judgment impairing medications, and prior history of frostbite. Symptoms of frostbite include numbness; tingling or stinging; aching; and bluish or pale, waxy skin. During treatment of frostbite and trench foot, avoid rubbing or putting pressure on affected areas, since that can damage tissue.

Hypothermia. When exposed to cold temperatures, the body loses heat faster than it can be produced. Prolonged exposure to cold causes internal body temperature to drop, resulting in a condition called hypothermia. Hypothermia affects brain function, making the victim unable to think clearly or move well (i.e., they may be unable to protect themselves from hazards, or experience slips, trips, and falls). This makes hypothermia particularly dangerous because a person may not recognize the symptoms and will be unable to make life-preserving decisions. Symptoms of hypothermia can depend on how long a person has been exposed to cold temperatures and individual variability.

Hypothermia Symptoms and First Aid

Early symptoms include shivering, fatigue, loss of coordination, confusion, and/or disorientation.

Late symptoms include no shivering, blue skin, dilated pupils, slowed pulse and breathing, and/or loss of consciousness.

If hypothermia is suspected, medical assistance should be requested immediately (e.g., call 911). Begin first aid by:

1. moving the worker to a warm room or vehicle,
2. removing wet clothing,
3. covering their body with loose, dry blankets, clothing, or towels (may use skin-to-skin contact or warm bottles or hot packs in armpits, sides of chest, and groin to increase body's temperature), and
4. providing warm, non-alcoholic beverages if the worker is conscious.

If the worker has no pulse, cardiopulmonary resuscitation (CPR) should be provided and continued during the warming attempts, until the person responds or medical aid becomes available. Chest compressions should not be performed for patients who manifest an organized rhythm on a cardiac monitor (e.g., automated external defibrillator [AED]), even if they have no palpable pulses and no other signs of life. The worker should be handled very gently and kept horizontal, because when cold, the heart is prone to ventricular fibrillation with any disturbance. Severely hypothermic patients have been known to survive neurologically intact after long periods (over an hour) in a state of "suspended animation" [State of Alaska DHSS 2014].

Photo by ilkercelik/Getty Images

Case Reports

Indoor Environment: Airline Catering Facility

In an airline catering facility cold room (approximately 40°F), meals were assembled at workstations in shifts lasting 3–8 hours [Ceballos et al. 2015; NIOSH 2014]. Because preparations sometimes required fine manual dexterity (e.g., thinly slicing fish, decorating with small garnishes), the workers preferred wearing thin gloves instead of thicker, better insulated gloves. The frozen food they handled caused their hands to become cold and numb. Drafts inside the cold room made some areas feel colder than others, and air velocities exceeded the recommended guidelines of 200 feet per minute (FPM) [ACGIH 2019]. In addition, the workers felt that their breaks were not long enough to warm up, or to change out of wet or sweat-dampened clothing. An evaluation of the cold room concluded that thermal comfort concerns perceived by workers might have resulted from workstation air drafts, insufficient use of personal protective equipment (e.g., better insulated gloves) due to dexterity concerns, work practices, and lack of knowledge about good health and safety practices. In an evaluation of a second airline catering facility where the temperature was approximately 40°F, workers reported that they

felt discomfort working in cold temperatures, particularly in the freezer or coolers [NIOSH 2015]. The reported findings suggest that language was a barrier to effective training and communication regarding workplace safety and health because employees came from 18 countries.

Outdoor Environment: Long Haul Driving Along Highway

In the winter of 2009, a 56-year-old male truck driver went to the emergency room seeking care [Alaska Trauma Registry]. He had come to Alaska after a long haul drive through Canada. Along his route, he had stopped to change a fuel filter. He accidentally splashed diesel fuel on his gloves, which froze to his hands as he worked outside along the highway. After arriving at his destination, he had to spend a night at the hospital receiving treatment for his frostbitten hands.

