Lower Duwamish Waterway Group

Port of Seattle / City of Seattle / King County / The Boeing Company

TECHNICAL MEMORANDUM:
SURVEY METHODS FOR IDENTIFYING SANDPIPER PRESENCE AND HABITAT ALONG THE LOWER DUWAMISH WATERWAY

FINAL

For submittal to

The US Environmental Protection Agency
Region 10
Seattle, WA

The Washington State Department of Ecology
Northwest Regional Office
Bellevue, WA

May 26, 2004

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Acronyms

CA	Coastal America
EBDRP	Elliott Bay/Duwamish Restoration Program
Ecology	Washington Department of Ecology
EPA	US Environmental Protection Agency
ERA	ecological risk assessment
FC	field coordinator
GPS	global positioning system
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MLLW	mean lower low water
NAD	North American datum
PM	project manager
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
TM	task manager
WAAS	wide area augmentation system
Windward	Windward Environmental LLC

1.0 Introduction

This memorandum describes the objectives and methods for conducting a survey of sandpiper presence and habitat in the Lower Duwamish Waterway (LDW) shoreline as part of the Phase 2 Remedial Investigation (RI) for the LDW. Data from this survey will be used to support the Phase 2 ecological risk assessment (ERA), as described in the Phase 2 RI work plan (Windward 2004). Section 3.3.1.2 of the Phase 2 work plan presented an overview of the study design for the survey of sandpiper presence and habitat to provide stakeholders with a common understanding of the objectives and general approach.

The Phase 1 ERA (Windward 2003a) included spotted sandpiper as one of the ecological receptors of concern (ROCs). The Phase 2 ERA will further assess risks to spotted sandpipers. One of the data needs identified in a data needs memorandum (Windward 2003b) to reduce uncertainties in the Phase 2 ERA was site-specific information on the spatial distribution of habitat in the LDW for spotted sandpipers as well as qualitative information on site use of the LDW by spotted sandpipers. Together, these data will be used, in conjunction with existing site-use information, to assess potential exposure scenarios for spotted sandpipers in the Phase 2 ERA. This survey will not be used to quantitatively assess their level of habitat utilization (i.e., the amount of time sandpipers spend foraging in the LDW).

Elements from US Environmental Protection Agency (EPA) guidance for Quality Assurance Project Plans (EPA 2002) are included in this memo, but a formal QAPP is not warranted because of the qualitative nature of the information to be collected.

This memorandum is organized into the following sections:

- Section 2 – project overview
- Section 3 – survey methods
- Section 4 – documentation and reporting
- Section 5 – references
- Section 6 – oversize figures

2.0 Project Overview

This section describes how the project will be managed and organized. It also provides background information on existing data from past bird monitoring studies of the LDW, project objectives, and a schedule for conducting the survey.

2.1 PROJECT ORGANIZATION

This section presents the overall project organization for the survey, as well as responsibilities of project team members. The Lower Duwamish Waterway Group (LDWG), EPA, and the Washington Department of Ecology (Ecology) will be involved in all aspects of this project, including discussion, review, and approval of the QAPP, and interpretation of the results of this project, including discussion, review, and approval of this technical memorandum, and interpretation of the results of the investigation. EPA and Ecology will be represented by their Project Managers for this project, Allison Hiltner and Rick Huey, respectively.

Kathy Godtfredsen will serve as the Windward PM on behalf of LDWG. The Windward PM is responsible for overall project coordination and provides oversight on planning and coordination, production of all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. The Windward PM is also responsible for coordinating with LDWG and EPA's and Ecology's PMs on schedule, deliverables, and other administrative details. Dr. Godtfredsen can be reached as follows:

Kathy Godtfredsen
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Berit Bergquist will serve as the Windward Task Manager (TM) and field coordinator (FC). The TM is responsible for project planning and coordination, production of all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. The TM is responsible for communicating with the Windward PM on progress of project tasks and any deviations from the methods described in this technical memorandum. Ms. Bergquist can be reached as follows:

