# YEAR 1 INTERIM MONITORING REPORT – PHASE I REMOVAL ACTION TERMINAL 4 EARLY ACTION PORT OF PORTLAND, PORTLAND, OREGON

**Prepared for**

Port of Portland

Portland, Oregon

**Prepared by**

Anchor QEA, LLC

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

**February 2010**

# YEAR 1 INTERIM MONITORING REPORT – PHASE I REMOVAL ACTION

# TERMINAL 4 EARLY ACTION

# PORT OF PORTLAND, PORTLAND, OREGON

**Prepared for**

Port of Portland

Portland, Oregon

**Prepared by**

Anchor QEA, LLC

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

**February 2010**

# TABLE OF CONTENTS



## List of Tables



## List of Figures

## List of Appendices

# 1 INTRODUCTION

This document provides a summary on the first year monitoring results for the head of Slip 3 cap and Wheeler Bay (WB) shoreline stabilization. Interim monitoring survey locations are depicted on Figure 1. Monitoring was conducted in accordance with the requirements of the *Interim Monitoring and Reporting Plan* (IMRP; DAR Appendix C; Anchor 2008). A description of the observed site conditions and relevant data summaries are provided in this report. There were no deficiencies noted during the first year of monitoring; therefore, recommended corrective actions and a schedule for implementing the corrective actions are not included in this report. In addition, while the IMRP included requirements for the evaluation of Berth 411 "Plus" dredging, the results of the Berth 411 "Plus" dredging have already been reported in the *Sediment Characterization Results for Terminal 4 Phase I Removal Action Post-Construction Sampling Data Report* (Anchor QEA 2009). This document was approved by USEPA on August 21, 2009.

This document also provides a summary on the condition of the habitat layer material placed on top of the armor rock layer in WB. The habitat layer material monitoring is not part of the monitoring requirements, but was performed as part of the WB monitoring activities as a pilot project to determine whether the site-specific conditions are conducive to maintaining a sand/gravel habitat layer over the armor layer. If monitoring demonstrates that a habitat layer can be maintained long-term, this habitat layer may be considered by the National Marine Fisheries Service (NMFS) and the U.S. Environmental Protection Agency (USEPA) when determining the appropriate mitigation project for the WB shoreline stabilization work that has been completed, and the in situ cap currently expected to be constructed as part of the Terminal 4 Phase II Removal Action work (NMFS 2008).

## 1.1 General Scope of Interim Monitoring

The IMRP provides the monitoring and reporting requirements between the completion of the Terminal 4 Phase I Removal Action work and the beginning of the Phase II Removal Action work. This work includes the monitoring of the integrity of the head of Slip 3 cap and WB shoreline stabilization, including establishment of vegetation.

The head of Slip 3 cap integrity monitoring was performed to confirm the following:

- Armor layer stability
- Absence of sheens

WB stabilization monitoring was performed to confirm the following:

- Slope stability
- Armor layer stability
- Establishment of vegetation
- Stability/presence of woody debris as designed

In addition, although not a requirement of the IMRP, the condition of the habitat layer material placed on top of the cap armor in WB was assessed.

## 1.2 Schedule of Year 1 Interim Monitoring Events

The Phase I Removal Action work was completed on October 22, 2008. WB vegetation observations were conducted monthly during the third week of each month from November 2008 through October 2009. WB and the head of Slip 3 cap visual slope and armor surveys were conducted on June 19 and October 22, 2009. The habitat layer material was also observed in WB on June 19 and October 22, 2009. A base survey of the pinch-pile wall was performed on October 16, 2008. Subsequent pinch-pile wall surveys were performed on June 16 and September 16, 2009.

# 2 MONITORING RESULTS SUMMARY FOR THE HEAD OF SLIP 3 CAP AREA

A summary description of the observed site conditions and relevant data summaries related to the head of Slip 3 cap area are provided in this section. Additional details are provided in the *Wheeler Bay and Head of Slip 3 Cap Visual Slope and Armor Survey Monitoring Report*, provided as Appendix A.

## 2.1 Armor Layer Stability

### *2.1.1 Visual Survey*

Visual assessments of the head of Slip 3 cap area slope and armor condition were performed on June 19 and October 22, 2009. Water levels during these site visits were approximately +6.5 and +3.5 feet National Geodetic Vertical Datum (NGVD), respectively. A description of monitoring activities that were performed and results are given below.

On June 19, 2009, three transects were established on 40-foot spacings perpendicular to the shoreline. A GPS point was taken at the downslope end of each transect. Transects were marked with flags and monitoring staff walked from the upslope edge of the stabilization area to the water. Notes and photographs (provided as attachments to Appendix A) were taken to document visual slope stability along each transect. In summary, no areas of instability were noted.

On October 22, 2009, monitoring staff walked from upslope to downslope along the three transects established during the first visual survey event. Notes and photographs (provided as attachments to Appendix A) were taken to document slope stability along each transect. In summary, no areas of instability were noted.

### *2.1.2 Pinch-pile Wall Survey*

A survey of the pinch-pile wall was completed to assess the stability of the armor layer and in-water portion of the cap in front of the pinch-pile wall. On October 16, 2008, (immediately after completion of construction), a surveyor's spike was inserted in the top of the pinch-pile wall at 40-foot spacings (three monitoring points), and a baseline survey was performed. Two successive surveys were conducted on June 16 and September 16, 2009, and

were compared to the baseline survey. The Port of Portland's in house survey crew completed the pile surveys. The accuracy of the survey method used is +/- 0.6 inches. Results of the surveys are provided in Table 1. The recorded measurements indicate that the wall is stable and that the observed measurements are likely within the accuracy of the survey method:

- Over the first 8 months all three points moved approximately 0.3 inches in a north-northwest direction (parallel to the wall—the wall runs in a north-northwest/south-southwest alignment), which is within the accuracy of the survey method.
- During the next 3-month measurement, all three points moved approximately 0.4 inches in a southwest direction (roughly perpendicular to the wall alignment), which is also within the accuracy of the survey method.
- Total observed movement over the 11 months was around 0.3 inches for all three points with movement in a northwest direction, which is also within the accuracy of the survey method.

The IMRP specified response actions in the event of movement greater than 1 inch. No significant movement greater than 1 inch compared to baseline was observed. Based on these results, the pinch-pile wall and wedge remain stable.

**Table 1**
**Head of Slip 3 Cap Pinch-pile Wall Survey Results**

| Point Number | Coordinates and Elevation | Date | | | 10/16/2008 to 6/16/2009 Distance Moved (inches) | 10/16/2008 to 9/16/2009 Distance Moved (inches) |
|---|---|---|---|---|---|---|
| | | 10/16/2008 | 6/16/2009 | 9/16/2009 | | |
| 3000 | Northing | 66964.660 | 66964.674 | 66964.668 | 0.40 | 0.29 |
| | Easting | 71313.600 | 71313.603 | 71313.578 | | |
| | Elevation | 7.740 | 7.710 | 7.746 | | |
| 3001 | Northing | 67000.512 | 67000.531 | 67000.521 | 0.28 | 0.29 |
| | Easting | 71307.629 | 71307.621 | 71307.607 | | |
| | Elevation | 8.380 | 8.370 | 8.379 | | |
| 3002 | Northing | 67030.301 | 67030.324 | 67030.304 | 0.32 | 0.34 |
| | Easting | 71302.597 | 71302.587 | 71302.569 | | |
| | Elevation | 7.990 | 7.980 | 7.992 | | |

Note: Horizontal datum: Port of Portland Local Projection (International Feet), Vertical Datum: NGVD 1929 (Feet).

## 2.2 Presence of Sheens

Surveys for the visual presence of sheens were performed at the end of the first high water season (June 19, 2009) and at the end of the first low water season (September 22, 2009). The water level was approximately +6.5 feet NGVD during the June 19, 2009 survey, and approximately +3.0 feet NGVD during the September 22, 2009 survey. Monitoring staff walked along 20-foot transects parallel to the shoreline to observe the presence of sheens. No sheens were observed, as documented in Appendix A.

In addition, although not a requirement of the IMRP, surveys for the visual presence of sheens were performed during each light non-aqueous phase liquid (LNAPL) monitoring event completed as part of the required remedial action for the Terminal 4 Slip 3 Upland Facility defined in the Record of Decision (ROD; Oregon Department of Environmental Quality [DEQ] 2003) and the Explanation of Significant Difference (DEQ 2004). No sheens were observed between the completion of the Terminal 4 Phase I Removal Action work though Year 1 of the Interim Monitoring time period, as documented in Ash Creek – NewFields 2008 and 2009, and Ash Creek 2009a, 2009b, and 2009c.

# 3 MONITORING RESULTS SUMMARY FOR THE WHEELER BAY SHORELINE STABILIZATION

A summary description of the observed site conditions and relevant data summaries related to the WB shoreline stabilization are provided in this section. Additional details are provided in the *Wheeler Bay and Head of Slip 3 Cap Visual Slope and Armor Survey Monitoring Report*, provided as Appendix A, and the monthly WB vegetation observation monitoring reports provided in Appendix B.

## 3.1 Slope Stability

In accordance with the IMRP, transects were established perpendicular to the shoreline at 100-foot centers. A total of eight transects were established and upslope and downslope GPS points were taken for each transect. The transects are depicted on Figure 2. Transects were marked with flags and monitoring staff walked from the upslope edge of the grass planting down to the water on June 19 and October 22, 2009. Notes and photographs (provided as attachments to Appendix A) were taken to document slope stability at each transect. No sloughing, instability, or erosion was observed in the willow or grass planting areas (the willow planting area is between elevations +15 to +20 feet NGVD and the hydroseeding area is between elevations +20 to +30 feet NGVD).

## 3.2 Establishment of Vegetation

Monitoring of the vegetation in the stabilization areas was conducted monthly during Year 1 to evaluate establishment of the vegetation. According to the IMRP, the vegetation coverage will be documented in years 3 and 5 to confirm that the target cover percentages are being achieved.

Photographs were taken each month at 12 fixed photograph points along the top portion (grass) and lower section (willow) of the slopes along the WB bank (Figure 2). Photographs were taken in opposing pairs at each point parallel to the shoreline. Photographs from each point are provided chronologically in Appendix C such that the establishment of vegetation at each point throughout the year can be easily reviewed.

Based on the vegetation monitoring performed, willow planting and grass planting establishment is anticipated to meet year 3 goals. No evidence of excessive vegetation destruction by geese or significant presence of invasive species was observed.

## 3.3 Armor Layer Stability

Transects were established perpendicular to the shoreline at 100-foot centers as described in Section 3.1 and as depicted on Figure 2. Monitoring staff walked along the transects at low water levels looking for evidence of erosion within the armor layer. Notes and photographs (provided as attachments to Appendix A) were taken of the armor layer at each transect.

The armor layer showed no signs of instability, sloughing, or erosion. All wood debris installed as part of the construction design was in place, stable, and in good condition. In addition to the installed wood debris, a significant amount of drift wood is also present.

## 3.4 Condition of Habitat Layer

Erosion of the habitat layer occurred in some areas as described below. The habitat layer serves no function of armoring. In spots where the erosion of the habitat layer exposed the armor layer, the armor layer appeared to be in place and in good condition, and did not show any signs of instability, movement, or erosion.