Outdoor Environment: Sheep Ranch

At 3:00 p.m., a 58-year-old woman (who was wearing tennis shoes, blue jeans, sweater, jacket, and gloves) and her husband left their sheep ranch headquarters to round up their animals and bring them in for protection from a major snow storm that was developing [NIOSH 1990]. The woman separated from her husband to chase down a second flock of sheep. Shortly afterward, a high wind arose and created whiteout conditions in the area. The husband was unable to locate the woman and returned to the ranch to obtain additional help. At 10:00 p.m., the sheriff's department, local volunteer fire department, emergency medical service, and search and rescue units became involved in the search. The search continued until 3:00 a.m., when it was decided to wait for daylight. At 7:45 a.m., the body of the woman was found. Autopsy results showed she had died from hypothermia.

Recommendations

Whether in an indoor or outdoor environment where cold stress conditions are possible, employers and workers should be aware of symptoms of cold-related illness and injury, not only in themselves but also in their coworkers, and be prepared to immediately notify their supervisor, provide first aid, and seek prompt medical assistance (e.g., call 911).

Prevention is the best way to avoid cold-related illness and injury. Employers and workers should follow the NIOSH recommendations below to reduce the risk of cold-related illness and injury.

All Cold Environments

Employers should:

- Train supervisors and workers to prevent, recognize, and treat cold-related illness and injury.
- Provide training in a language and vocabulary that the workers understand.
- Reduce workers' time spent in the cold environment.
- Reduce the physical demands of workers (e.g., use relief workers or rotate extra workers in and out of work for long, demanding jobs).
- Ensure access to warm areas and a place to change out of wet clothes.
- Encourage employees to take breaks to warm up when needed.
- Monitor workers in cold conditions and initiate a buddy system.
- Include a medical and environmental thermometer and chemical hot packs in first aid kits.
- Participate in joint management/employee safety committees.
- Provide appropriate cold weather gear such as hats, gloves, and boots for work in cold environments.
- Provide wind protective clothing based on air velocities.
- Provide prompt medical attention to workers who show signs of cold-related illness or injury.

Workers should:

- Take regular breaks to warm up.
- Monitor their physical condition and that of coworkers.
- Stay hydrated by drinking lots of water; warm beverages may help increase body temperature.
- Stay well nourished by snacking on high carbohydrate foods.
- Avoid touching cold metal or wet surfaces with bare skin.

Photo by sorn340/Getty Images

- Report signs and symptoms of cold-related illness and injury to supervisors and medical staff immediately.
- Participate in joint management/employee safety committees.
- Carry extra cold weather gear, such as a change of clothes, in case work clothing gets wet.
- Wear several layers of loose clothing for better insulation; take layers off if you begin to sweat and put them back on when you cool down. Inner layers should be wool or synthetic fabrics to wick away moisture; outer layers should be wind and water-resistant.
- Avoid wearing wet clothes.
- Protect the ears, face, hands, and feet by wearing hats, gloves, socks, and boots.

Indoor Environments

Employers should:

- Install equipment to reduce drafts and condensation.
- Provide warm water or dry air heaters outside cold rooms for workers to warm their hands.
- Minimize air velocity and not exceed 200 FPM.
- Perform preventative maintenance on a regular schedule and make repairs if heating systems are not working properly.
- Rotate employees to different tasks after every break.
- Minimize work requiring manual dexterity in cold rooms.
- Provide glove alternatives for workers inside cold rooms (e.g., glove liners or fingerless gloves to wear under plastic gloves).

Photo by wabeno/Getty Images

Outdoor Environments

Employers should:

- Create a plan for assessing and acting on workplace hazards posed by sudden weather changes, such as dropping temperatures or increasing wind speeds.
- Schedule normal maintenance and repairs in cold areas for warmer months when possible.
- Schedule cold jobs for the warmer part of the day.
- Ensure that workers traveling through or working in remote areas have appropriate cold-weather survival equipment (e.g., emergency communications equipment such as a personal locator beacon or satellite phone).

Acknowledgments

The principal contributors to this publication were Brenda Jacklitsch, PhD, MS, of the NIOSH Division of Science Integration (DSI) and Diana Ceballos, PhD, MS, CIH, of the Harvard T.H. Chan School of Public Health (formerly with NIOSH).

