Port of Seattle

East Waterway, Harbor Island Superfund Site:
Phase 1 Removal Action

EAST WATERWAY PHASE 1 REMOVAL ACTION: RECONTAMINATION MONITORING 2006 DATA REPORT

For submittal to:

The US Environmental Protection Agency
Region 10
Seattle, WA

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Acronyms

AET	apparent effects threshold
ARI	Analytical Resources, Inc.
BEHP	bis(2-ethylhexyl)phthalate
GC/ECD	gas chromatograph-electron capture detection
GC/MS	gas chromatograph-mass spectrometry
CCV	continuing calibration verifications
CSL	cleanup screening level
CVAA	cold vapor atomic absorption
DMMP	Dredged Material Management Program
EPA	US Environmental Protection Agency
EWW	East Waterway Operable Unit of the Harbor Island Superfund site
ICP-AES	inductively coupled plasma-atomic emission spectrometry
ID	identification
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PSEP	Puget Sound Estuary Program
RMP	recontamination monitoring plan
SDG	sample delivery group
SMS	Washington State Sediment Management Standards
SQS	sediment quality standards of SMS
SVOC	semivolatile organic compound
TOC	total organic carbon
Windward	Windward Environmental LLC

1.0 Introduction

This data report presents the results of the chemical analyses conducted with surface sediment samples collected as part of the recontamination monitoring plan (RMP) (Windward 2005) for the East Waterway Phase 1 Removal Action Plan. The RMP presented the sampling design and analysis plan, including details on project organization, field data collection, laboratory analyses, and data management. As described in the RMP, the data will be used to evaluate compliance with the cleanup standards identified in the Phase 1 Removal Action engineering evaluation and cost analysis, characterize surface sediment chemistry throughout the removal area, assess the thickness of the sand layer, and assess any changes in surface chemistry or sand layer thickness over time. This information will be used in the remedial investigation/feasibility study planned for East Waterway (EWW).

Sediment cores were collected at 21 locations to confirm the thickness of the sand layer. Surface sediment grab samples were collected for chemical analyses at 20 locations in the EWW Phase 1 Removal Action footprint in January 2006. All surface sediment samples were analyzed for polychlorinated biphenyls (PCBs), organochlorine pesticides, mercury and metals, and semivolatile organic compounds (SVOCs) listed in the Washington State Sediment Management Standards (SMS).

The remainder of this report is organized into the following sections:

- Section 2.0 –Sediment Core and Grab Sampling Methods
- Section 3.0 – Laboratory methods
- Section 4.0 – Results
- Section 5.0 – References

The text of this report is supported by the following appendices:

- Appendix A – Data tables
- Appendix B – Data management
- Appendix C – Data validation reports
- Appendix D – Raw analytical laboratory data
- Appendix E – Collection forms and field notes
- Appendix F – Chain-of-custody forms

2.0 EWW Sediment Core and Grab Sampling Methods

This section presents the surface sediment sample identification (ID) scheme, sample locations, collection methods, and field deviations from the RMP (Windward 2005) for samples collected in the EWW in January 2006. Additional details regarding the surface sediment collection methods are presented in the RMP. Copies of field notes, surface sediment collection forms, and protocol modification forms are presented in Appendix E. Copies of completed chain-of-custody forms used to track sample custody are presented in Appendix F. Photographs of the sediment cores are provided on a compact disk (located in a pocket inside the back cover).

2.1 Sample Identification Scheme

Each sampling location was assigned a unique alphanumeric location ID number. The first four characters were "EW-RM" to identify the EWW recontamination monitoring event. The last characters were consecutive numbers between 1 and 30 to identify the specific location within the EWW (e.g., EW-RM-1). Sample IDs were consistent with the location IDs but also included the two-digit year after the event identifier. For example, a sample taken at location 1 this year was identified as "EW-RM06-1."

Field quality assurance/quality control samples were assigned modified sample identifiers as described below:

- Field duplicates were assigned a unique sample location number beginning with 101 (e.g., EW-RM06-101).
- Rinsate blanks were assigned the same characters as the sample identifier, followed by the identifier "RB." For example, the rinsate blank collected for sample EW-RM06-1 would be "EW-RM06-1-RB."

2.2 Sampling Locations

The rationale for selecting sediment core and surface grab locations is presented in the RMP (Windward 2005). Sampling was conducted January 12, 23, and 24, 2006. Twenty eight locations were sampled (Table 1). Twelve locations were designated in the RMP for depth core sampling only. However, if there were less than 10 cm of sand layer observed at a core location or if there were at least 2 cm of material overlying the sand layer, then a sediment chemistry grab sample was collected at the location. Sampling locations are shown in Figure 1.