As designed, a habitat layer was placed below the willow planting area to an elevation of +10 feet NGVD during construction. Beginning 50 feet channel-ward of Transect 1 and extending to Transect 3, a 250-foot scarp in the habitat layer was observed on June 19, 2009. The scarp ranged between 0.5 to 2 feet in height, exposing the underlying armor rocks in some spots. The largest erosion scarp was located near Transect 2 and was progressively less severe on either side extending to Transects 1 and 3. The distance between the erosion scarp and the lower edge of the willow planting area and jute mat was greater than 5 feet where the erosion scarp was 1 foot high or less. Where the erosion scarp was 2 feet in height, the distance to the jute mat was approximately 2 feet. An additional 1-foot erosion scarp in the habitat rock was observed at Transect 7, where the habitat rock transitions to armor riprap.

Based on the observations performed, the habitat layer is still in place (covering the riprap) over approximately 80 percent of the area where it was initially placed. In the areas noted above (representing approximately 20 percent of the total area where the habitat layer was initially placed), the habitat layer has eroded from within the voids in the riprap.

# 4 CONCLUSIONS AND NEXT STEPS

## 4.1 Head of Slip 3 Cap

No instability, sloughing, or sheens were observed; therefore, no further monitoring action beyond what is required in the IMRP is recommended for the head of Slip 3 cap at this time.

Future monitoring will include a visual survey of the slope upland of the pinch-pile wall for sloughing/stability to determine if it is stable, performed once yearly during low water levels. In addition, a survey of the pinch-pile wall to assess stability of the wedge in front of the wall will be performed annually during low water levels. These surveys will be conducted in October each year until Phase II work begins.

Surveys for the visual presence of sheens will be completed at two different water level conditions. Observations will be conducted when the water level is approximately +5 feet NGVD and when the water level is approximately +10 feet NGVD. Depending on the water level, one of these surveys may be conducted concurrently with the visual survey of the slope upland of the pinch-pile wall in October each year until Phase II work begins. Otherwise, the two surveys will be conducted when the water level is at the specified elevations prior to November of each year until Phase II work begins.

## 4.2 Wheeler Bay

Although spots of mulch bark erosion were noted during the monitoring event, slope stability remains unaffected and the armor layer has remained in place. No sloughing or instability of the armor layer was observed.

Future monitoring will include a visual survey of the slope for sloughing/stability and erosion annually to determine if it is stable. A visual survey of the armor layers will also be completed annually to determine if excessive erosion is occurring.

In addition, the vegetation in the stabilization areas will be evaluated annually to determine if the vegetation is serving its intended function. The vegetation between elevations +15 and +30 feet NGVD (willow plantings between elevations +15 to +20 feet NGVD and

hydroseeding between elevations +20 to +30 feet NGVD) will be compared to percent coverage goals in years 3 and 5.

These WB surveys will be conducted in October each year until Phase II work begins.

## 4.3 Reporting

Annual reports will be submitted to USEPA yearly in December. Annual reports will consist of technical memoranda with color photos of a reasonable size to interpret the conditions, a description of site conditions observed, data summaries, a statement of any deficiencies found, recommended corrective action(s), and a schedule for implementing the corrective action(s).

## 5 REFERENCES


Anchor Environmental, L.L.C. (Anchor). 2008. Interim Monitoring and Reporting Plan (IMRP). Appendix C to the Final Design Analysis Report: Terminal 4 Phase I Removal Action. Prepared for the Port of Portland. June 2008.

Anchor QEA, LLC (Anchor QEA). 2009. Sediment Characterization Results for Terminal 4 Phase I Removal Action Post-Construction Sampling Data Report. Prepared for the Port of Portland. August 2009.

Ash Creek. 2009a. Quarterly Report – First Quarter 2009 Terminal 4 Slip 3 Upland Facility, Port of Portland, Portland, Oregon, 97209. May 2009.

Ash Creek. 2009b. Quarterly Report – Second Quarter 2009 Terminal 4 Slip 3 Upland Facility, Port of Portland, Portland, Oregon, 97209. August 11, 2009.

Ash Creek. 2009c. Quarterly Report – Third Quarter 2009 Terminal 4 Slip 3 Upland Facility, Port of Portland, Portland, Oregon, 97209. November 13, 2009.

Ash Creek – NewFields. 2008. Quarterly Report – Third Quarter 2008 Terminal 4 Slip 3 Upland Facility, Port of Portland, Portland, Oregon, 97209. November 2008.

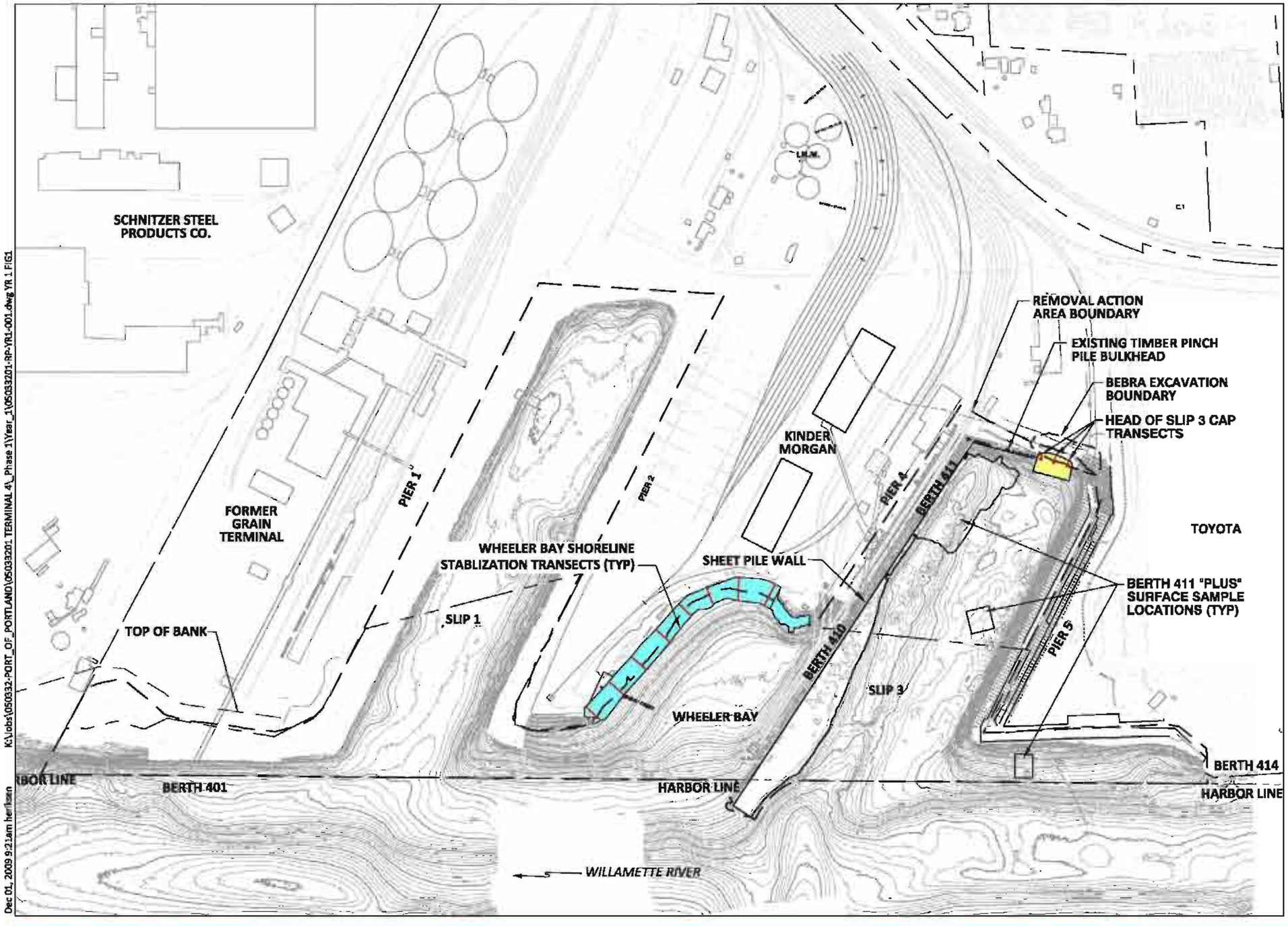
Ash Creek – NewFields. 2009. Quarterly Report – Fourth Quarter 2008 Terminal 4 Slip 3 Upland Facility, Port of Portland, Portland, Oregon, 97209. February 2009.

DEQ. 2003. Record of Decision, Port of Portland Terminal 4 Slip 3 Upland. Oregon Department of Environmental Quality. April 21, 2003.

DEQ. 2004. Explanation of Significant Difference, Port of Portland Terminal 4 Slip 3 Upland Facility. Oregon Department of Environmental Quality. September 1, 2004.

NMFS. 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Environmental Protection Agency and Port of Portland Terminal 4 Superfund Phase I of the Removal Action, Willamette River (HUC 17090012), Multnomah County, Oregon. July, 2008.

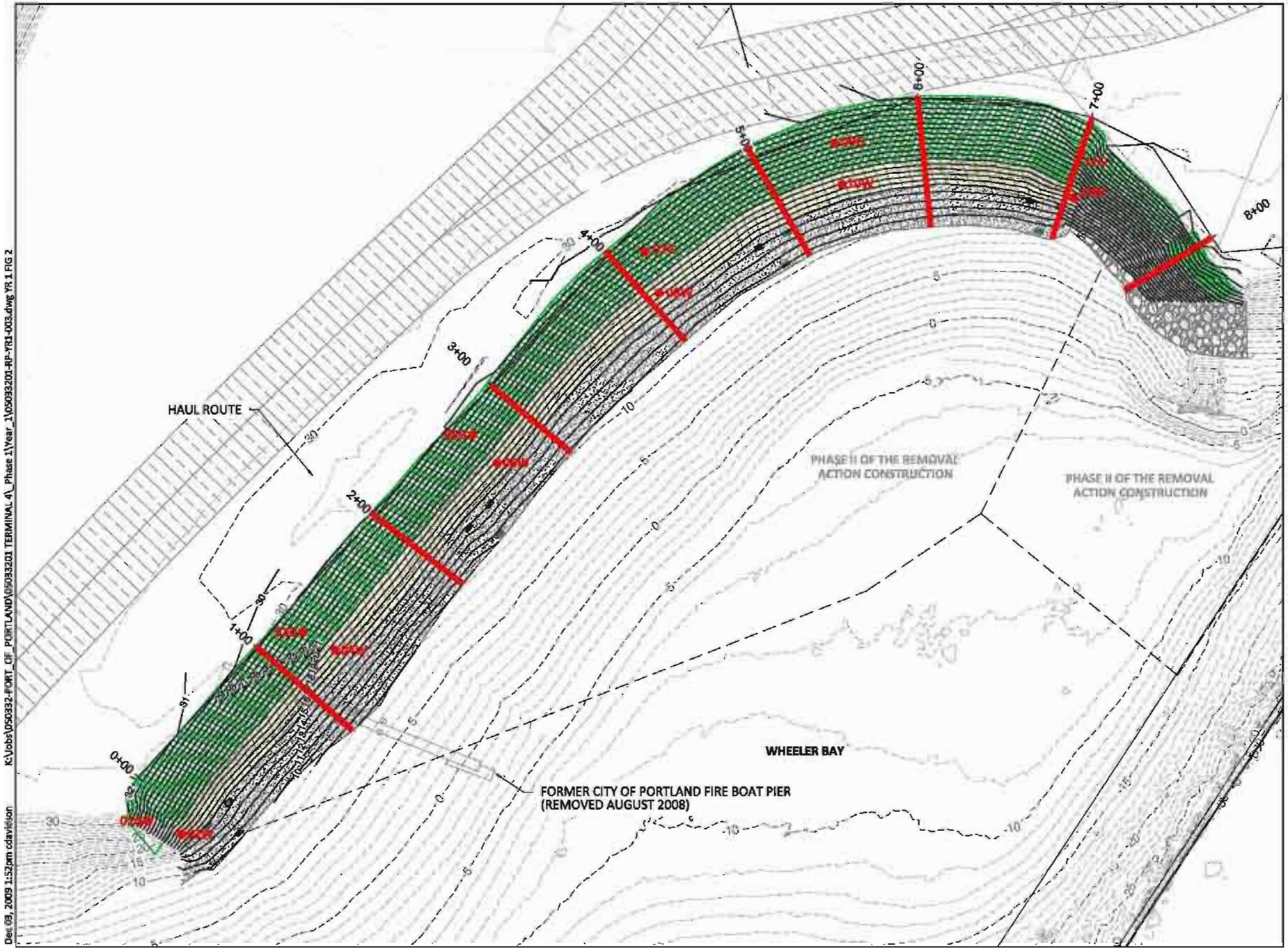
# FIGURES




K:\Jobs\050332-PORT_OF_PORTLAND\050332201 TERMINAL 4_Phase 1\Year_1\050332201-RP-YR1-001.dwg YR 1 FIG1
Dec 01, 2009 9:21am herrlizen