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NIOSH [2015]. Health hazard evaluation report: evaluation of ergonomic risk factors, acute traumatic injuries, and occupational exposures at an airline catering facility. By Ramsey J, Kawamoto M, Ceballos D, Wiegand DM. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH HHE Report No. 2011-0131-3222.

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For More Information

Information about ***Cold Stress*** can be found on the following website:

https://www.cdc.gov/niosh/topics/coldstress/

1-800-CDC-INFO (1-800-232-4636)
TTY: 1-888-232-6348
CDC/NIOSH INFO: cdc.gov/info | cdc.gov/niosh
Monthly *NIOSH eNews*: https://www.cdc.gov/niosh/eNews.

Mention of any company or product does not constitute endorsement by NIOSH. In addition, citations to websites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these websites.

As part of the Centers for Disease Control and Prevention, NIOSH is the federal agency responsible for conducting research and making recommendations to prevent work-related illness and injuries. All ***Workplace Solutions*** are based on research studies that show how worker exposures to hazardous agents or activities can be significantly reduced.

DOI: https://doi.org/10.26616/NIOSHPUB2019113
DHHS (NIOSH) Publication No. 2019-113

September 2019

OSHA® QUICK CARD™

How to Protect Yourself and Others

- Know the symptoms; monitor yourself and co-workers.
- Drink warm, sweetened fluids (no alcohol).
- Dress properly:
  - Layers of loose-fitting, insulating clothes
  - Insulated jacket, gloves, and a hat (waterproof, if necessary)
  - Insulated and waterproof boots

What to Do When a Worker Suffers from Cold Stress

For Hypothermia:

- Call 911 immediately in an emergency.
- To prevent further heat loss:
  - Move the worker to a warm place.
  - Change to dry clothes.
  - Cover the body (including the head and neck) with blankets, and with something to block the cold (e.g., tarp, garbage bag). Do **not** cover the face.
- If medical help is more than 30 minutes away:
  - Give warm, sweetened drinks if alert (no alcohol).
  - Apply heat packs to the armpits, sides of chest, neck, and groin. Call 911 for additional rewarming instructions.

For Frostbite:

- Follow the recommendations "**For Hypothermia**".
- Do not rub the frostbitten area.
- Avoid walking on frostbitten feet.
- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the area unless directed by medical personnel.

For Trench (Immersion) Foot:

- Remove wet shoes/socks; air dry (in warm area); keep affected feet elevated and avoid walking. Get medical attention.

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

ATTACHMENT 6

Safety Data Sheets

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	**Supplier**
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Safety Data Sheet

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Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

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12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA	None	
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA	None	
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	**Class:** **Label:** **LTD. QTY:**	None None None

US DOT

Limited Quantity Exception: None

Bulk:	**Non Bulk:**
RQ (if applicable): None	**RQ (if applicable):** None
Proper shipping Name: None	**Proper shipping Name:** None
Hazard Class: None	**Hazard Class:** None
Packing Group: None	**Packing Group:** None
Marine Pollutant (if applicable): No additional information.	**Marine Pollutant (if applicable):** No additional information.

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	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed

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Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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Trade Name: Alconox