Table 1. EWW sediment core and grab sampling locations

Location ID	Zone[a]	Sample Date	Sample Time	Actual Coordinates[b]		Target Coordinates[b]		Distance Off Target (ft)	Sample Type
				(X)	(Y)	(X)	(Y)		
EW-RM01	1	01.12.06	0913	1267410	214187	1267413	214188	2.7	chemistry grab
EW-RM02	2	01.12.06	0930	1267727	214220	1267726	214222	2.5	chemistry grab
EW-RM03	2	01.24.06	0912	1267653	214296	1267657	214293	5.3	core
		01.24.06	1321	1267652	214294			5.3	chemistry grab
EW-RM04	1	01.24.06	1338	1267260	214433	1267258	214434	2.1	chemistry grab
EW-RM05	2	01.23.06	0847	1267518	214454	1267519	214458	4.3	core
		01.24.06	1351	1267518	214460			2.3	chemistry grab
EW-RM06	2	01.24.06	0939	1267728	214454	1267730	214452	2.9	core
		01.24.06	1404	1267729	214452			1.1	chemistry grab
EW-RM07	1	01.24.06	1415	1267460	214581	1267462	214581	2.2	chemistry grab
EW-RM08	2	01.24.06	1005	1267367	214644	1267368	214645	1.2	core
		01.24.06	1426	1267368	214644			1.4	chemistry grab
EW-RM09	2	01.23.06	0924	1267645	214659	1267647	214659	1.7	core
EW-RM10	2	01.24.06	1048	1267529	214703	1267527	214703	2.3	core
		01.24.06	1437	1267530	214703			2.7	chemistry grab
EW-RM11	2	01.23.06	0958	1267443	214764	1267439	214767	4.7	core
EW-RM12	2	01.23.06	1305	1267262	214780	1267254	214787	11.1	core
EW-RM13	2	01.23.06	1340	1267519	214788	1267518	214788	1.4	core
EW-RM14	2	01.23.06	1407	1267526	214848	1267527	214849	1.2	core
EW-RM15	3	01.12.06	0835	1267660	214866	1267653	214869	7.6	core
		01.12.06	1133	1267647	214877			9.6	chemistry grab
EW-RM16[c]	2	01.12.06	0947	1267619	215022	1267620	215021	1.3	chemistry grab
EW-RM17	2	01.23.06	1439	1267481	215017	1267477	215018	4.0	core
EW-RM18	2	01.24.06	1111	1267317	215027	1267317	215030	2.8	core
		01.12.06	1533	1267314	215030			3.2	chemistry grab
EW-RM19	3	01.23.06	1112	1267653	215081	1267654	215081	1.4	core
		01.24.06	1506	1267629	215096			28.9	chemistry grab
EW-RM20	2	01.24.06	1134	1267310	215159	1267308	215161	2.4	core
		01.12.06	1524	1267311	215162			3.3	chemistry grab
EW-RM21	2	01.23.06	1508	1267599	215152	1267600	215153	1.8	core
		01.24.06	1518	1267598	215152			2.0	chemistry grab
EW-RM22	3	01.23.06	1138	1267770	215170	1267770	215171	1.4	core
EW-RM23	2	01.24.06	0849	1267406	215274	1267408	215271	4.0	core
		01.12.06	1511	1267408	215270			0.7	chemistry grab
EW-RM24	1	01.12.06	1000	1267607	215311	1267609	215311	2.3	chemistry grab

Location ID	Zone[a]	Sample Date	Sample Time	Actual Coordinates[b] (X)	Actual Coordinates[b] (Y)	Target Coordinates[b] (X)	Target Coordinates[b] (Y)	Distance Off Target (ft)	Sample Type
EW-RM25	1	01.12.06	1018	1267648	215503	1267653	215501	5.7	chemistry grab
EW-RM26	2	01.23.06	1558	1267433	215676	1267436	215674	3.4	core
		01.12.06	1456	1267430	215676			6.4	chemistry grab
EW-RM27	2	01.23.06	1534	1267654	215743	1267654	215744	0.7	core
EW-RM28	2	01.24.06	0817	1267560	216033	1267557	216035	4.0	core
		01.12.06	1442	1267556	216035			1.3	chemistry grab

a Zone 1 is area with no interim action, Zone 2 is area with sand layer placement, Zone 3 is mound area where gravel layer was placed

b Washington State Plane North, NAD83, US survey ft.

c Field duplicate EW-RM06-101 was collected at this location.

2.3 Sampling Methods

Sediment cores were initially collected using a gravity corer with a 3-inch (outer diameter) steel core tube and a butyl acetate core tube liner. A vibratory core sampler (vibracorer) was used after initial attempts with the gravity corer failed to achieve the necessary penetration. The vibracorer was able to achieve the minimum target penetration depth of 80 cm. At each sample location, total water depth and total sediment recovered were measured and recorded in the field log book. Time and date of core collection were also recorded. Cores were photographed through the clear liner, and specific details including the presence or absence of the sand layer, the depth of the sand layer, and visible organic material of each core were documented.

Surface sediment grab samples were collected with a stainless steel, 0.1-m^2 van Veen grab sampler. Before processing, each successful grab sample was evaluated for acceptability in accordance with the criteria listed in the RMP. Sediment samples for chemical analysis were collected from the 0-to-10-cm-depth interval with a clean stainless steel spoon and placed into a clean stainless steel bowl for homogenization.

2.4 Field Deviations from the RMP

Field deviations from the RMP (Windward 2005) included modifications to the core sampling method and core acceptance criteria. These field deviations did not affect the data quality and are discussed below. The US Environmental Protection Agency (EPA) was consulted on these changes.