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Matthew Boyle will serve as lead biologist during the survey to provide expertise on sandpiper identification and habitat observations. Kevin Li, a field biologist with King

County, will assist Matthew Boyle with sandpiper identification. Their contact information is as follows:

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2.2 PROBLEM DEFINITION/BACKGROUND

The Phase 2 ERA will evaluate exposure of wildlife to sediment-associated chemicals in the LDW. Shorebirds represent a group of avian wildlife species that may be exposed to sediment-associated chemicals because their diet includes benthic invertebrates, and they incidentally ingest sediment as a result of their feeding behavior. Spotted sandpipers were chosen as the ROC to represent shorebirds for the Phase 2 ERA because of their feeding behavior, and also because spotted sandpiper nesting sites have previously been documented along the LDW. Their presence suggests potential exposure of both adult and young sandpipers to chemicals in LDW sediment. The primary reason spotted sandpiper was selected as an avian ROC rather than other shorebirds with similar dietary exposure (i.e., dunlin or other sandpiper species) is because the other species are not known to nest along the LDW. Spotted sandpiper will serve as a surrogate species for other shorebirds in the Phase 2 ERA.

The Phase 2 ERA will include an exposure assessment for spotted sandpiper to estimate their dietary intake of chemicals through ingestion of prey and sediment. This exposure estimate will be based on assumptions regarding foraging locations and chemical concentrations in prey and sediment at those locations. Because chemical concentrations vary throughout the LDW, it is important to determine where sandpipers may be feeding within the LDW to minimize uncertainty in the risk estimates.

Sandpiper site use data are available for certain areas of the LDW from past bird monitoring studies, but these studies have focused on restoration sites located between river mile (RM) [1] 0 and 1 and between RM 4 and 5 (Figure 1). A summary of

[1] In the LDW, river miles are measured from the southern tip of Harbor Island.

past bird monitoring studies is presented in Table 1; monitoring locations are shown in Figure 1.

There are two objectives for this survey; the primary objective is to identify potential habitat for spotted sandpipers throughout the LDW regardless of where these birds are observed during the survey. The secondary objective is to observe the presence of spotted sandpipers throughout the LDW[2] during their nesting period. The results of the survey will be used in the exposure assessment of the Phase 2 ERA, using a weight-of-evidence approach to estimate which habitats may be used by spotted sandpipers (or other resident/nesting shorebirds). Areas will be identified as potential habitat based on: 1) the observed presence of spotted sandpiper during this survey or past surveys, and 2) the presence of habitat characteristics preferred by spotted sandpipers. The presence of preferred habitat characteristics alone will be sufficient to identify an area as potential spotted sandpiper habitat. The Phase 2 ERA will evaluate risk based on a range of exposure scenarios for spotted sandpipers; these scenarios will be further described in the Phase 2 ERA. The uncertainty section of the Phase 2 ERA will discuss uncertainties in site use by spotted sandpiper based on the number and locations of surveys available and spotted sandpiper use relative to site use by other shorebirds.

Information obtained on sandpiper presence and potential habitat along the LDW will be used to determine which existing intertidal sediment data are most appropriate to use in the assessment of sandpiper exposure, and whether these existing data are sufficient. This information will be used in preparing the sampling design for the surface sediment QAPP to ensure that sufficient intertidal surface sediment data will be available for the exposure assessment for sandpiper.

[2] The intertidal areas and shorelines of the LDW will be surveyed, including Kellogg Island shorelines and intertidal areas.