**Figure 1**
Interim Survey Locations
Terminal 4 Removal Action - Year 1 Interim Monitoring Report
Portland, Oregon

ANCHOR QEA




**LEGEND:**

- HYDROSEED AND JUTE MAT
- COIR FABRIC AND PLANTINGS WITH MULCH
- HABITAT ROCK
- ARMOR ROCK
- ECOLOGY BLOCK LWD ANCHORS (BURIED MINIMUM 4 FEET BELOW FINISH GRADE)
- PRE-CONSTRUCTION CONTOURS
- AS-BUILT CONTOURS
- 08W PHOTO POINT LOCATIONS
- TRANSECT

**NOTES:**

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. PRE-CONSTRUCTION BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED NOVEMBER, 2007
3. PRE-CONSTRUCTION UPLAND SURVEY PROVIDED BY PORT OF PORTLAND DATED JANUARY 2008.
4. AS-BUILT UPLAND SURVEY BY MINISTER-GLASER DATED OCTOBER 13, 2008 AND PROVIDED BY ASH CREEK.

0 60
Scale In Feet

K:\Jobs\050332-PORT_OF_PORTLAND\050332O1 TERMINAL 4_Phase 1\Year_1\050933201-RP-YR1-003.dwg YR 1 FIG 2
Dec 03, 2009 1:52pm cdavidson

**Figure 2**
Wheeler Bay Year 1 Transect and Photo Point Locations
Terminal 4 Removal Action - Year 1 Interim Monitoring Report
Portland, Oregon

ANCHOR QEA

# APPENDIX A
# WHEELER BAY AND HEAD OF SLIP 3 CAP VISUAL SLOPE AND ARMOR SURVEY MONITORING REPORT

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | October 29, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay and Head of Slip 3 Cap Year 1 Visual Slope and Armor Survey Monitoring Report, Terminal 4 Removal Action, Port of Portland | | |

## YEAR 1 SLOPE AND ARMOR OBSERVATIONS

In accordance with the *Interim Monitoring and Reporting Plan* (IMRP; DAR Appendix C; Anchor 2008), visual assessments of Wheeler Bay and Slip 3 slope and armor condition were performed on June 19 and October 22, 2009. Water levels during these site visits were approximately +6.5 and +3.5 feet National Geodetic Vertical Datum (NGVD), respectively. Slip 3 was inspected for the presence of sheens during the June 19, 2009 site visit. An additional site visit was conducted on September 22, 2009 to inspect Slip 3 for the presence of sheens. Water levels during the September 22 visit were between +2.5 and +3.0 feet NGVD. A description of the monitoring activities performed and results is given below.

### Wheeler Bay

Monitoring of Wheeler Bay was performed to confirm the following:

- Slope stability
- Armor layer stability
- Stability/presence of woody debris as designed

In addition, although not a requirement of the IMRP, the condition of the habitat layer material placed on top of the cap armor in Wheeler Bay was assessed.

On June 19, 2009, transects were established perpendicular to the shoreline at 100-foot centers. A total of eight transects were established, and upslope and downslope GPS points were taken for each transect. Transects were marked with flags and walked from the upslope edge of the grass planting down to the water. Notes and photographs were taken of

slope stability at each transect. Approximate transect locations are shown in Figure A-1 (attached). Actual GPS points are provided in Table 1. Monitoring staff walked from upslope to downslope along the eight established transects during the subsequent October 22, 2009 site visit. Notes and photographs were taken of slope stability at each transect. Data sheets and photographs from both site visits are provided in the attachments to this memorandum (Attachments A-1 and A-2; respectively).

**Table 1**
**Wheeler Bay Transects**

| Transect | Upslope | | Downslope | | Erosion Scarp Height in Habitat Material Layer (ft) | |
|---|---|---|---|---|---|---|
| | Latitude | Longitude | Latitude | Longitude | 6/19/2009 | 10/22/2009 |
| 1 | 45.60283 | 122.77720 | 45.60284 | 122.77731 | 1.0 | 0.5-1.0 |
| 2 | 45.60277 | 122.77673 | 45.60266 | 122.77676 | 2.0–2.5 | 2.0-2.5 |
| 3 | 45.60259 | 122.77647 | 45.60261 | 122.77676 | 1.5–2.0 | 1.5-2.0 |
| 4 | 45.60263 | 122.77608 | 45.60253 | 122.77612 | - | - |
| 5 | 45.60250 | 122.77572 | 45.60242 | 122.77582 | - | - |
| 6 | 45.60225 | 122.77551 | 45.60227 | 122.77554 | - | - |
| 7 | 45.60204 | 122.77528 | 45.60208 | 122.77547 | - | - |
| 8 | 45.60182 | 122.77541 | 45.60192 | 122.77551 | 1.0 | - |

## *Results*

- **Slope stability:** No sloughing, instability, or erosion was observed in the willow or grass planting areas (elevations +15 to +25 feet NGVD).
- **Amor layer stability:** The armor layer at the head of Wheeler Bay showed no signs of instability, sloughing, or erosion during the June 19 and October 22, 2009 site visits. In spots where the erosion of the habitat rock has exposed the armor layer, the armor rock appears to be in place and in good condition. The armor layer does not show any signs of instability, movement, or erosion.
- **Stability/presence of woody debris as designed:** All wood debris installed as part of the construction design was in place, stable, and in good condition at the time of both site visits. In addition to the installed large wood debris, a significant amount of drift wood is also present.

### *Condition of the Habitat Material Layer*

As designed, a habitat layer was placed below the willow planting area to an elevation of +10 feet NGVD during construction. The habitat layer serves no function of armoring. Beginning 50 feet channel-ward of Transect 1 and extending to Transect 3, a 250-foot erosion scarp in the habitat layer was observed on June 19, 2009 (Figure A-2). The scarp ranged between 0.5 and 2 feet in height, exposing the underlying armor rocks in some spots. The largest erosion scarp was located near Transect 2 and was progressively less severe on either side extending to Transects 1 and 3. The distance between the erosion scarp and the lower edge of the willow planting area and jute mat was greater than 5 feet where the erosion scarp was 1 foot or less. Where the erosion scarp was 2 feet in height, the distance to the jute mat was approximately 2 feet. An additional 1-foot erosion scarp in the habitat rock was observed at Transect 7, where the habitat rock transitions to armor riprap. The erosion scarp was observed to be largely unchanged during the October 22, 2009 site visit.

Based on the observations performed, the habitat layer is still in place (covering the riprap) over approximately 80 percent of the area where it was initially placed. In the areas noted above (representing approximately 20 percent of the total area where the habitat layer was initially placed), the habitat layer has eroded from within the voids in the riprap.

## Head of Slip 3 Cap

Monitoring of the head of Slip 3 cap was performed to confirm the following:

- Slope stability
- Absence of sheens

Transects were established on 40-foot spacings perpendicular to the shoreline to confirm slope stability. A total of three transects were established, and a GPS point was taken at the downslope end of each transect. Transects were marked with flags and walked from the upslope edge of the stabilization area to the water on June 19 and October 22, 2009. Notes and photographs were taken of slope stability at each transect. Data sheets and photographs are provided in the attachments (Attachments A-3 and A-4; respectively). Actual GPS points are provided in Table 2.

In addition, 40-foot transects parallel to shore were established to confirm the absence of sheens. The transects were walked during post-high water (June 19, 2009) and post-low water conditions (September 22, 2009). Water levels during the observation events were approximately +6.5 and between +2.5 and +3.0 feet NGVD, respectively. Notes and photographs were taken during observation events. Data sheets and photographs are provided as attachments to this memorandum (Attachments A-5 and A-6; respectively).

### *Results*

No areas of instability were observed along any portion of the stabilized slope. Armor rocks were stable and free of erosion and sloughing. No sheens were observed during either of the sheen observation events.

**Table 2**
**Slip 3 Transects**

| Transect | Latitude | Longitude |
|---|---|---|
| 1 | 45.60049 | 122.77257 |
| 2 | 45.60035 | 122.77255 |
| 3 | 45.60025 | 122.77252 |

Note: No upslope GPS point was taken.

## Conclusions

### *Wheeler Bay*

Although spots of mulch bark erosion were noted during the monitoring event, slope stability remains unaffected and the armor layer has remained in place. No sloughing or instability of the armor layer was observed.