- A sediment core collected from location EW-RM15 was accepted, although it did not meet the minimum penetration depth criteria (80 cm). After multiple attempts, 60 cm of penetration was achieved and a 2- to 2.5-cm layer of material was observed above the sand layer resulting in the collection of a sediment grab sample.

- Sediment cores were not collected using a 3-inch (outer diameter) gravity corer because initial attempts with added weights on January 12, 2006, could not penetrate enough of the sand and gravel cap layer to meet core penetration acceptance criteria. The coring equipment was switched to a 4-inch (outer diameter) Vibracorer following consultation with EPA.

3.0 Laboratory Methods

The methods used to chemically analyze sediment samples are described briefly in this section and in detail in the EWW RMP (Windward 2005). This section also summarizes any laboratory deviations from the RMP. All chemical analyses of the sediment samples were conducted at Analytical Resources, Inc. (ARI).

3.1 Analytical Methods

The chemical testing adhered to the most recent EPA analysis protocols which represent standard methods used for the analysis of these analytes in sediments. Table 2 summarizes the specific methods used to analyze the sediment samples.

Table 2. Chemical analysis methods for surface sediment samples

Parameter	Method	Reference
PCBs as Aroclors	GC/ECD	EPA 8082
Organochlorine pesticides[a]	GC/ECD	EPA 8081A
SVOCs (including PAHs)[b]	GC/MS	EPA 8270C
Mercury	CVAA	EPA 7471A
Other metals[c]	ICP-AES	EPA 6010B
Grain size	sieve/pipette	PSEP (1986)
TOC	combustion	Plumb (1981)
Total solids	oven-dried	EPA 160.3

a Target pesticides included: 4,4’-DDT, 4,4’-DDE, 4,4’-DDD, 2,4’-DDT, 2,4’-DDE, 2,4’-DDD, aldrin, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC, oxychlordane, alpha- and gamma-chlordane, cis- and trans-nonachlor, dieldrin, alpha- and beta-endosulfan, endosulfan sulfate, endrin, endrin ketone, endrin aldehyde, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxychlor, mirex, and toxaphene.

b Target PAHs included: anthracene, pyrene, dibenzofuran, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene, fluoranthene, benzo(k)fluoranthene, acenaphthylene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benz(a)anthracene, acenaphthene, phenanthrene, fluorene, 2-chloronaphthalene, naphthalene, and 2-methylnaphthalene.

c Target metals included: arsenic, antimony, cadmium, chromium, copper, lead, nickel, silver, and zinc.

CVAA – cold vapor atomic absorption

GC/ECD – gas chromatograph-electron capture detection

GC/MS – gas chromatograph-mass spectrometry

EPA – US Environmental Protection Agency

ICP-AES – inductively coupled plasma-atomic emission spectrometry

PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PSEP – Puget Sound Estuary Program
SVOC –semivolatile organic compound
TOC – total organic carbon

3.2 Laboratory Deviations from the RMP

There were no laboratory deviations from the methods and procedures described in the RMP, with the following exception. The RMP lists EPA Method 9060 as the test method for total organic carbon (TOC). Plumb (1981) is the correct method reference for TOC analysis in these sediment samples.

4.0 Results

4.1 Cover Layer Verification Results

Twenty-one core samples were collected in the areas where sand or gravel cover material had been placed (Zones 2 and 3)to confirm the depth of the cover layer. These results are provided in Table 3. In all core samples, at least 10 cm of sand layer were observed. At four locations (EW-RM05, EW-RM15, EW-RM19, and EW-RM21) more than 2 cm of material had accumulated on top of the sand cover layer, which resulted in the collection of additional chemistry samples (Figure 2).

Table 3. Depth of cover layer and accumulation in core samples

Location ID	Zone	Sand Layer Depth (cm)	Overlying Material Depth (cm)	Surface Sediment Grab Collected	Reason for Chemistry Grab
EW-RM03	2	23	1	Y	predetermined in RMP
EW-RM05	**2**	**25**	**5**	**Y**	**overlying material ≥ 2 cm**
EW-RM06	2	39	1	Y	predetermined in RMP
EW-RM08	2	25	<1	Y	predetermined in RMP
EW-RM09	2	30	1	N	overlying material < 2 cm
EW-RM10	2	24	1	Y	predetermined in RMP
EW-RM11	2	23	1.5	N	overlying material < 2 cm
EW-RM12	2	30	1	N	overlying material < 2 cm
EW-RM13	2	24	1	N	overlying material < 2 cm
EW-RM14	2	28	1.5	N	overlying material < 2 cm
EW-RM15	**3**	**23**	**2.5**	**Y**	**overlying material ≥ 2 cm**
EW-RM17	2	20	not visible	N	overlying material < 2 cm
EW-RM18	2	38	<1	Y	predetermined in RMP
EW-RM19	**3**	**29**	**2**	**Y**	**overlying material ≥ 2 cm**
EW-RM20	2	34	not visible	Y	predetermined in RMP

EW-RM21	**2**	**36**	**3**	**Y**	**overlying material ≥ 2 cm**
EW-RM22	3	43	1.5	N	overlying material < 2 cm
EW-RM23	2	23	<1	Y	predetermined in RMP
EW-RM26	2	41	4	Y	predetermined in RMP
EW-RM27	2	17	1	N	overlying material < 2 cm
EW-RM28	2	24	<1	Y	predetermined in RMP

RMP – recontamination monitoring plan

Bold and shading indicates locations where chemistry grab samples were subsequently collected because > 2cm of accumulated material was observed on top of the cover material.