Table 1. Summary of bird monitoring studies on the LDW

Study	Reference	Monitoring Years	Sites[a]	Monitoring Frequency	Type of Observation	Available Data for Spotted Sandpiper
Coastal America (CA) sites	Cordell et al. 1997; 1999; 2001	1996-2000	Terminal 105, Kellogg Island, and Turning Basin	June-September 1995: 13 dates Fall 1996: 23 dates Winter 1996-97: 13 dates 1997-98: "continually" 1999-2000: data not available in report	Bird species, abundance, and behavior (foraging, resting, transit)[b]	1996: Number of spotted sandpiper observations during entire period per site 1997-98: Frequency categories for spotted sandpiper by season for each site 1999-2000: No species-specific data were presented
Elliott Bay/Duwamish Restoration Program (EBDRP): intertidal habitat monitoring	USFWS 2002; 2003	2001-2003[c]	Herring's House (formerly Seaboard Lumber), Kellogg Island, Hamm Creek, and Turning Basin	Quarterly	Bird species, gender, primary behavior[b]	2001: Number of spotted sandpiper observed per quarter per site 2002: No data specific to spotted sandpiper and site were presented
BirdSound (People for Puget Sound)	People for Puget Sound 2004; Fung 2004	2001-2003[c]	GSA marsh, Hamm Creek, Herring's House, Puget Creek, Terminal 105, and Turning Basin	Monthly	Bird species, behavior, nesting behavior type, location within site	Number of spotted sandpiper observed per month per site; behavior; whether nests or nesting behavior were observed
Terminal 107 Study (Canning et al. 1979)	Canning et al. 1979	1977-1978	Kellogg Island	September 1977 to July 1978: approximately twice monthly	Bird species; nesting sites	Number of spotted sandpiper observed each date; description of nesting habitat

[a] Locations are shown on Figure 1.

[b] Although the report states these observations were made, not all results were presented.

[c] Monitoring studies are ongoing.