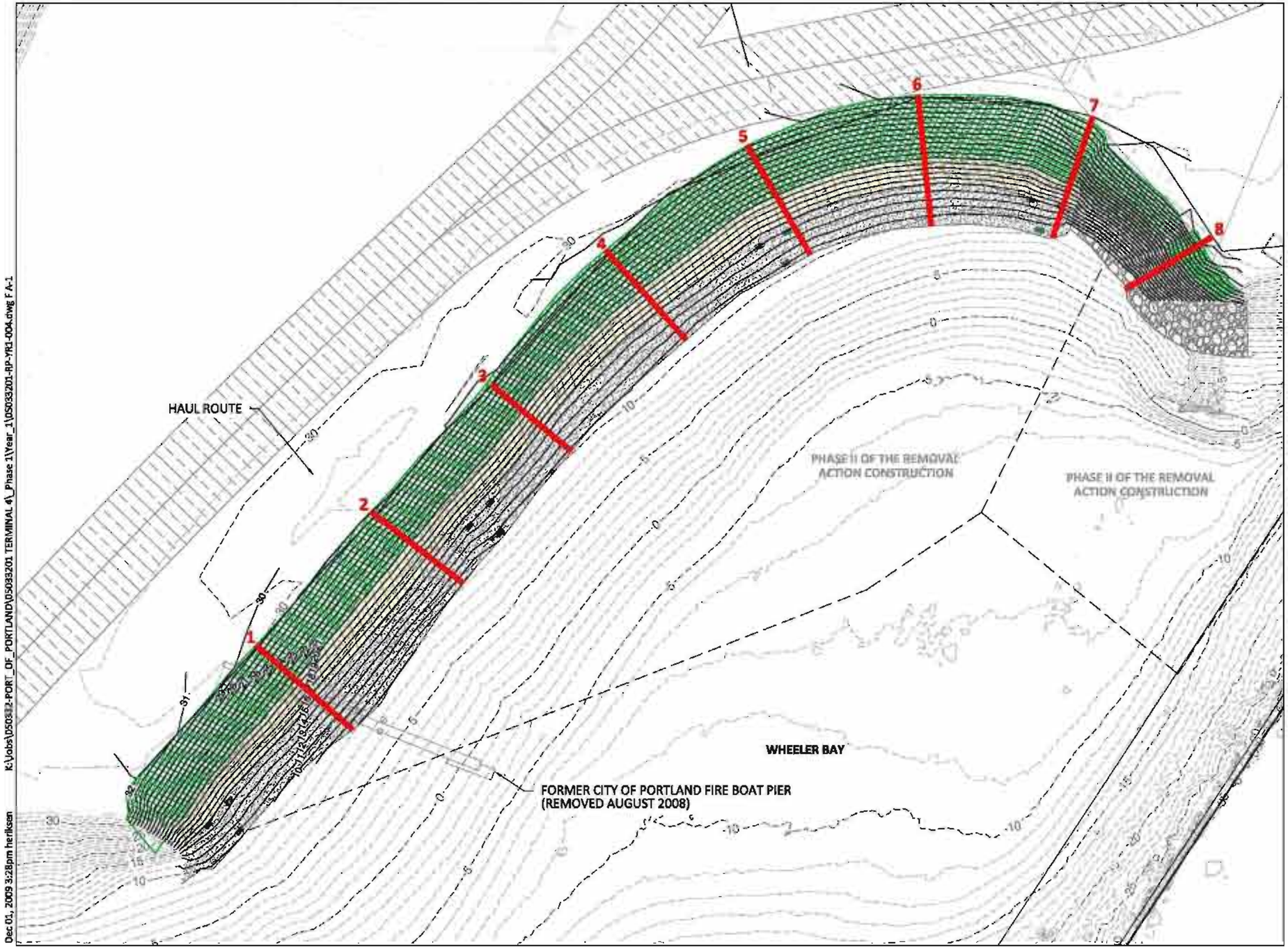
### *Head of Slip 3 Cap*

No instability, sloughing, or sheens were observed; therefore, no further monitoring action beyond what is required in the IMRP is recommended for the head of Slip 3 cap at this time.

## REFERENCES

Anchor Environmental, L.L.C. (Anchor). 2008. Interim Monitoring and Reporting Plan (IMRP). Appendix C to the Final Design Analysis Report: Terminal 4 Phase I Removal Action. Prepared for the Port of Portland. June 2008.

# FIGURES




**LEGEND:**

- HYDROSEED AND JUTE MAT
- COIR FABRIC AND PLANTINGS WITH MULCH
- HABITAT ROCK
- ARMOR ROCK
- ECOLOGY BLOCK LWD ANCHORS (BURIED MINIMUM 4 FEET BELOW FINISH GRADE)
- PRE-CONSTRUCTION CONTOURS
- AS-BUILT CONTOURS
- 7 TRANSECT

**NOTES:**

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. PRE-CONSTRUCTION BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED NOVEMBER, 2007
3. PRE-CONSTRUCTION UPLAND SURVEY PROVIDED BY PORT OF PORTLAND DATED JANUARY 2008.
4. AS-BUILT UPLAND SURVEY BY MINISTER-GLASER DATED OCTOBER 13, 2008 AND PROVIDED BY ASH CREEK.

0 60
Scale In Feet

K:\Jobs\050332-PORT_OF_PORTLAND\050332O1 TERMINAL 4_Phase 1\Year_1\050332O1-RP-YR1-004.dwg F A-1
Dec 01, 2009 3:28pm herliksen

ANCHOR QEA

**Figure A-1**
Wheeler Bay Year 1 Transect Locations
Wheeler Bay and Head of Slip 3 Cap Year 1 Visual Slope and Armor Survey Monitoring Report
Portland, Oregon

**Figure A-2**
Habitat Layer Erosion Scarp East of Transect 3
Wheeler Bay and Head of Slip 3 Cap Year 1 Visual Slope and Armor Survey Monitoring Report
Portland, Oregon

ANCHOR QEA

# ATTACHMENT A-1
# WHEELER BAY MONITORING DATA SHEETS

Observation Date: 6-19-08

# ANCHOR OEA Slope Observation Data Sheet

Project Name: Wheeler Bay  Project No: 050332-01

Observation Crew: Julie Fox, Gabe Nagler

Datum (circle one): NAD 83 / WGS 84 / NAD 27 / Lat long  Weather: Cloudy

Begin @ 0935  End @ 12:20

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 1** | N: 45.60283 | E: 122.77720 | N: 45.60284 | E: 122.77731 |

Comments:

Habitat rock eroded 8' downslope of bankwich creating 1' lip. Some armor rip-rap exposed.

pic # 042 - 056

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 2** | N: 45.60272 | E: 122.77673 | N: 45.60266 | E: 122.77676 |

Comments:

lip in habitat rock increased to 2-2.5'. Some rip-rap exposed. Wood debris in place. No sloughing or erosion above habitat rock. Lip comes within 1' of jute net.

pic # 58 - 75

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 3** | N: 45.60259 | E: 122.77647 | N: 45.60261 | E: 122.77650 |

Comments:

Habitat rock lip diminished. No lip present east of transect 3. Possibly due to wave action angle against shore line. Undercutting of lip present west of transect 3. No erosion or sloughing above habitat rock.

pic # 76 - 93

Wood in place.

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 4** | N: 45.60263 | E: 122.77608 | N: 45.60253 | E: 122.77613 |

Comments:

No erosion/sloughing in habitat rock or upslope bank. Much more beach present. More gradual slope leading to less erosion and wave action @ transect 4.

pic # 94 - 107

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 5** | N: 45.60250 | E: 122.77572 | N: 45.60242 | E: 122.77582 |

Comments:

lots of wood debris accumulation. No erosion/sloughing in upper or lower bank. Habitat rock in good condition. 50' exposed beach (much more than transect # 1+2).

pic # 108 - 121

Recorded by: Gabe Nagler + Julie Fox

ANCHOR QEA

# Slope Observation Data Sheet

Observation Date: 6/19/09

Project Name: Project No: 050332-01

## Transect 6

| Upslope | | Downslope | |
|---|---|---|---|
| N: [illegible] | E: [illegible] | N: 45.60277 | E: 122.77554 |

Comments: 45.60225 122.77581

No erosion/ sloughing on upper or lower slopes. Significant wood debris accumulation.

pic #122 - 137

## Transect 7

datum GCS NAD83

| Upslope | | Downslope | |
|---|---|---|---|
| N: 45.60264° | E: 122.77528° | N: 45.60208° | E: 122.77547° |

Comments:

No erosion/sloughing on upper slope. ~15' of habitat rock lip diminished, remainder of transect shows no erosion/sloughing of habitat rock. Significant woody debris (small + large) accumulation.

pic #138-155

## Transect 8

| Upslope | | Downslope | |
|---|---|---|---|
| N: 45.60182° | E: 122.77541° | N: 45.60192° | E: 122.77551° |

Comments:

No erosion/sloughing on upper or lower slope (armor) Some woody debris accumulation on lower slope.

pic # 156 - 168

## Transect 9

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E. | N: | E: |

Comments:

## Transect 10

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

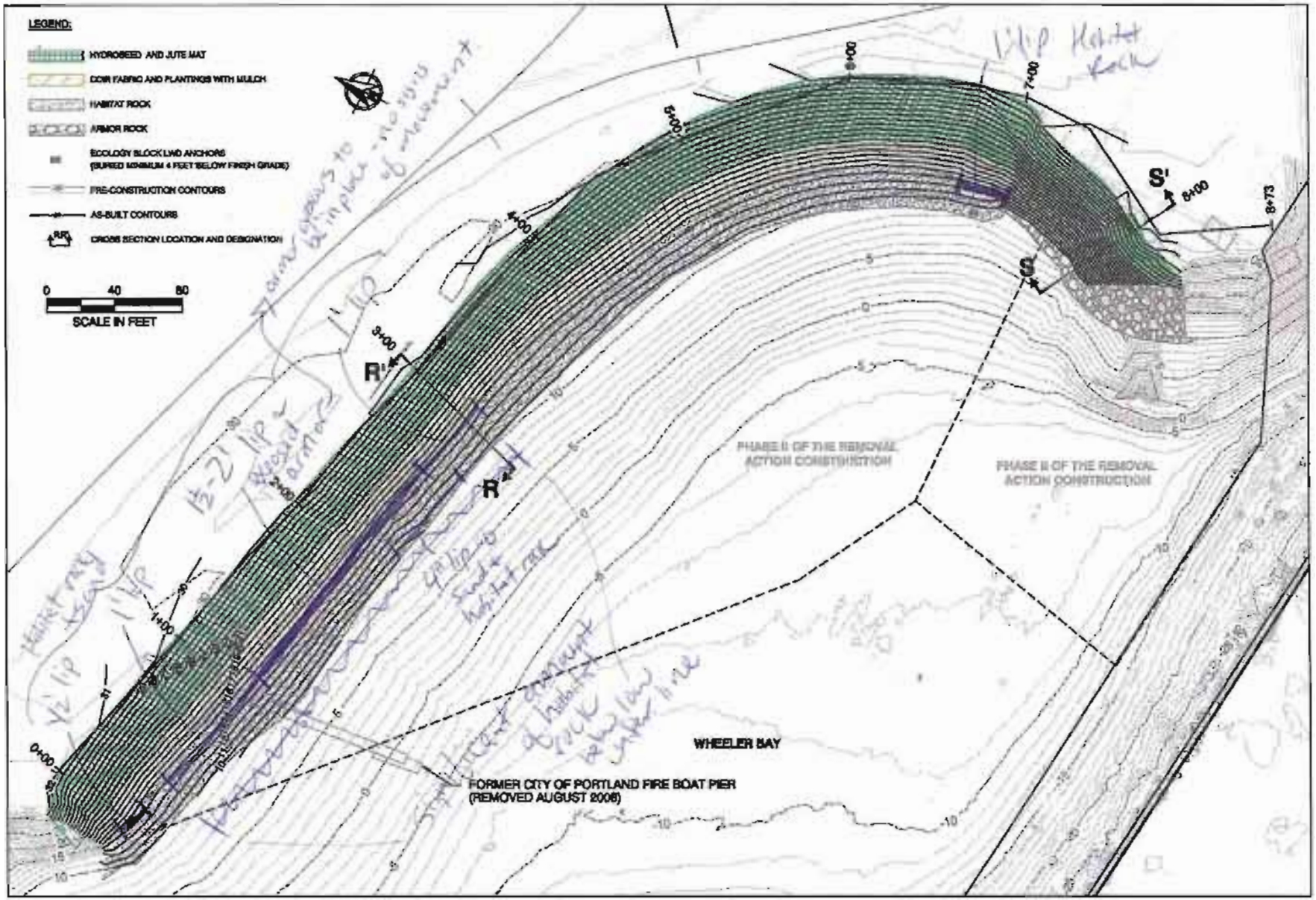
Comments:

Additional Comments:

Recorded by: Gabe Nagler + Julie Fox

# Wheeler Bay Slope + Armor Observation

Date 6/19/09




As-Built Wheeler Bay Shoreline Stabilization Surface Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by Julie Fox

ANCHOR QEA Slope Observation Data Sheet

WB

Observation Date: 10-22-09

Project Name: Wheeler Bay stability observation Project No: 050332-01

Observation Crew: Gabe Nagler + Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 / Lat long N/A

Weather: overcast + foggy ~60° Calm

Points same as June 19 site visit.