4.2 Surface Sediment Chemistry Results

Surface sediment grab samples were analyzed for the full suite of SMS chemicals. The data validation, conducted by EcoChem, Inc., is discussed in Section 4.3 and presented in full in Appendix C. Complete data tables and raw laboratory data are presented in Appendices A and D, respectively. Data management protocols, including rules for the treatment of lab replicates and field duplicates as well as summation rules for total PCBs, total polycyclic aromatic hydrocarbons (PAHs) and total DDTs, are presented in Appendix B.

Appendix A presents a summary of chemistry results for the 21 EWW surface sediment samples, including the number of detections, range of detected concentrations, mean of detected concentrations, and range of reporting limits for chemicals reported and non-detects. In addition, the complete data tables containing results for each sample compared to SMS, Dredged Material Management Program (DMMP), or apparent effects threshold (AET) values are presented. DMMP screening level guideline (SL) and DMMP maximum level guideline (ML) were used for 14 chemicals for which there are no available SMS.

All surface sediment samples collected from the EWW were analyzed by ARI for PCBs as Aroclors, pesticides, metals, SVOCs (including PAHs and phthalates), grain size, TOC, and percent solids. The results of the analyses are discussed below by analyte group. Table 4 presents the chemistry results that exceeded SMS. Surface sediment chemistry results represented by sediment quality standards (SQS) or cleanup screening level (CSL) categories for total PCBs, bis(2-ethylhexyl)phthalate (BEHP), and mercury are presented in Figures 3 through 5, respectively.

Table 4. Sample results exceeding SMS criteria

Location ID	Sample ID	Total PCBs (mg/kg OC)		Bis(2-ethylhexyl)-phthalate (mg/kg OC)		1,4-Dichloro-benzene (mg/kg OC)		Phenol (µg/kg dw)		Mercury (mg/kg dw)	
		SQS	CSL	SQS	CSL	SQS	CSL	SQS	CSL	SQS	CSL
		12	65	47	78	3.1	9.0	420	1,200	0.41	0.59
EW-RM01	EW-RM06-1	**32**		16		1.3 J		**630**		0.17	
EW-RM02	EW-RM06-2	4.5		8.8		**7.9**		330		0.06	
EW-RM03	EW-RM06-3	2.8 U		4.6		**5.7**		44		0.05 U	
EW-RM04	EW-RM06-4	<u>**170**</u>		16		0.91 J		**450**		0.15	
EW-RM05	EW-RM06-5	**16**		15		1.7		220		0.13	
EW-RM06	EW-RM06-6	12 J		20		**6.2**		400		0.13	
EW-RM07	EW-RM06-7	**16**		18		1.7		**520**		0.12	
EW-RM10	EW-RM06-10	**23**		30		**3.2**		**470**		<u>**0.67**</u>	
EW-RM15	EW-RM06-15	<u>**100**</u>		<u>**120**</u>		**7.4**		340		<u>**0.78**</u>	
EW-RM16	EW-RM06-16	**16**		16		1.0 J		**560**		0.16	
	EW-RM06-101	**19**		12		1.4		390		0.15	
EW-RM18	EW-RM06-18	3.5 U		3.5 U		**3.5 U**		20 U		0.04 U	
EW-RM19	EW-RM06-19	**30**		14		0.81 J		**480**		0.38	
EW-RM24	EW-RM06-24	**14 J**		26		1.0 J		310		0.28	
EW-RM25	EW-RM06-25	**34**		20		1.7		**590**		0.33	
EW-RM26	EW-RM06-26	**40**		13		**4.0 U**		20 U		0.05 U	

dw – dry weight

Concentration in **bold** indicates SQS exceedance.

Concentration in <u>**bold underline**</u> indicates CSL exceedance.

CSL – cleanup screening level

OC – organic carbon

SQS – sediment quality standards

4.2.1 Conventionals: grain size, TOC, and percent solids

TOC values ranged from 0.35 to 2.3% dry weight. Only one sample, EW-RM06-20, was less than 0.5%. The percent solids ranged from 57.6 to 93.6. Grain size results were consistent with the placement of cover material. In Zone 1, where no cover material was placed, the sediments consisted primarily of fine to medium sand. The percent of fine material (silt + clay) was typically higher in Zone 1 sediments than in Zone 2 or 3 sediments. In Zone 2, where sand cover material was placed, sediments were typically very coarse to medium sand. Finally, in Zone 3, where gravel cover material was placed, the sediments were predominantly gravel.

4.2.2 PCBs as Aroclors and pesticides

Total PCBs exceeded the SQS at 12 locations (Figure 3). At two of those locations, EW-RM04 and EW-RM15, total PCB concentrations also exceeded the CSL. Pesticides were not detected in any of the samples.