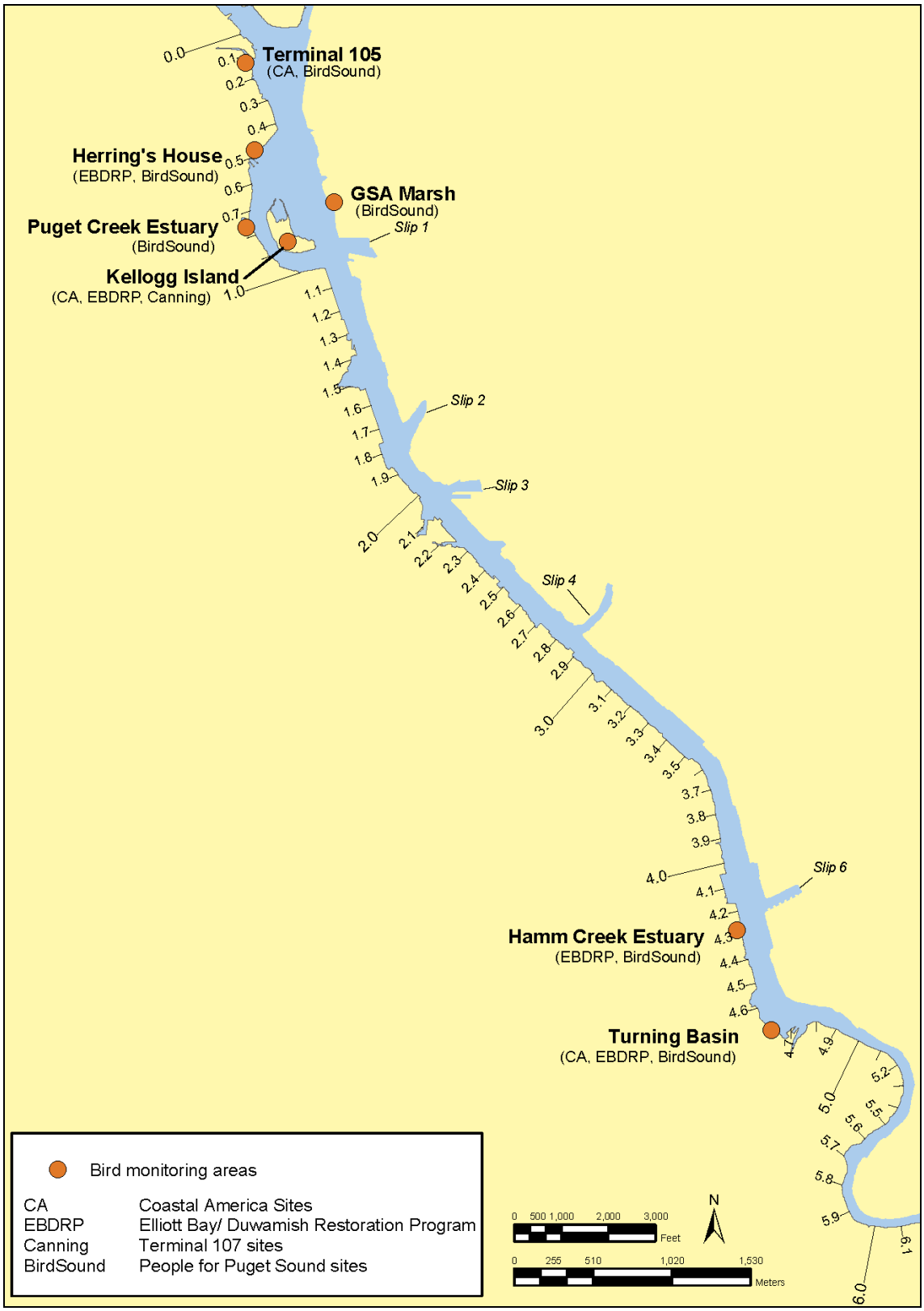

Figure 1. Areas monitored in previous bird surveys

2.3 PROJECT DESCRIPTION AND SCHEDULE

To address the data needs and study objectives identified above, a survey will be conducted from a boat along the entire LDW shoreline to identify the presence of sandpipers and their preferred intertidal habitat. The survey is scheduled for four days in early June 2004 during the expected spotted sandpiper nesting period. Sandpiper presence and potential habitat will be documented during a minus low tide on June 3 and 4, 2004. On the remaining two survey days, June 7 and June 11, the shoreline will be monitored for sandpiper presence only (i.e., habitat will not be surveyed). On June 7, monitoring will occur during high tide levels, and on June 11, monitoring will occur during medium tide levels. A draft technical memorandum of survey results will be submitted to EPA and Ecology on July 23, 2004. Information in the draft results memorandum will be used to inform the draft surface sediment QAPP, which will be submitted to EPA and Ecology prior to finalization of the sandpiper survey results memorandum.

3.0 Survey Methods

This section provides a description of methods for assessing potential sandpiper habitat as well as sandpiper observation methods to be used during the survey. The survey will be conducted by Matthew Boyle (Grette Associates), Kevin Li (King County), and Windward personnel. An agency representative may also attend.

3.1 HABITAT SURVEY METHODS

Observations of potential sandpiper habitat will be made by boat during low tide along all intertidal areas of the LDW, as shown in Figures 2a and 2b (oversize figures; see Section 6). The habitat survey will begin at RM 0.0 along the eastern shoreline of the LDW, continue to RM 5.0,[3] and then reverse direction and continue from RM 5.0 to RM 0.0 along the western shoreline.[4] The shoreline will be observed in sections containing areas of similar habitat, with the length of each section being approximately 200 to 500 m. Each section surveyed will be assigned a unique section number. A spotted sandpiper habitat field form (Form 1 in Attachment A) will be completed for each section. Information recorded on this form will include spatial coordinates of the survey section (see Section 4.1), the general type of intertidal substrate (e.g., mud, sand, riprap), bank slope (e.g., steep, medium grade, flat), presence of vegetation and structures in upland areas, and best professional judgment by Matthew Boyle on the potential for nesting habitat.

[3] RM 5.0 was selected as the upstream boundary of the survey because it is the upstream boundary of chemical concentrations in sediment in excess of the Washington State Sediment Quality Standards (SQS; WAC 173-204-310(1)(a)), as summarized in the Phase 1 RI report (Figure 2-2).