HMIS: 1-0-0

APPENDIX C

Dioxin/Furan Sediment Data Figures

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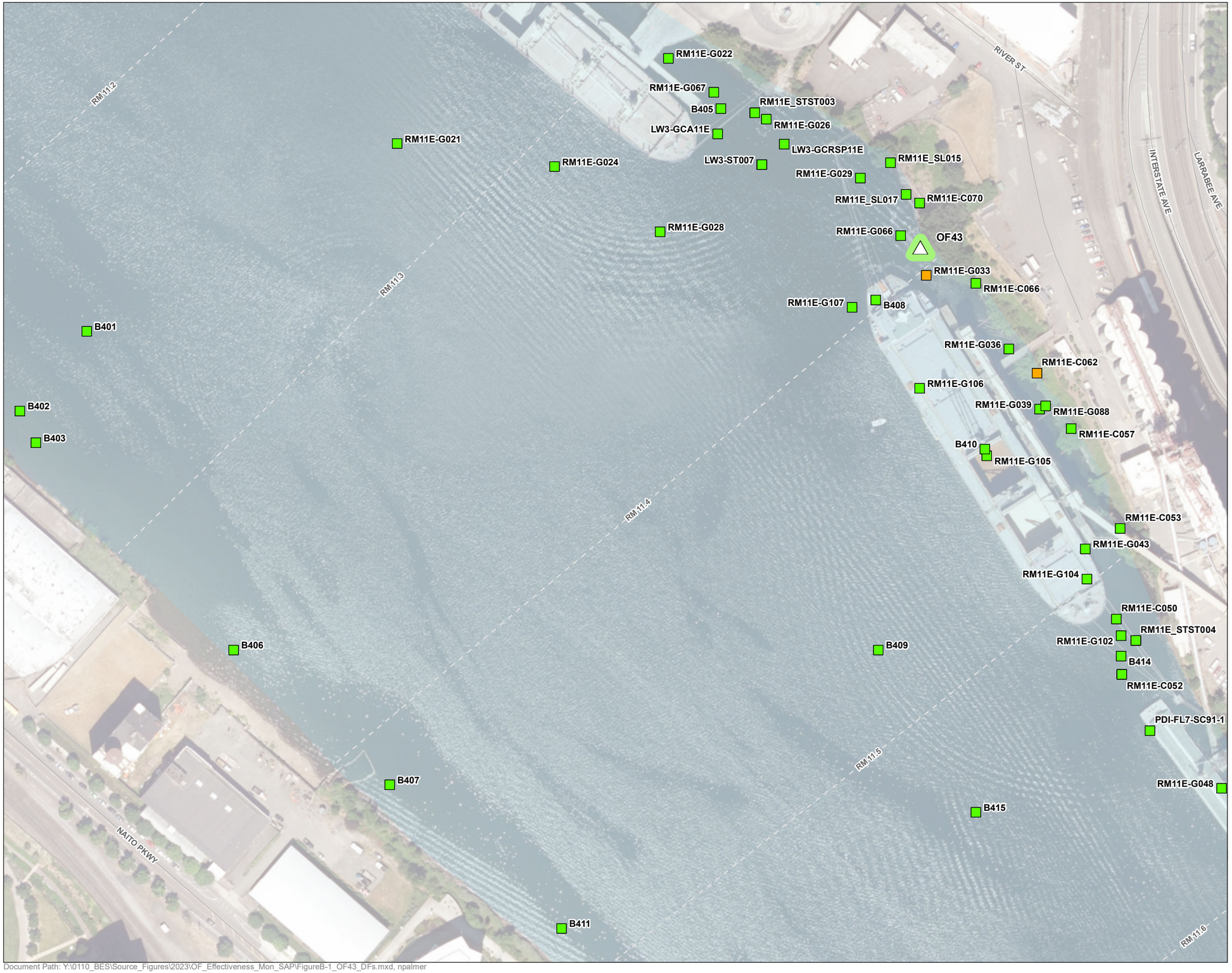
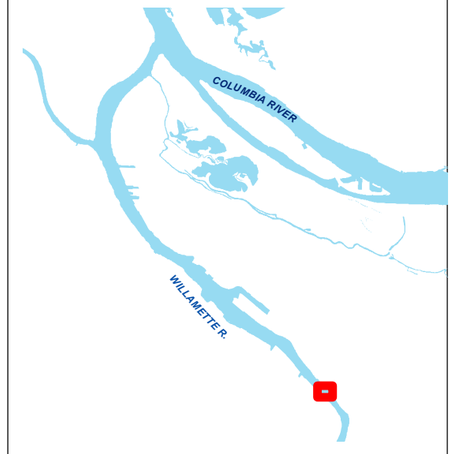
FIGURE C-1

Basins 43
Dioxin/Furan Concentrations in Surface Sediment

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring





LEGEND

- Surface Sediment Location

Dixin/Furan Result

- Below Practical Quantitation Limit (PQL)
- Above Practical Quantitation Limit (PQL)