4.2.3 SVOCs

No PAH results were above SMS criteria. BEHP was the only phthalate to exceed SMS criteria. At location EW-RM-15, BEHP exceeded both the SQS and CSL with a concentration of 120 mg/kg OC (Figure 4). Phenol exceeded the SQS at seven locations, and 1,4--dichlorobenzene had detected exceedances of the SQS at five locations. No other SVOCs exceeded SMS criteria.

4.2.4 Metals

Mercury was the only metal to exceed SMS criteria. Mercury exceeded both the SQS and CSL at locations EW-RM10 and EW-RM15, with concentrations of 0.67 and 0.78 mg/kg, respectively (Figure 4).

4.3 DATA INTERPRETATION

The results of the cover layer verification sampling indicate that the depth of the cover layer was greater than 10cm at all sampling locations where cover layer thickness was measured. All measured depths exceeded 20cm with the exception of one location where a depth of 17cm was reported (EW-RM-27).

The surface sediment chemistry results were consistent with the deposition of contaminated material on top of the sand cover material resulting in surface sediment chemistry results above SMS values. All locations with sediment chemistry values above the SMS were locations with greater than 2cm of material deposited on top of the cover material with one exception (EW-RM-10). The goal of the recontamination monitoring study was to assess the surface sediment in the removal area. The extent to which contaminated subsurface sediment might be mixed with the cover layer material was not assessed.

Future recontamination monitoring events should focus on identifying areas of deposition and further characterizing the areas which have been observed to be depositional with SMS exceedances. The initial placement of the cover material appears to have been successful and future sampling of the depth of the cover material should focus on areas that were not sampled in the initial sampling event.

4.4 CHEMICAL DATA VALIDATION RESULTS

Independent data validation of all chemical analysis results was conducted by EcoChem. The complete data validation report is provided in Appendix C. The results of the validation are summarized below. Detailed information regarding every qualified sample is available in Appendix C.

The surface sediment samples submitted to ARI were analyzed in one sample delivery group (SDG). EcoChem conducted a full-level data validation on this SDG (IZ26). The data validation included a review of calibration, internal standard, and interference check sample summary forms. The majority of the data did not require qualification, or were qualified with a J, indicating an estimated value. Based on the information reviewed, the overall data quality was considered acceptable for use as qualified. Issues that resulted in the qualification of data are summarized below.

- The percent recovery for antimony in the matrix spike sample was 19.4%. The post-digestion spike recovery was within quality control limits. Antimony was never detected, and all antimony results were UJ-qualified as estimated.
- 2,4-Dinitrophenol, 3-nitroaniline, 4-nitroaniline, benzyl alcohol, and 4,6-dinitro-o-cresol exhibited low responses in continuing calibration verifications (CCVs) These chemicals were not detected in any samples, and all results were UJ-qualified.
- When more than one Aroclor is present in a sample, the potential exists for a high bias from the contribution of one Aroclor to another caused by common peaks or peaks that cannot be completely resolved. Analytical peaks are selected and Aroclor identification is made based on the best resolution possible for that particular sample. Reporting limits for some PCB Aroclors were elevated in six samples because of chromatographic interferences and overlapping Aroclor patterns. Reported Aroclor concentrations were reported based on the individual Aroclors that provided the best match to the observed sample pattern.
- Thirteen samples exhibited an analytical response above standard reporting limits for select pesticides. These tentatively identified results were Y-qualified by the laboratory as non-detect at elevated reporting limits. The Y-qualifier indicates that chromatographic interference from PCB congeners in the sample prevented adequate resolution of the analyte at the standard reporting limits.

5.0 References

Plumb R, Jr. 1981. Procedures for handling and chemical analysis of sediment and water samples. Waterways Experiment Station, US Army Corps of Engineers, Vicksburg, MS.

PSEP. 1986. Recommended protocols for measuring conventional sediment variables in Puget Sound. Prepared for the Puget Sound Estuary Program. US Environmental Protection Agency, Region 10, Seattle, WA.

Windward. 2005. East Waterway Phase 1 removal action: recontamination monitoring plan. Windward Environmental LLC, Seattle, WA.