[4] It is estimated that it will take one day to survey each side of the LDW, although it may be possible to complete the entire survey in one day.

Sandpiper nests found on Kellogg Island in 1978 were generally constructed on a bare scrape under cover of an herbaceous shrub, or occasionally grass (Canning et al. 1979). It may be necessary to go ashore for closer observation to determine whether certain areas contain suitable nesting habitat for spotted sandpipers. Digital photographs will be taken of areas considered potential nesting habitat by Matthew Boyle or an additional field team member who is not observing sandpiper presence, as described in the following section. The sandpiper habitat survey will take place during approximately six-hour periods surrounding a minus low tide on June 3 and 4, 2004 (between -3 ft and +2 ft relative to MLLW).[5] These periods occur from 8:45 am to 2:30 pm on June 3 and from 9:30 am to 3:30 pm on June 4.

3.2 SANDPIPER OBSERVATION METHODS

Observations of intertidal habitat use by sandpipers will be conducted by boat along the entire length of the LDW on four days[6] to evaluate habitat use during different tidal stages. Although the focus of this survey is on spotted sandpipers, the presence of other sandpiper species or shorebirds will also be noted if they are observed. These species may include least sandpiper, western sandpiper, dowitcher, dunlin, killdeer, sanderling, lesser yellowleg, or greater yellowleg, based on previous observations in the LDW (Cordell et al. 1997, 1999, 2001; Canning et al. 1979; USFWS 2002, 2003). In addition, observations of great blue heron and osprey (other avian ROCs for the Phase 2 ERA) and bald eagle (a threatened species) will be recorded.

Sandpipers will be observed during low, medium, and high tidal stages. Surveying for sandpiper presence during low tide will be conducted on June 3 and 4, 2004, in coordination with the habitat survey described in the previous section. Surveying for sandpiper presence during high and medium tidal stages will be conducted on June 7 and 11, 2004, respectively.[7] On June 7, tide heights range from +8 to +6 ft above MLLW during a 5.5 hour period from 5:00 am to 10:30 am. On June 11, tide heights range from +4 to +5 ft above MLLW during a 4.5-hour period from 5:00 pm to 9:30 pm.[8]

The sequence of shoreline navigation will be different on June 3 and 4 than on June 7 and 11, so that observations of both sandpiper presence and potential habitat can be coordinated on those first two dates. The sandpiper presence survey will begin on June 3 at RM 0.0 along the eastern shoreline of the LDW, continue to RM 5.0, and then reverse direction and continue from RM 5.0 to RM 0.0 along the western shoreline, as described in Section 3.1 for the habitat survey. If the habitat and sandpiper presence

[5] If the entire habitat survey can be completed on June 3, surveying on June 4 will not be necessary.
[6] Monitoring for sandpiper presence may only be conducted on three days (June 3, 7, and 11) if habitat surveying is not needed on June 4. If this occurs, sandpiper presence would still be monitored during a low, medium, and high tide.
[7] This is the highest tide that will occur during daylight hours during early to mid-June.
[8] Sunset is at 9:06 pm in Seattle on June 11, 2004, which may not allow for observations up until 9:30 pm, depending upon visibility at the time.

surveying is completed on June 3, then surveying will not be necessary on June 4. Observations of sandpiper presence will be conducted by a primary observer (Kevin Li) and a secondary observer (from Windward). These observers will focus on sandpiper presence, while Matthew Boyle focuses on the habitat survey. The primary observer will transmit observations verbally to a third-party note-taker who will record observations on the field form (Form 2 in Attachment A) and take GPS coordinate readings of the boat's location. Information transmitted by the primary observer to the note-taker includes:

- bird species
- number of birds
- location description
- behavior
- approximate distance from the boat
- direction of observation (with hand-held compass)
- characteristics of the habitat being used

The secondary observer will serve as a back-up for observations made by the first observer. If the second observer sees a bird missed by the first observer, a note will be made of the discrepancy in observations. These notes will be reviewed after June 4 to determine if any locations or habitat types warrant duplicate observations on June 7 and 11, in addition to the survey as proposed on those last two days. Also, on the last two days of the survey, three observers will be available because Matthew Boyle will have completed the habitat survey. On these days, the third observer will monitor the center of the waterway for potential movement of birds up or down the LDW.