All Other Features

- Outfall
- Non City Outfall
- Road
- River Mile
- Waterbody

N

0 75 150 225
Feet

Date: September 21, 2023
Data Sources: ESRI, USGS, BES, Aerial Photo COP 2021

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Document Path: Y:\0110_BES\Source_Figures\2023\OF_Effectiveness_Mon_SAP\FigureB-1_OF43_DFs.mxd, npalmer

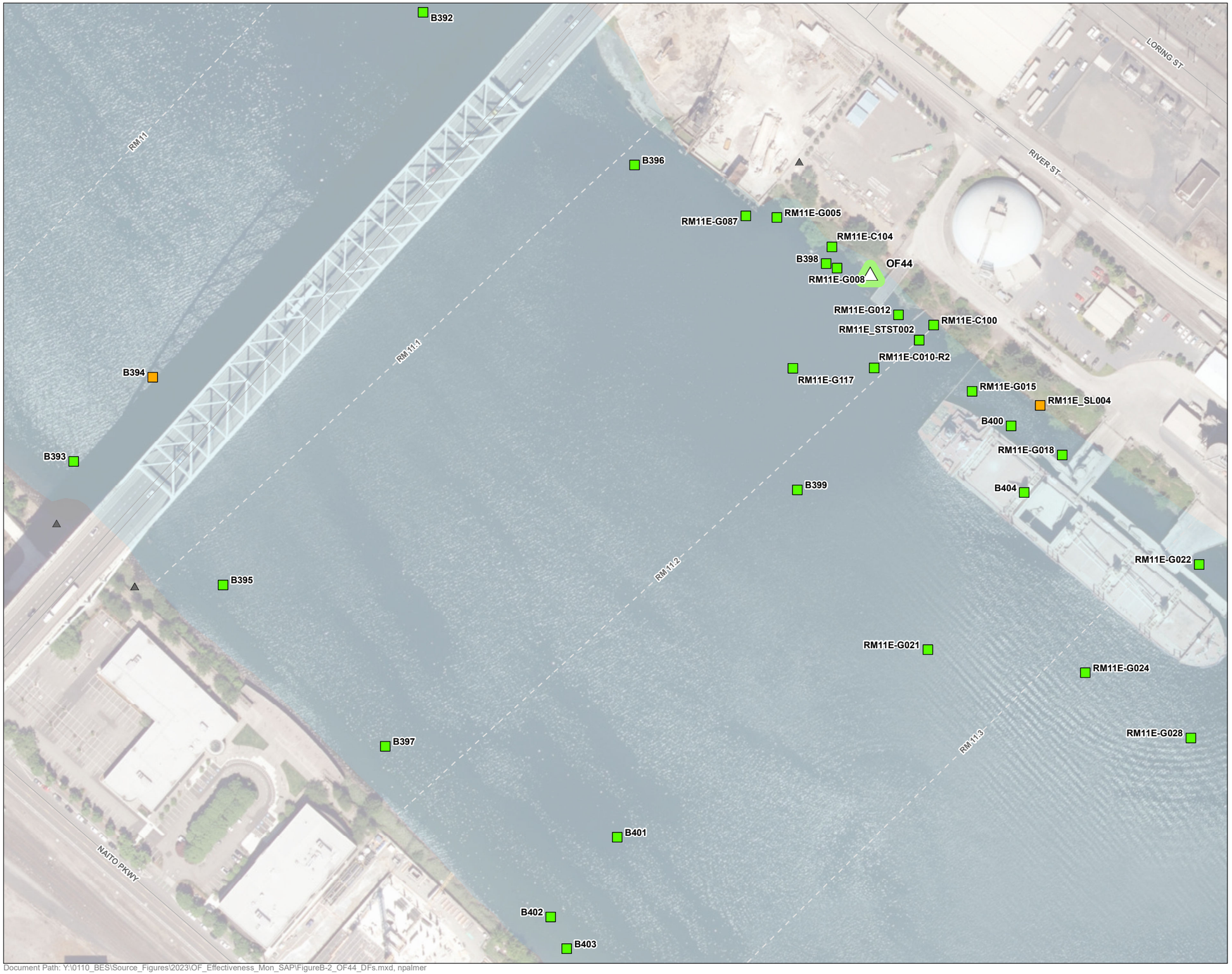


FIGURE C-2

Basins 44
Dioxin/Furan Concentrations in Surface Sediment

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

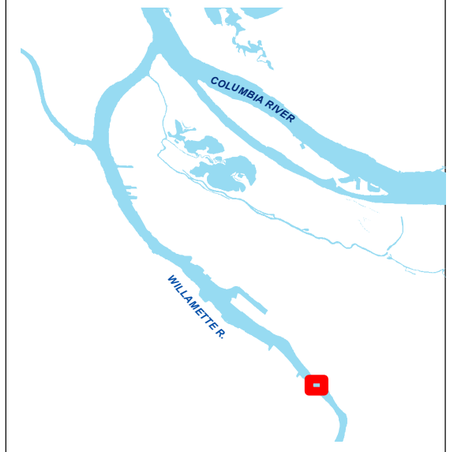
- Surface Sediment Location

Dixin/Furan Result

- Below Practical Quantitation Limit (PQL)
- Above Practical Quantitation Limit (PQL)

All Other Features

- Outfall
- Non City Outfall
- Road
- River Mile
- Waterbody



N

0 75 150 225
Feet

Date: September 13, 2023
Data Sources: ESRI, USGS, BES, Aerial Photo COP 2021