Figures

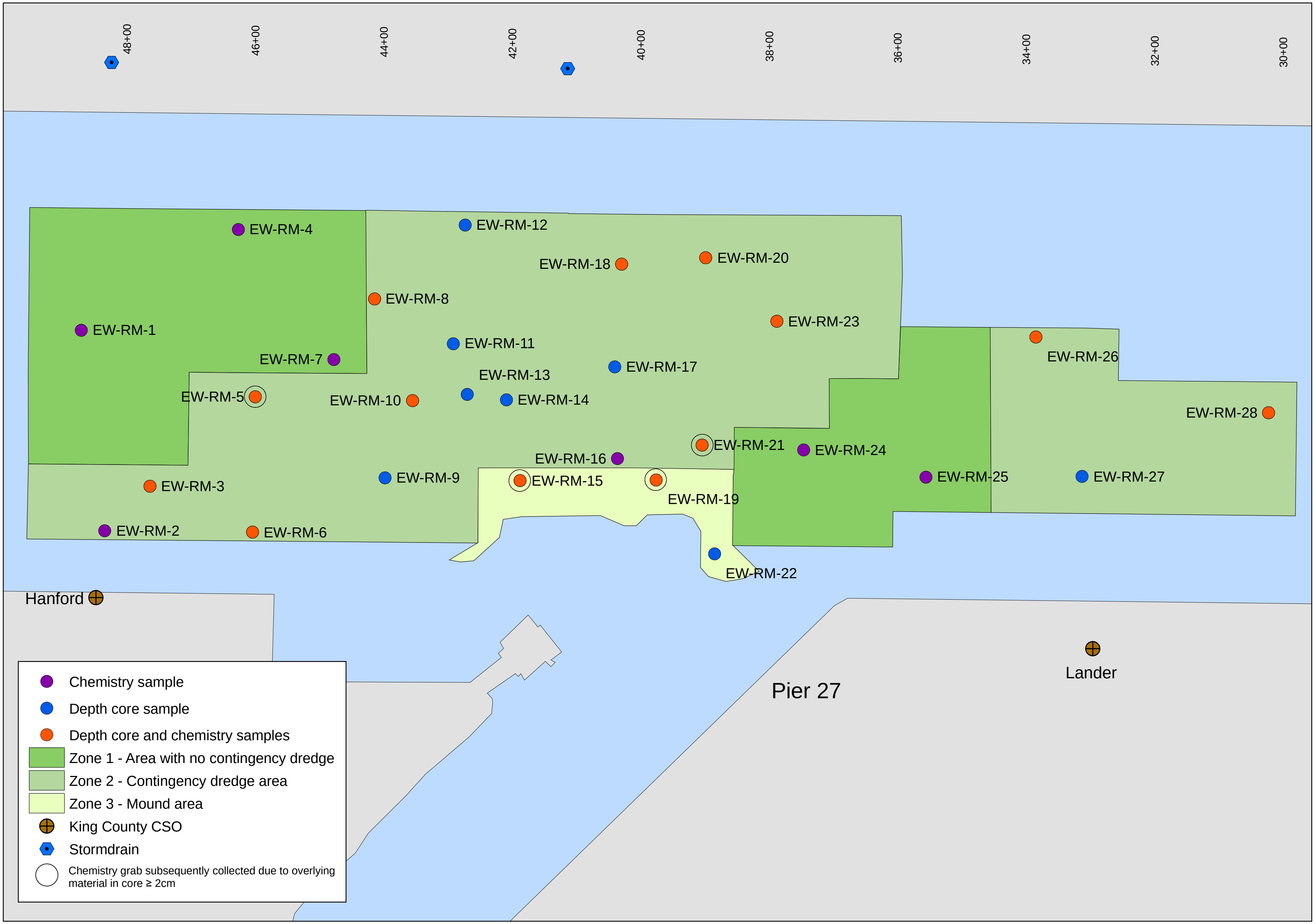
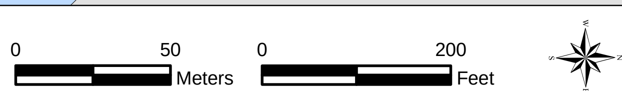


Figure 1. Sample locations



WinWard environmental LLC

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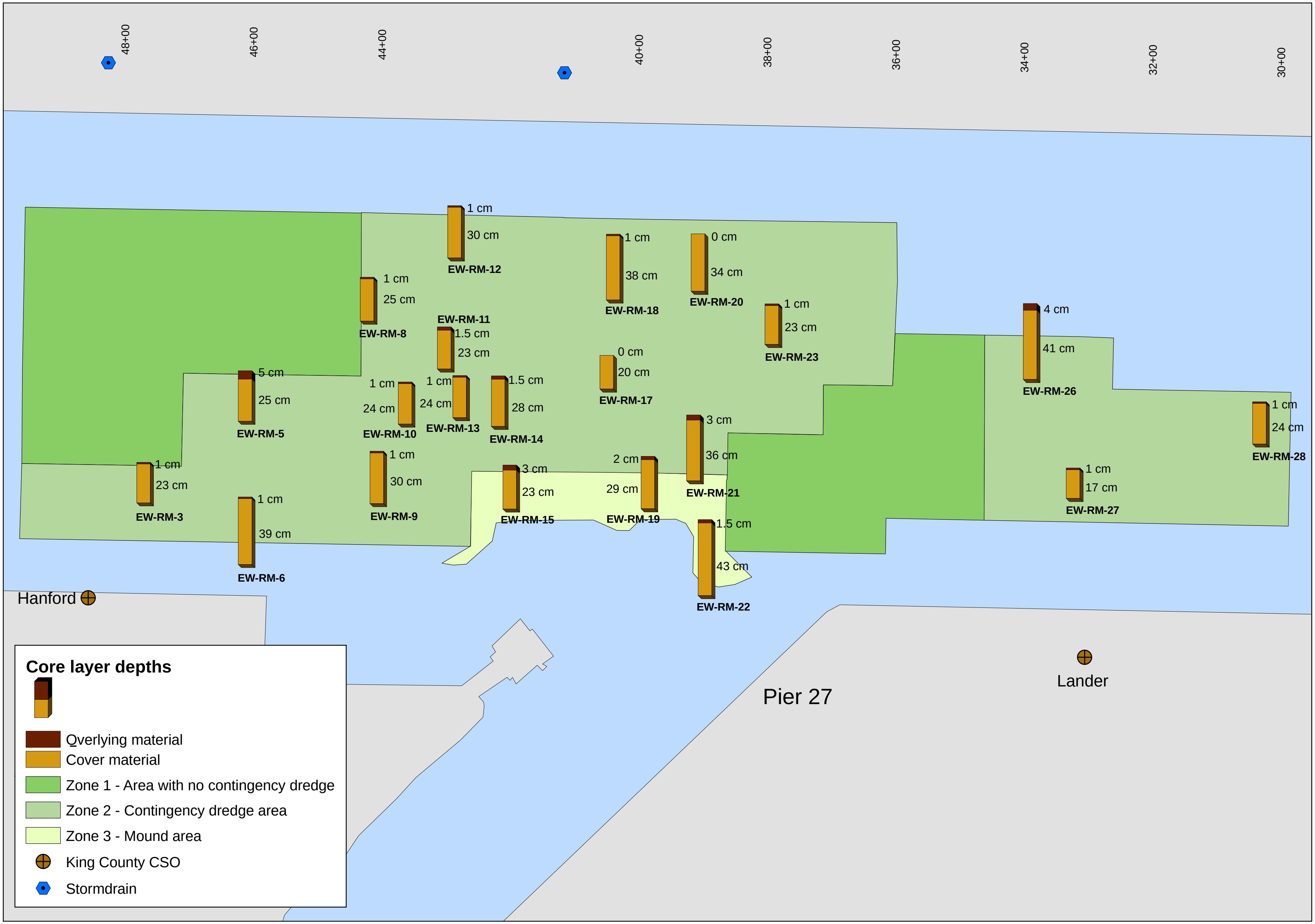