The primary and secondary observers will be equipped with a pair of 10x30 image-stabilized binoculars. The third observer will use binoculars with a magnification of 8x40. When a bird of interest is observed, the boat speed will be reduced and an attempt will be made to move closer to the bird for better visual detail, if necessary. Bird field guides will be available on the boat for bird identification. The flushing distance will also be estimated, which is the distance when birds start to fly away because of disturbance from the boat. Care will be taken not to disturb birds while surveying. If flushing should occur, the direction of movement for flushed birds will be noted. If the flushing occurs in areas observed on foot, the observers will relay this information to the person remaining in the boat on the LDW. The field notebook will include notes on observed human activities that could influence bird use in the area under observation that particular day (e.g., construction activity, pile driving).

There are several potential shorebird locations with extensive shallow areas during low tide that may be difficult to reach by boat on June 3 and 4. These areas include: Hamm Creek, 1st Avenue South, the west side of Kellogg Island, and the LDW

shoreline across from Kellogg Island. At these areas, Matthew Boyle, Kevin Li, and the additional observer will access the shore from the boat, and will walk along inland or along the shore to record information on potential habitat and sandpiper presence in these intertidal areas. The coordinates of potential habitat or bird observations will be documented using a hand-held GPS. If time allows, the observers will cross the road in the 1st Avenue South area to view the upper restoration area, including the large *Phragmites* stand.

On June 7 and 11, the survey will begin at RM 0.0 on the east side of the river. Observations will be made along the eastern shore for approximately 0.5 miles to the south. The boat will then cross the LDW, and cover the same distance moving to the north along the west side of the river. In this way, both sides of the river will be observed while progressing to the south. This pattern will be repeated throughout the length of the LDW. This approach will not be followed on June 3 and 4 because both a habitat survey and sandpiper presence survey will be conducted on those dates, and the habitat survey would be difficult to conduct in this manner. Areas of high sandpiper use will be documented with digital photographs.

4.0 Documentation and Reporting

The sandpiper survey will be documented using GPS, binoculars, digital pictures, and field logs and forms, as described in the following sections.

4.1 Navigation and Positioning

Navigation and positioning will be accomplished using a Magellan SporTrak GPS unit, WAAS-enabled (Wide Area Augmentation System) for accuracy to 3 m or less. The GPS unit will be linked to a laptop computer, complete with navigation software and digitized versions of official NOAA navigation charts. Real-time boat position will be displayed on screen. Start and end locations of each shoreline section for the habitat survey will be identified in the field and plotted on-screen using the navigation software. These start and end GPS coordinates will then be saved on the computer's hard disk for later incorporation into GIS maps. A unique number will be assigned to each section surveyed. Washington State Plane North coordinates (NAD 83) will be used for the horizontal datum. Survey coordinates for habitat survey sections will be displayed as a figure in the results memorandum (Section 4.4).

4.2 Digital Photographs

Photographs will be taken with a digital camera to document potential nesting areas onshore or intertidal areas of high use.[9] At each photo location, GPS coordinates and

[9] A panoramic set of photographs will be taken in conjunction with the human access shoreline survey to be conducted from June 1 to June 4, 2004 (Windward 2004) as part of the larger effort to document

the direction of the photo as measured with a hand-held compass will be recorded on the field form. Photographs will be provided as an appendix to the results memorandum (Section 4.4).

4.3 FIELD LOGS AND FORMS

A complete record of all field activities will be entered in a field logbook maintained by the FC. The field logbook will provide a description of all activities, the survey route, the start and end times of the survey, discussions among field crew associated with field activities, weather conditions, and a record of any deviations from the approved plan. The field logbook will consist of bound, numbered pages constructed of all-weather paper. All entries will be made in indelible ink. The field logbook is intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the survey.