**Transect 1**

| Looking Upslope | | Looking Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

Comments:

Downslope: 0681 & 0682

upslope 0683

No signs of slope instability

0684 - erosion "lip" between T1 & T2

Habitat mix layer channelward of Transect 1: 1" lip to 0 channelward, redistributed.

**Transect 2**

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

Comments:

Downslope: 0685 & 0686

upslope: ~~0688~~ 0687

No signs of slope instability.

Habitat mix layer pix 0688 ~2 ft of "lip" - redistributed, also 0689

**Transect 3**

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

Comments:

Downslope: 0690 & 0691

Upslope: 0692

No signs of slop instability.

Habitat mix layer - redistribution "lip" ends @ ~T3.

**Transect 4**

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

Comments:

Downslope: 0693 & 0694

Upslope: 0695

No signs of instability

**Transect 5**

| Upslope | | Downslope | |
|---|---|---|---|
| N: | E: | N: | E: |

Comments:

Downslope 0696 & 0697

Upslope 0698

No signs of instability.

0699 - LWD in place

Recorded by: JF.

ANCHOR QEA **Slope Observation Data Sheet** WB

Observation Date: 10-22-09

**Project Name:** **Project No:** 050332-01

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 6** | N: | E: | N: | E: |

Comments:
Downslope: 0706 & 0707
Upslope: 0702
No signs of instability.

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 7** | N: | E: | N: | E: |

Comments:
Downslope: 0703 & 0704
Upslope: 0705
No signs of instability.

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 8** | N: | E: | N: | E: |

Comments:
Downslope: 0706 & 0707
Upslope (lateral slope looking South): 0708
No signs of instability.
0709 - 0710 - overview of habitat layer end ~ 13:45

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 9** | N: | E: | N: | E: |

Comments:

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 10** | N: | E: | N: | E: |

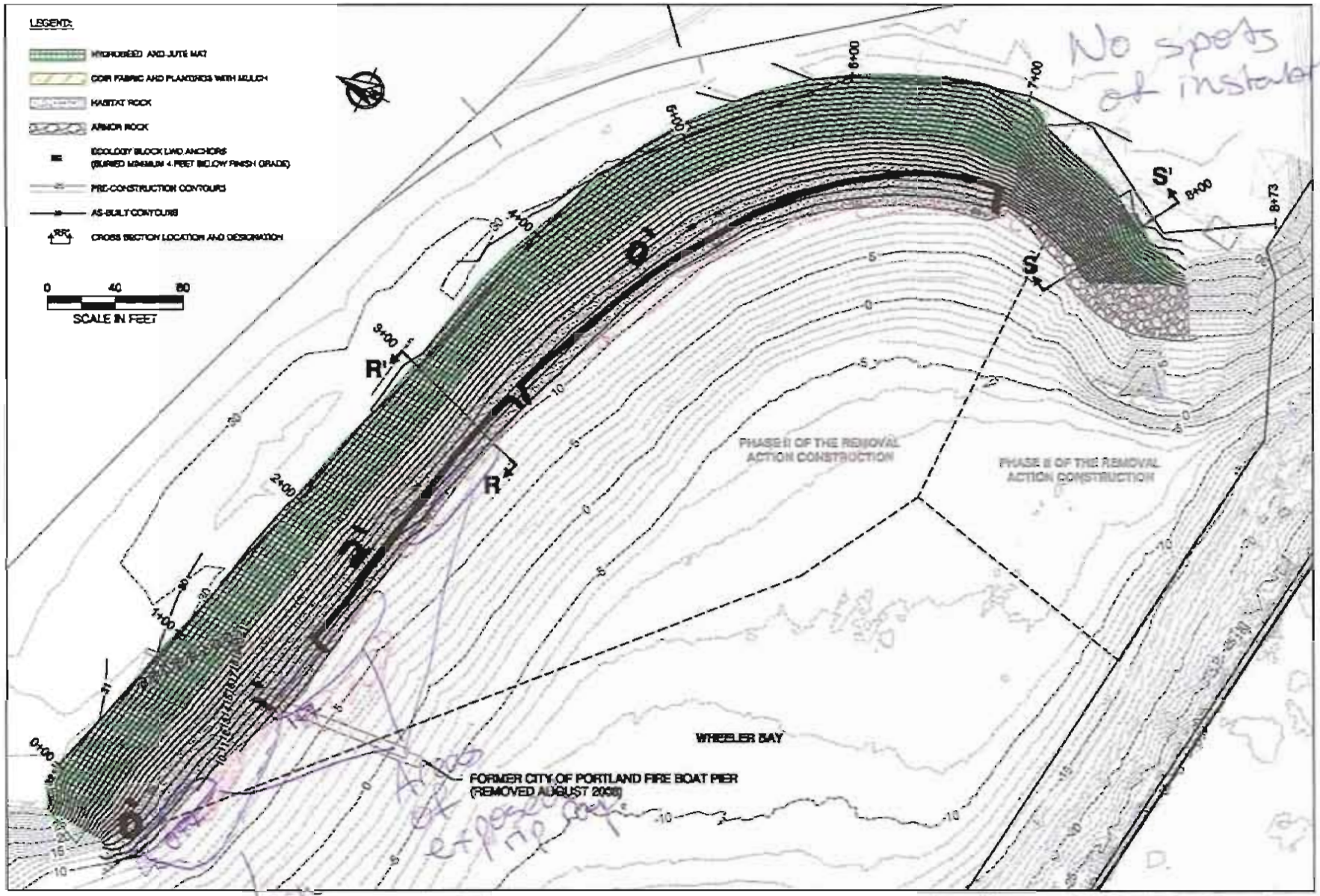
Comments:

Additional Comments:

Recorded by: JP

# Wheeler Bay Slope + Armor Observation

Date 10/22/09




No spots of instability

As-Built Wheeler Bay Shoreline Stabilization Surface Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

Sharpie = habitat mix "lip"

Recorded by Gabe Nagler

# ATTACHMENT A-2
# WHEELER BAY MONITORING PHOTOGRAPHS


Transect 1, looking down-slope 6/19/2009

Transect 2, looking down-slope 6/19/2009


Transect 3, looking down-slope 6/19/2009


Transect 4, looking down-slope 6/19/2009


Transect 5, looking down-slope 6/19/2009


Transect 6, looking down-slope 6/19/2009

Transect 7, looking down-slope 6/19/2009

Transect 8, looking down-slope 6/19/2009

Transect 1, looking down-slope 10/22/2009

Transect 2, looking down-slope 10/22/2009

Transect 3, looking down-slope 10/22/2009

Transect 4, looking down-slope 10/22/2009

Transect 5, looking down-slope 10/22/2009

Transect 6, looking down-slope 10/22/2009

Transect 7, looking down-slope 10/22/2009

Transect 8, looking down-slope 10/22/2009

Slope overview, looking NW 10/22/2009

Woody debris along shoreline 6/16/2009

# ATTACHMENT A-3
# HEAD OF SLIP 3 CAP MONITORING DATA SHEETS – SLOPE STABILITY

Observation Date: 6/19/09

ANCHOR QEA

# Slope Observation Data Sheet

Project Name: Project No: 050332-01

Observation Crew: Gabe Nagler & Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 (Lat long)

Weather: raining overcast

Begin: 14:28 End: 15:30

## Transect 1

| | Upslope | | Downslope | |
|---|---|---|---|---|
| | N: 45.60049 | E: 122.77207 | N: | E: |

Comments:

located 20' south of Hickey line

No erosion / sloughing. Armor stones in place.

pic # 169 + 170

## Transect 2

| | Upslope | | Downslope | |
|---|---|---|---|---|
| | N: 45.60035° | E: 122.77255 | N: | E: |

Comments:

located 60' south of Hickey line.

No erosion / sloughing. Armor stones in place

pics: 171, 172, 173

## Transect 3

| | Upslope | | Downslope | |
|---|---|---|---|---|
| | N: 45.60025 | E: 122.77252 | N: | E: |

Comments:

located 100' south of Hickey line (2 poles @ 390)

No erosion/sloughing. Armor stones in place.

slight fresh wood debris accumulation along entire head of slip.

## Transect 4

| | Upslope | | Downslope | |
|---|---|---|---|---|
| | N: | E: | N: | E: |

Comments:

Comments:

Walked shoreline at head of slip:

no shee observed along active head of slip.

## Transect 5

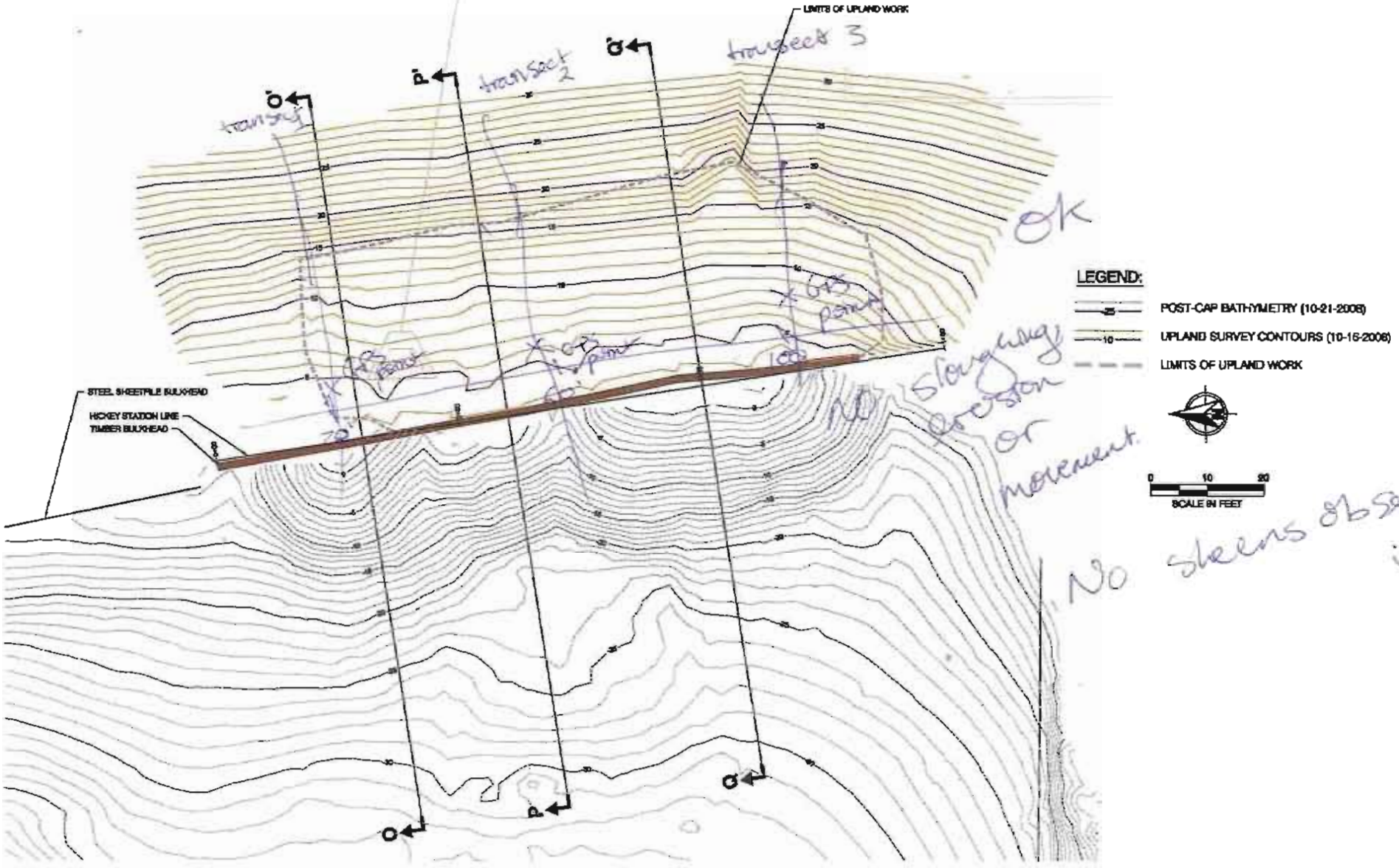
| | Upslope | | Downslope | |
|---|---|---|---|---|
| | N: | E: | N: | E: |