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FIGURE C-3

Basins 45
Dioxin/Furan Concentrations in Surface Sediment

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

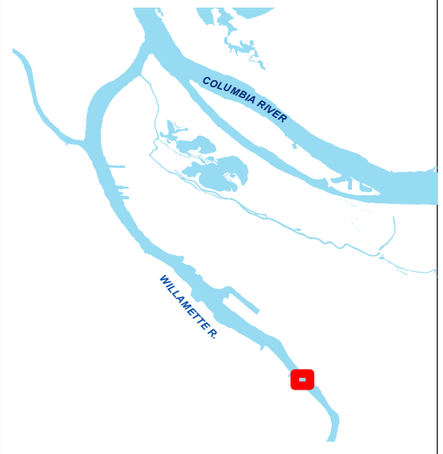
- Surface Sediment Location

Dixin/Furan Result

- Below Practical Quantitation Limit (PQL)
- Above Practical Quantitation Limit (PQL)

All Other Features

- Outfall
- Non City Outfall
- Road
- River Mile
- Waterbody



N

0 75 150 225
Feet

Date: September 13, 2023
Data Sources: ESRI, USGS, BES, Aerial Photo COP 2021

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FIGURE C-4

Basins 48
Dioxin/Furan Concentrations in Surface Sediment

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring

LEGEND

- Surface Sediment Location

Dixin/Furan Result

- Below Practical Quantitation Limit (PQL)
- Above Practical Quantitation Limit (PQL)