Figure 2. Depth of material in core samples

0 50 Meters
0 200 Feet

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Windward environmental LLC

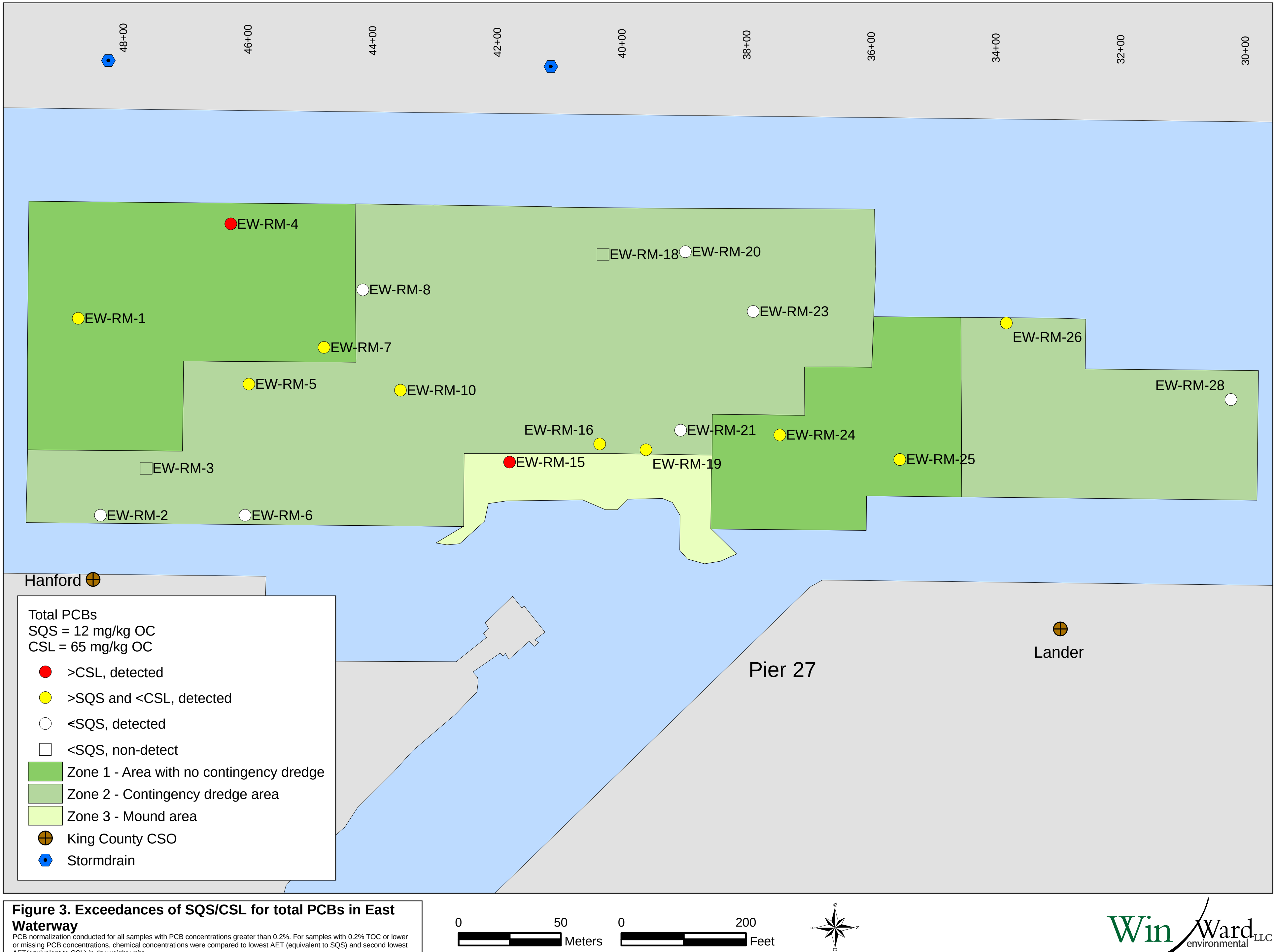

Figure 3. Exceedances of SQS/CSL for total PCBs in East Waterway

PCB normalization conducted for all samples with PCB concentrations greater than 0.2%. For samples with 0.2% TOC or lower or missing PCB concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET(equivalent to CSL) in dry weight units.