Comments:

Recorded by: Gabe Nagler

# Head of Slip 3 Cap Transects Observation

Date 6/19/09




As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations
Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by Gabe Nagler, Julie Fox

Observation Date: 10-22-09

ANCHOR QEA Slope Observation Data Sheet

Project Name: Head of Slip 3 Project No: 050332-01

Observation Crew: Gabe Nagler + Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 / Lat long N/A

Weather: overcast + foggy ~60° calm

Same as June 19 site visit

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 1** | N: | E: | N: | E: |

Comments:

0711 + 0712

No signs of instability or armor movement

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 2** | N: | E: | N: | E: |

Comments:

0713 + 0714

No signs of instability or armor movement

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 3** | N: | E: | N: | E: |

Comments:

0715 + 0716

No signs of instability of armor movement

General overview 0717 + 0718

| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 4** | N: | E: | N: | E: |

Comments:

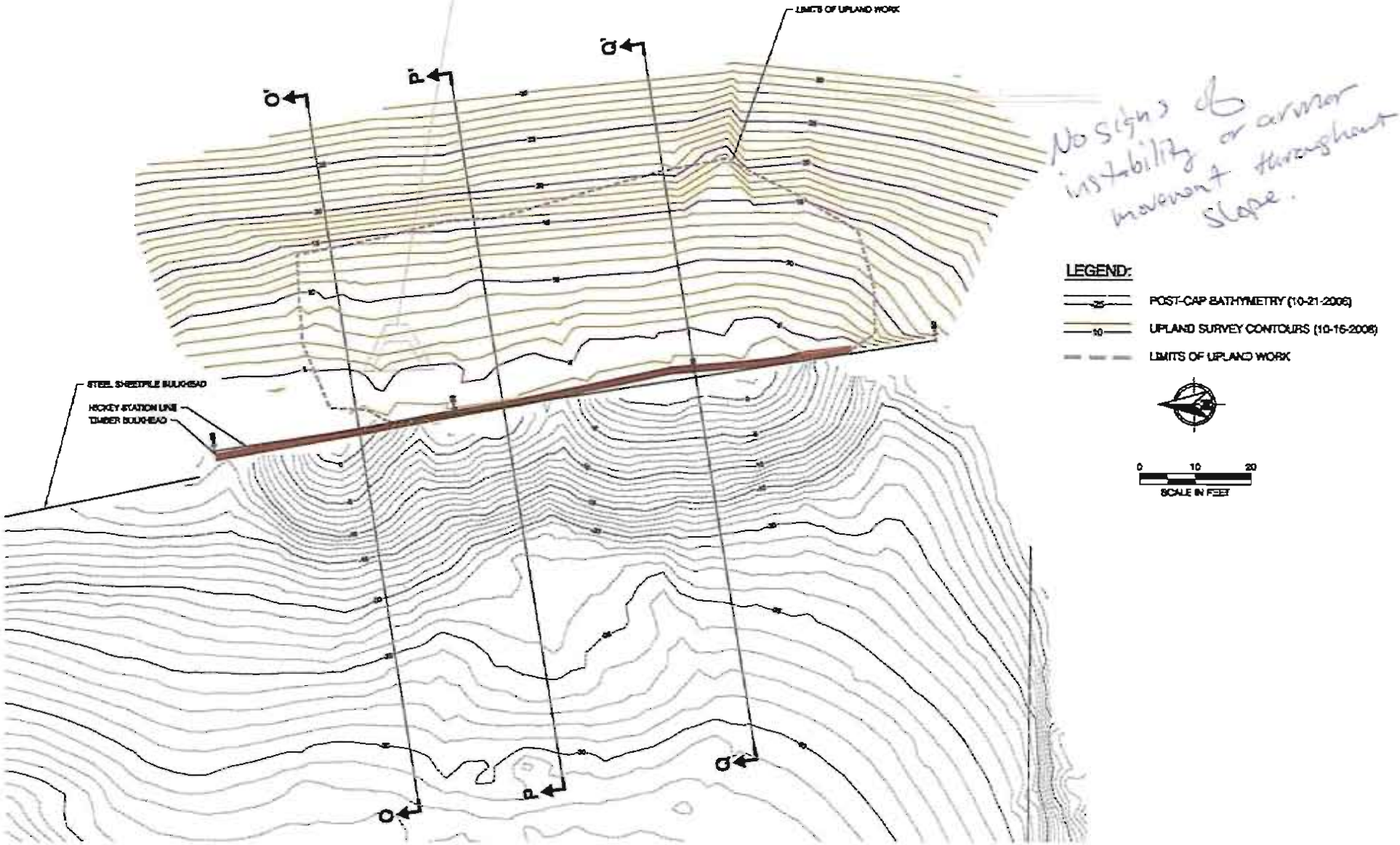
| | Upslope | | Downslope | |
|---|---|---|---|---|
| **Transect 5** | N: | E: | N: | E: |

Comments:

Recorded by: JF

# Head of Slip 3 Cap Transects Observation

Date 10/22/09




No signs of instability or armor movement throughout slope.

As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations
Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by JF

# ATTACHMENT A-4
# HEAD OF SLIP 3 CAP MONITORING PHOTOGRAPHS – SLOPE STABILITY

North Transect, looking down-slope 6/19/2009

Middle Transect, looking down-slope 6/19/2009

South Transect, looking up-slope 6/19/2009

Slip 3 slope looking North 6/22/2009

North Transect, looking down-slope 10/22/2009

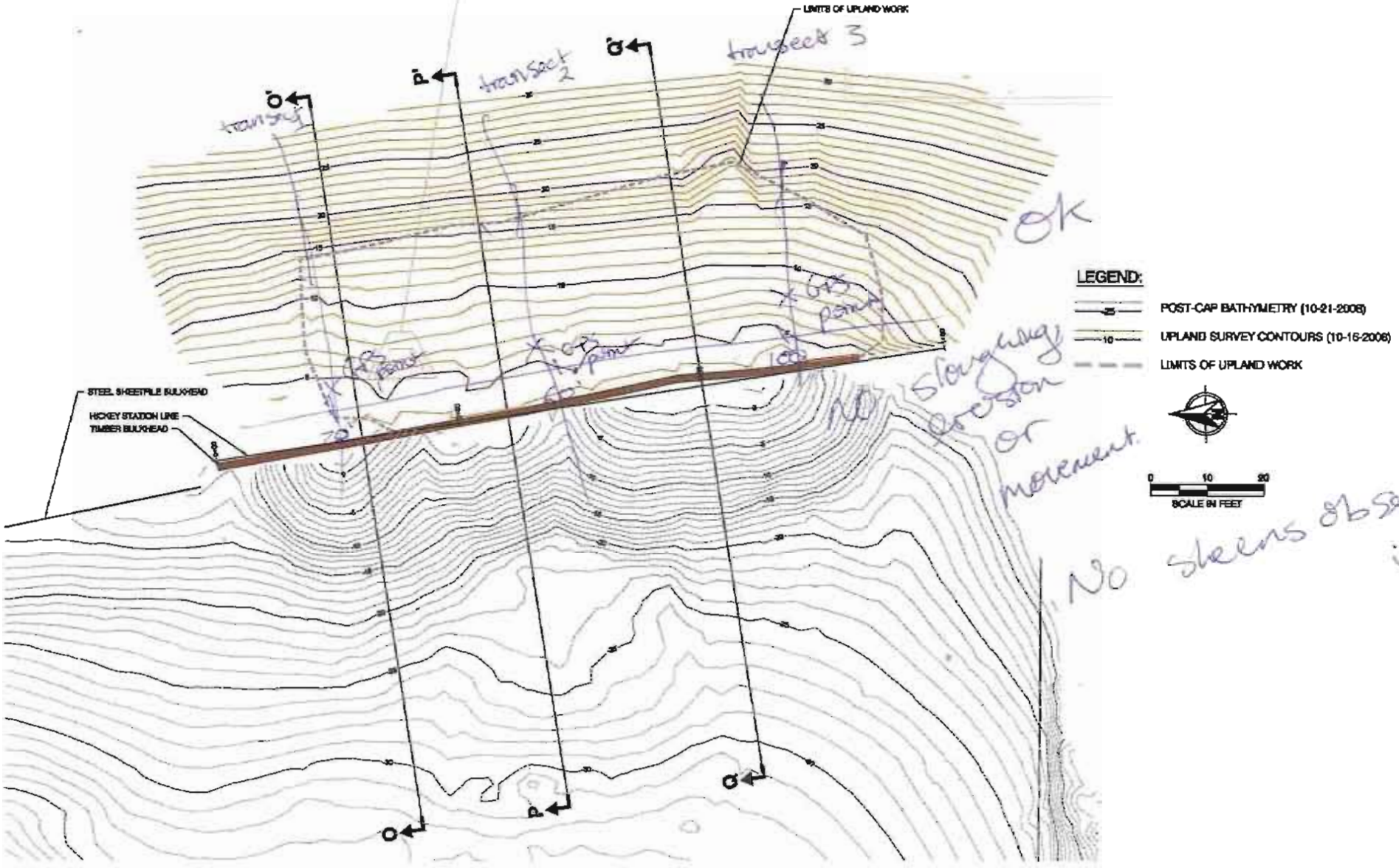
Middle Transect, looking down-slope 10/22/2009

| | |
|---|---|
|  |  |
| South Transect, looking down-slope 10/22/2009 | Slip 3 slope looking North 10/22/2009 |

# ATTACHMENT A-5
# HEAD OF SLIP 3 CAP MONITORING DATA SHEETS – SHEEN

# Head of Slip 3 Cap Transects Observation

Date 6/19/09




As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations
Terminal 4, Portland, Oregon