All Other Features

- Outfall
- Non City Outfall
- Road
- River Mile
- Waterbody

N

0 75 150 225
Feet

Date: September 21, 2023
Data Sources: ESRI, USGS, BES, Aerial Photo COP 2021

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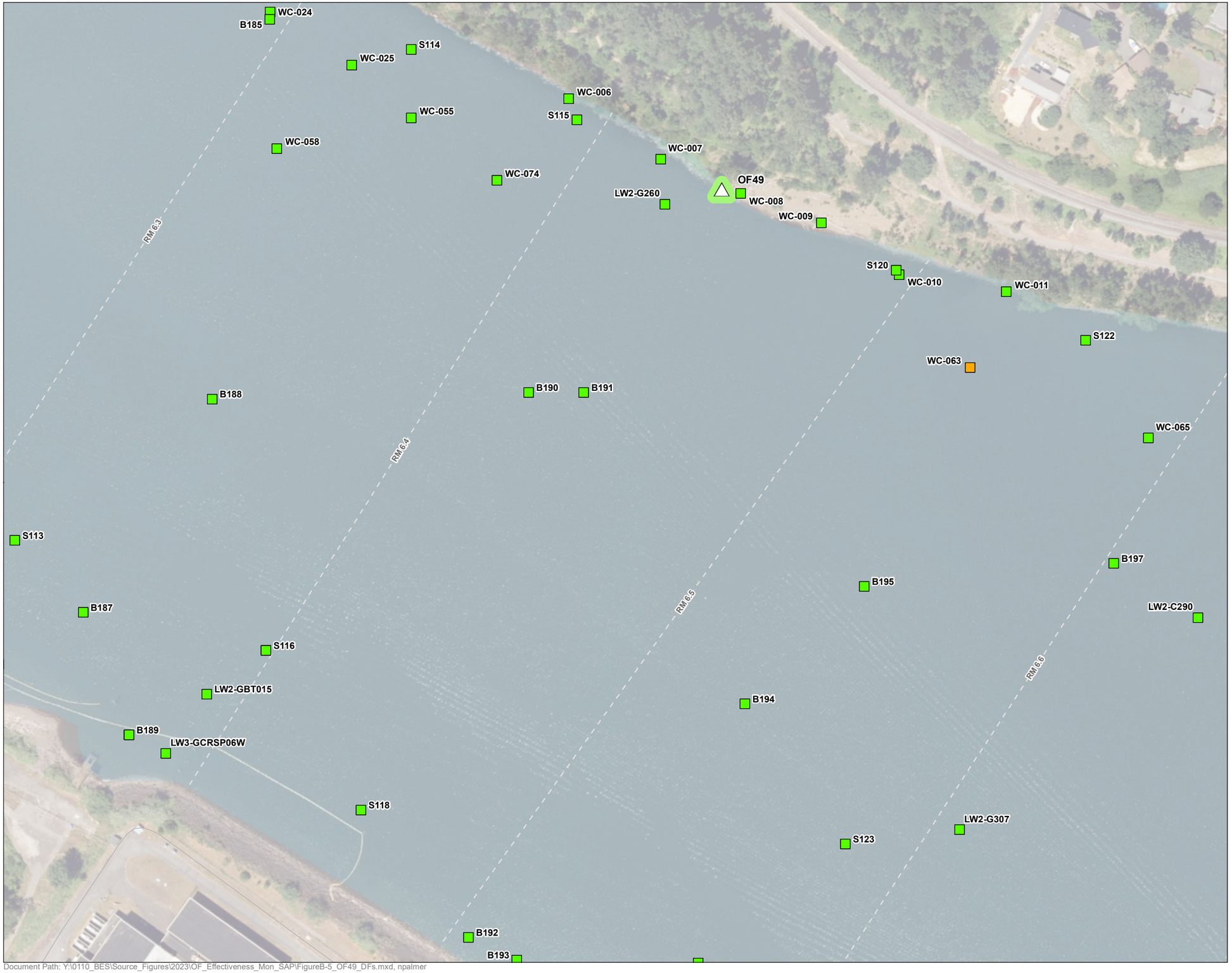
FIGURE C-5

Basins 49
Dioxin/Furan Concentrations in Surface Sediment

Sampling and Analysis Plan (Year 3)
Basin-Scale Stormwater
Outfalls Monitoring



LEGEND

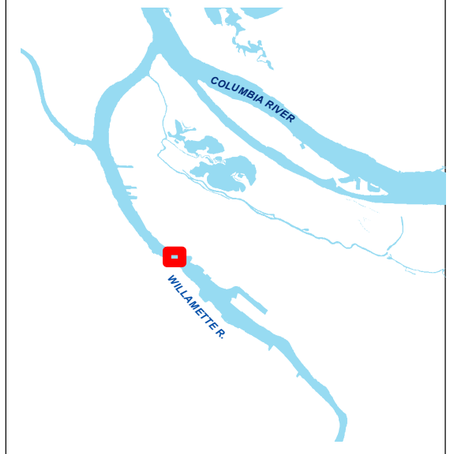
- Surface Sediment Location

Dixin/Furan Result

- Below Practical Quantitation Limit (PQL)
- Above Practical Quantitation Limit (PQL)

All Other Features

- Outfall
- Non City Outfall
- Road
- River Mile
- Waterbody



N

0 75 150 225
Feet

Date: September 13, 2023
Data Sources: ESRI, USGS, BES, Aerial Photo COP 2021

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