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Modified by AMW 09/22/06; Prepared by STS 05/22/06 Map 2333 W:\Projects\00-08-08 East Waterway\Data\GIS\Recontamination

Figure 4. Exceedances of SQS/CSL for BEHP (OC normalized) in East Waterway

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC or lower or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET(equivalent to CSL) in dry weight units.

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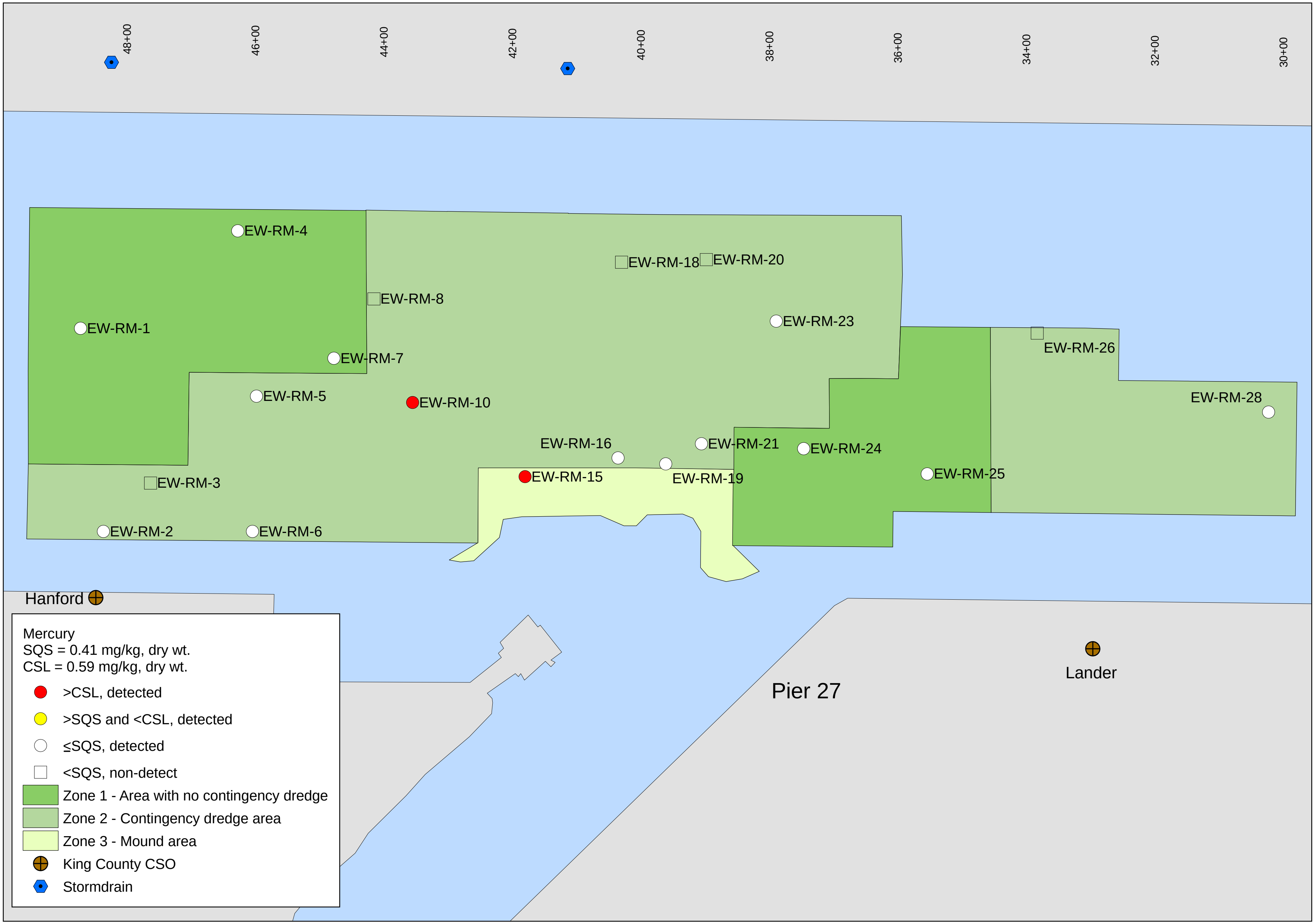

Figure 5. Exceedances of SQS/CSL for Mercury in East Waterway

Modified by AMW 09/22/06; Prepared by STS 05/22/06 Map 2334 W:\Projects\00-08-08 East Waterway\Data\GIS\Recontamination