ANCHOR QEA

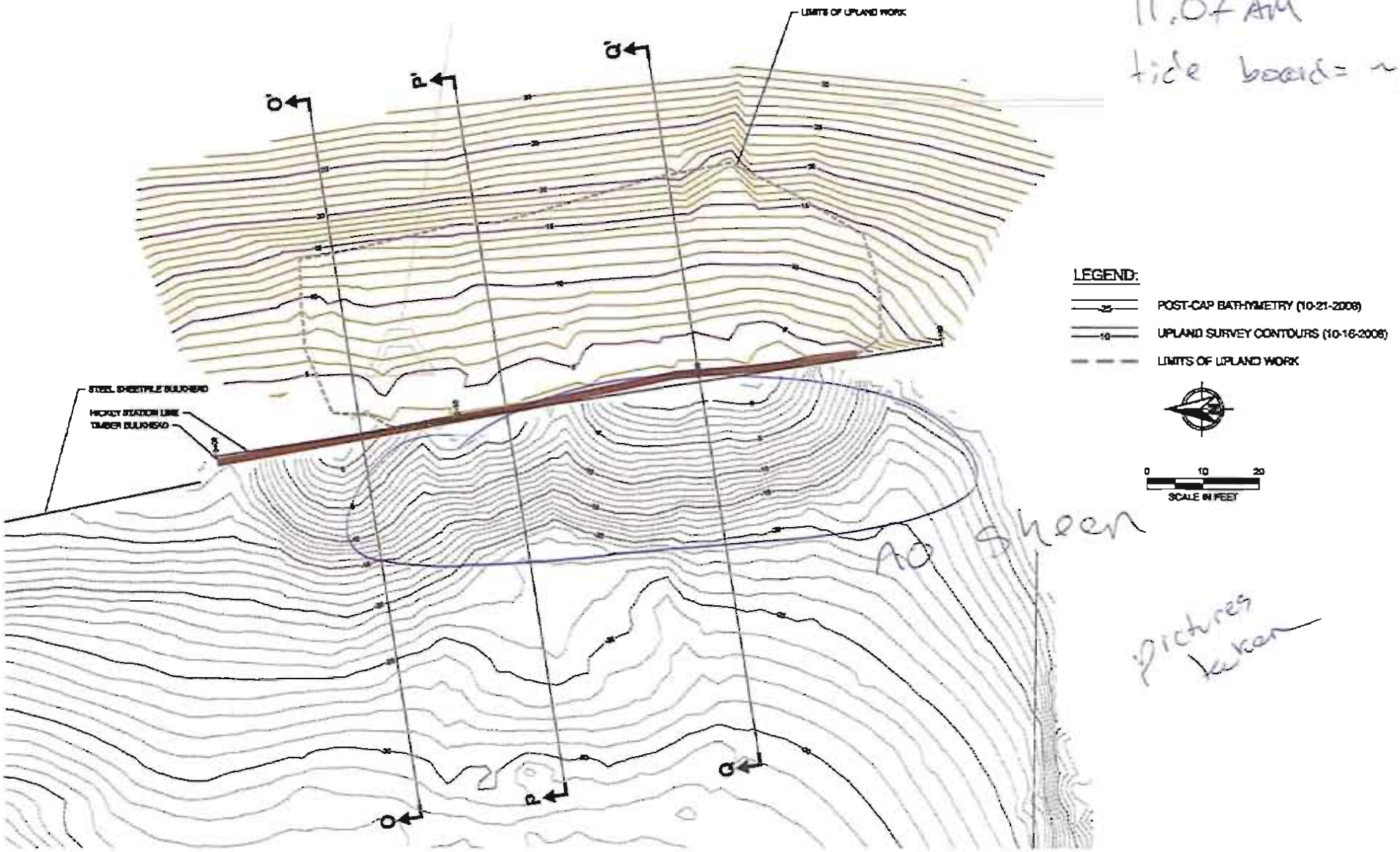
Recorded by Gabe Nagler, Julie Fox

# Head of Slip 3 Cap Transects Observation

Date 9/22/09

11:07 AM

tide board = ~1'




no sheen

pictures taken

As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by Gabe Nagler

# ATTACHMENT A-6
# HEAD OF SLIP 3 CAP MONITORING PHOTOGRAPHS – SHEEN

High water sheen observation 6/19/2009

Low water sheen observation 9/22/2009

# APPENDIX B
# MONTHLY WHEELER BAY VEGETATION OBSERVATION REPORTS

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | December 1, 2008 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 1, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On November 11, 2008, 12 fixed photograph points were established along the Wheeler Bay bank. Photograph points were placed in pairs; one downslope in the willows and one upslope in the grass. The vertical position of stations was established at half the distance from the grass/willow transition line to the upper (grass) or lower (willow) extent of the plantings. Photographs were taken in both directions parallel to the shore. Magnetic north bearings of each photograph were recorded.

## OBSERVATION RESULTS

Grass height was approximately 1 to 3 centimeters and mostly grazed. Goose droppings were present. Willows were approximately 1 meter tall. No significant mortality was observed. Many of the lower elevation willows were also grazed; some heavily (see attached photographs). Minor erosion of bark mulch in the willow planting was present at three locations, A, B, and C (see attached photographs and data sheet map). There was no indication of any sloughing, slope instability, or significant erosion from elevation +15 to +30 feet NGVD. The bank is free from invasive species.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (11-24-2008)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Geese grazing near Stations 11G and 12W

Grazed willow

Grazed willow

Grazed willow

Bark mulch erosion A

Bark mulch erosion B

Bark mulch erosion B

Bark mulch erosion C

Observation Date: 11/24

ANCHOR ENVIRONMENTAL

# Vegetation Observation Data Sheet

Project Name: Project No:

Observation Crew: Julie Fox, Gabe Nagler

Datum (circle one): NAD 83 / WGS 84 / NAD 27 Weather: overcast, calm.

Photo Point ID: 01G Time: 15:30 File Name: _____

Coordinates:
Lat/Northing 45.6025 Long/Easting 122.7764

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 0005 | – |

Photo Point ID: 02W Time: 15:35 File Name: _____

Coordinates:
Lat/Northing 45.60251 Long/Easting 122.77641

| Photo Bearing | ~~320~~ | 140 |
|---|---|---|
| Photo ID # | X | 0007 |

Photo Point ID: 03G Time: 15:40 File Name: _____

Coordinates:
Lat/Northing 45.60278 Long/Easting 122.77703

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0009 | 0010 |

Photo Point ID: 04W Time: 15:45 File Name: _____

Coordinates:
Lat/Northing 45.60273 Long/Easting 122.77708

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0011 | 0012 |

Photo Point ID: 05G Time: 15:50 File Name: _____

Coordinates:
Lat/Northing 45.60268 Long/Easting 122.77650

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0013 | 0014 |

Photo Point ID: 06W Time: 15:55 File Name: _____

Coordinates:
Lat/Northing 45.60270 Long/Easting 122.77663

| Photo Bearing | ~~325~~ 325 | ~~125~~ 325 |
|---|---|---|
| Photo ID # | 0015 | 0016 |

Photo Point ID: 07G Time: ~~16:00~~ 16:00 File Name: _____

Coordinates:
Lat/Northing 45.60257 Long/Easting 122.77599

| Photo Bearing | ~~330~~ 150 | ~~150~~ 330 |
|---|---|---|
| Photo ID # | 0017 | 0018 |

Recorded by: Gabe Nagler Observation Date: 11/24

ANCHOR

# Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time: 10:05 File Name:

Coordinates:
Lat/Northing 45.60246 Long/Easting 122.77600

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0019 | 0020 |

Photo Point ID: 09G Time: 16:10 File Name:

Coordinates:
Lat/Northing 45.60233 Long/Easting 122.77552

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0021 | 0022 |

Photo Point ID: 10W Time: 16:15 File Name:

Coordinates:
Lat/Northing 45.60228 Long/Easting 122.77560

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0023 | 0024 |

Photo Point ID: 11G Time: 16:20 File Name:

Coordinates:
Lat/Northing 45.60203 Long/Easting 122.77537

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0026 0025 | 0027 0026 |

Photo Point ID: 12W Time: 16:25 File Name.

Coordinates:
Lat/Northing 45.60201 Long/Easting 122.77547

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0027 | 0028 |

Comments (flooding, erosion, vandalism, plant mortality?):

- slight erosion of bark mulch. See dig diagram for locations.

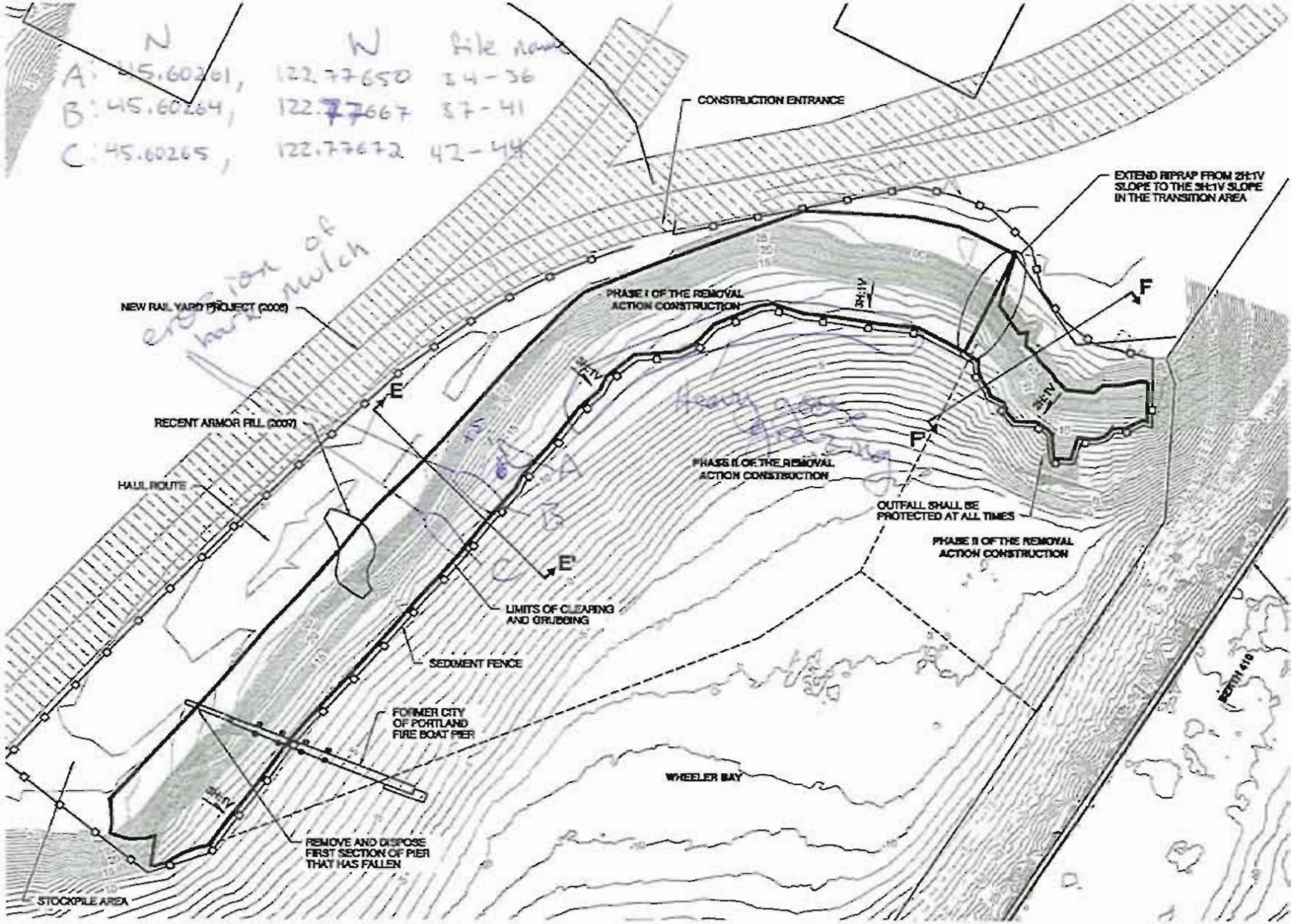
Grass: 1-3 cm in height; mostly goose grazed w/ goose droppings

Heavy goose grazing present on lower elevation willows (pictures)

Recorded by: Gabe Nagler Date 11/24

# Wheeler Bay Vegetation Observation

Date 11/24




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by _____

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | January 7, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 2, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On December 31, 2008, photographs were taken at 12 fixed photograph points along the Wheeler Bay bank. Photographs were taken in pairs; one downslope in the willows and one upslope in the grass. Additional photographs were taken of dormant willows and spots of minor erosion.