During the habitat survey, a field form will be filled out for each section of the LDW (Form 1 in Attachment A). A separate field form (Form 2 in Attachment A) will be used to record observations made during the sandpiper monitoring surveys.

4.4 REPORTING

The methods and results of the sandpiper survey will be summarized in a draft technical memorandum that will be submitted to EPA and Ecology on July 23, 2004.

At a minimum, the following information will be included in the memorandum:

- summary of all field activities, including descriptions of any deviations from the approved plan
- written report of the survey describing methodology, equipment, and analysis
- map of the shoreline sections surveyed[10] for sandpiper habitat, descriptions of habitats observed, and notations of potential nesting habitat
- map of locations where sandpipers were observed and summary of field notes
- list of locations where other birds of interest were observed and summary of field notes, including GPS coordinates and approximate river mile

site conditions along the LDW. Digital photos will be taken in series to give a continuous view of the shoreline. This photo documentation can be referred to for general visual information on the LDW areas surveyed for sandpiper habitat and presence.

[10] Maps in the data report will reflect updated aerial photos, if available.

- prints of digital photographs
- photocopies of field logbook and field forms

Following receipt of comments on the draft memorandum from EPA and Ecology, the necessary changes will be made to the memorandum and it will then be resubmitted to EPA and Ecology for final approval.

5.0 References

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6.0 Oversize Figures

Figure 2a. LDW intertidal habitat (RM 0.0 - 2.5)

0 500 1,000 2,000 Feet

0 100 200 400 Meters

N

Wind Ward environmental LLC

Prepared by RAC 03/25/04 Map 1286

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Figure 2b. LDW intertidal habitat (RM 2.5 - 5.0)

0 500 1,000 2,000 Feet

0 100 200 400 Meters

N

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Prepared by RAC 03/25/04 Map 1287

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Attachment A: Field Forms

Form 1. LDW spotted sandpiper habitat survey form

Date:	**Observer's name:**
Area number:	**Time:**
Data recorder's name:	**Weather:**
GPS location: start	**GPS location: end**
Easting (X):	**Easting (X):**
Northing (Y):	**Northing (Y):**
Intertidal habitat description	
Substrate type (i.e., gravel, sand, mud, riprap):	
Bank slope (i.e., steep, medium, flat)	
Other observations:	
Upland habitat description	
Vegetation type:	
Structures present:	
Potential nesting habitat:	
Other observations:	
Photo # and description:	

Date:	**Observer's name:**
Area number:	**Time:**
Data recorder's name:	**Weather:**
GPS location: start	**GPS location: end**
Easting (X):	**Easting (X):**
Northing (Y):	**Northing (Y):**
Intertidal habitat description	
Substrate type (i.e., gravel, sand, mud, riprap):	
Bank slope (i.e., steep, medium, flat):	
Other observations:	
Upland habitat description	
Vegetation type:	
Structures present:	
Potential nesting habitat:	
Other observations:	
Photo # and description:	

Form 2. LDW spotted sandpiper observations form

Date			**ABBREVIATIONS**		
Data Recorder			**LOCATION**		**BEHAVIOR**
Data Observer		**A**	air	**FN**	foraging near water's edge
Weather		**C**	canopy	**FA**	foraging away from water's edge (describe)
		HG	high ground	**R**	resting
		S	salt marsh	**S**	singing
		M	mudflat	**P**	passing through
		R	riprap	**C**	calling
		MM	manmade structure (describe)	**Fl**	flying
Page	**of**			**N**	nesting (including display or distraction)

SPECIES OBSERVED	TIME	# OF BIRDS	LOCATION DESCRIPTION	EASTING (X):	NORTHING (Y):	COMPASS DIRECTION	BEHAVIOR	NOTES	PHOTO #