## OBSERVATION RESULTS

Grass height was very low (1 to 2 centimeters) due to a recent snow event. No new grazing was observed. Willows were approximately 1 meter tall. No significant mortality was observed. Approximately 25% of willows were shorter with few branches (see attached photographs).

Three small patches of superficial bark mulch erosion at lower elevations were observed (see photographs). The erosion was similar to that observed in the Month 1 Vegetation Observation. There was no indication of any sloughing, slope instability, or significant erosion from elevation +15 to +30 feet NGVD. The bank is free from invasive species.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (12-31-2008)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Dormant willow

Dormant willows

Bark mulch erosion A

Bark mulch erosion B

Bark mulch erosion C

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Observation Date: 12/31/08

**Project Name:** **Project No:**

Observation Crew: Cathe Nagler + Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27

Weather: overcast, 50° ENA

Photo Point ID: 01G Time: 15:50 File Name: 24

Coordinates: Lat/Northing 714115.59 Long/Easting 7619253.17

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 24 | – |

Photo Point ID: 02W Time: 15:52 File Name: 25

Coordinates: Lat/Northing 714099.60 Long/Easting ~~7619251.09~~ 7619251.09

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | | 25 |

Photo Point ID: 03G Time: 15:56 File Name: 26, 27

Coordinates: Lat/Northing 714080.59 Long/Easting 7619382.91

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 26 | 27 |

Photo Point ID: 04W Time: 15:58 File Name: 28, 29

Coordinates: Lat/Northing 714061.45 Long/Easting 7619379.15

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 28 | 29 |

Photo Point ID: 05G Time: 16:02 File Name: 30, 31

Coordinates: Lat/Northing 714044.73 Long/Easting 7619525

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 30 | 31 |

Photo Point ID: 06W Time: 16:02 File Name: 32, 33

Coordinates: Lat/Northing 714024.70 Long/Easting 7619521.83

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 32 | 33 |

Photo Point ID: 07G Time: 16:07 File Name: 45, 46

Coordinates: Lat/Northing 713988.52 Long/Easting 7619667.15

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 45 | 46 |

Recorded by: _____

ANCHOR

# Vegetation Observation Data Sheet

Observation Date: 12/31/08

Project Name:

Project No:

Photo Point ID: 08W Time: 16:12 File Name: 49

Coordinates:
Lat/Northing 713968.99 Long/Easting 7619656

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 49 | 53 |

Photo Point ID: 09G Time: 16:11 File Name:

Coordinates:
Lat/Northing 713901.82 Long/Easting 7619778.6

| Photo Bearing | 340 | 160 |
|---|---|---|
| Photo ID # | 54 | 55 |

Photo Point ID: 10W Time: 16:15 File Name:

Coordinates:
Lat/Northing 713881.53 Long/Easting 7619754.85

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 56 | 57 |

Photo Point ID: 11G Time: 16:25 File Name:

Coordinates:
Lat/Northing 713792.53 Long/Easting 7619812.35

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 58 | 59 |

Photo Point ID: 12W Time: 16:25 File Name:

Coordinates:
Lat/Northing 713779.99 Long/Easting 7619702.16

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 60 | 61 |

Comments (flooding, erosion, vandalism, plant mortality?):

62-68 willow pics

- Three small spots of bark mulch erosion present. See Site map
- Willows appear to be dormant. Some (25%) are short w/ few branches. Possibly stunted due to earlier goose grazing.
- Grass 1-2 cm in height. Very flat due to recent snow event

Approx. Grass Height:

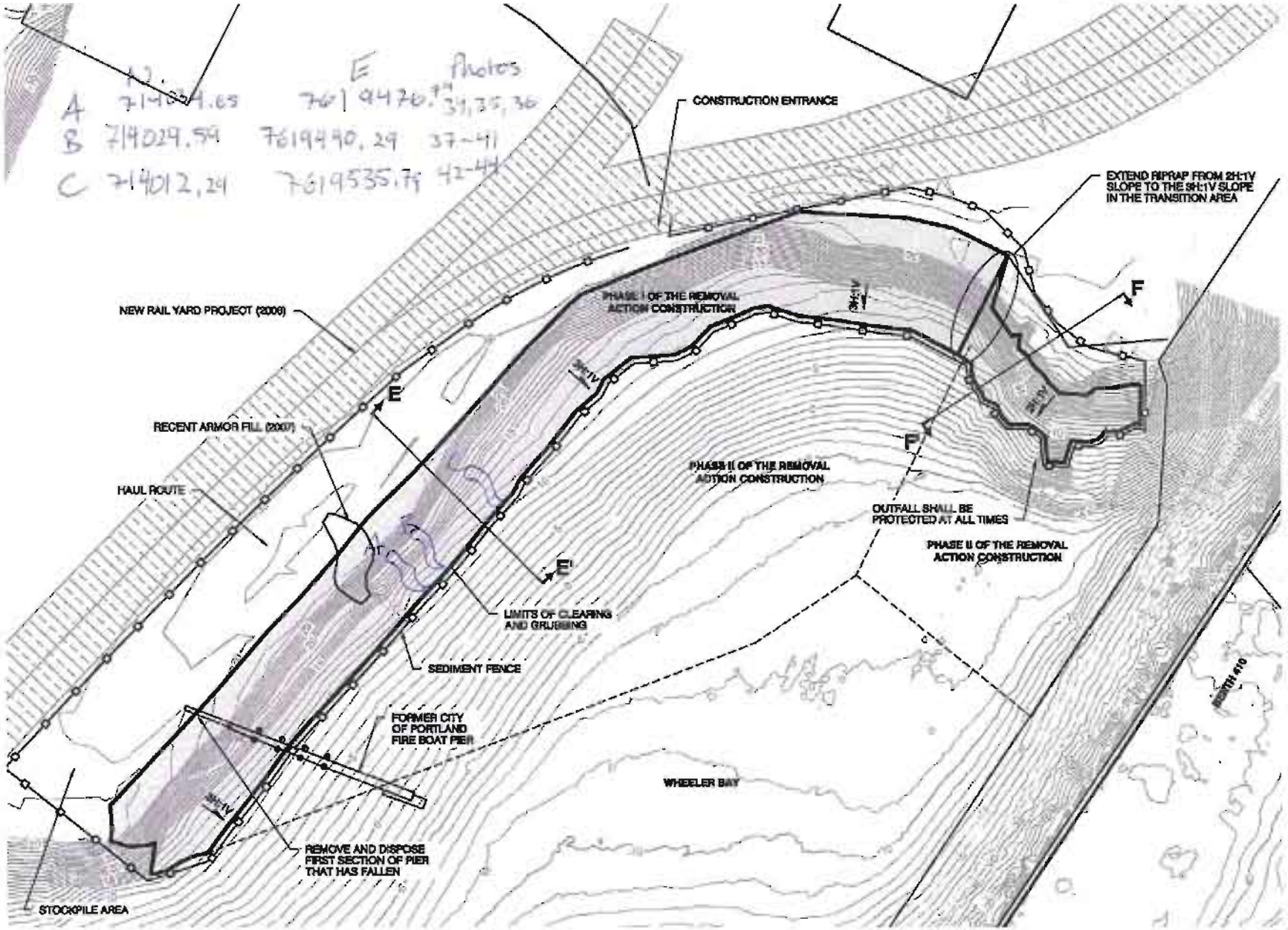
Goose Grazing?

↳ no new grazing

Recorded by: Cabe Nagler, Julie Fox

# Wheeler Bay Vegetation Observation

Date 12/31/08




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by Gabe Mayer & Julie Foy

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | January 30, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 3, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On January 22, 2009, photographs were taken at 12 fixed photograph points along the Wheeler Bay bank. Photographs were taken in pairs; one downslope in the willows and one upslope in the grass. Additional photographs were taken of dormant willows and spots of minor erosion.

## OBSERVATION RESULTS

Grass height was low (2 to 3 centimeters). Geese were observed on the grass, but no active grazing was witnessed. Grass was slightly grazed throughout, although more heavily grazed at the lower elevations. Higher elevation willows were approximately 1 meter tall. Lower elevation willows ranged from 0.5 to 1 meter in height. All willows were dormant (see attached photographs); therefore, mortality was not possible to determine.

Five small patches of bark mulch erosion at lower elevations were observed (see photographs). Erosion was observed in two additional locations apart from the three observed in the Months 1 and 2 Vegetation Observations (see photographs). Erosion of bark mulch remains superficial and does not penetrate below the jute mat material. There was no indication of any sloughing, slope instability, or significant erosion from elevation +15 to +30 feet NGVD. The bank is free from invasive species.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (1-23-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Bark mulch erosion A

Bark mulch erosion B

Bark mulch erosion C

Bark mulch erosion D

Bark mulch erosion E

Dormant willow

Observation Date: 1/23/09

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Project Name: Project No:

Observation Crew: Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 Weather: Partly Sunny / Calm

OR N

Photo Point ID: 01G Time: 09:21 File Name: _____

Coordinates:

Lat/Northing 714128.52 Long/Easting 7619232.32 Ft.

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 0002 | – |

Photo Point ID: 02W Time: 09:24 File Name: _____

Coordinates:

Lat/Northing 714097.81 Long/Easting 7619243.05 Ft

| Photo Bearing | ~~320~~ | 140 |
|---|---|---|
| Photo ID # | ~~0003~~ | 0003 |

Photo Point ID: 03G Time: 09:32 File Name: _____

Coordinates:

Lat/Northing 714081.06 Long/Easting 7619378.16 ft

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0004 | 0005 |

Photo Point ID: 04W Time: 09:36 File Name: _____

Coordinates:

Lat/Northing 714059.01 Long/Easting 7619371.35 Ft.

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0006 | 0007 |

Photo Point ID: 05G Time: 09:44 File Name: _____

Coordinates:

Lat/Northing 714040.47 Long/Easting 7619527.54 Ft

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0008 | 0009 |

Photo Point ID: 06W Time: 09:48 File Name: _____

Coordinates:

Lat/Northing 714017.14 Long/Easting 7619524.78 Ft

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0010 | 0011 |

Photo Point ID: 07G Time: 09:51 File Name: _____

Coordinates:

Lat/Northing 713990.42 Long/Easting 7619665.16 Ft

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 0012 | 0013 |

Recorded by: Julie Fox Observation Date: _____

ANCHOR **Vegetation Observation Data Sheet**

Project Name: Project No:

Photo Point ID: 08W Time: 09:55 File Name: _____

Coordinates:
Lat/Northing 713969.71 Long/Easting 7619654.99 Ft

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0014 | 0015 |

Photo Point ID: 09G Time: 09:57 File Name: _____

Coordinates:
Lat/Northing 713899.67 Long/Easting 7619776.14 Ft

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0016 | 0017 |

Photo Point ID: 10W Time: 09:59 File Name: _____

Coordinates:
Lat/Northing 713882.95 Long/Easting 7619755.55

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0018 | 0019 |

Photo Point ID: 11G Time: 10:03 File Name: _____

Coordinates:
Lat/Northing 713787.39 Long/Easting 7619810.21 Ft

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0020 | 0021 |

Photo Point ID: 12W Time: 10:05 File Name: _____

Coordinates:
Lat/Northing 713786.38 Long/Easting 7619787.36 Ft.

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0022 | 0023 |

Comments (flooding, erosion, vandalism, plant mortality?):

Willows dormant - plant mortality unknown - no significant changes since last month.

Water level reaching edge of bark mulch - mixing + some erosion occurring at base of & bark mulch slope & first row of willows affected.

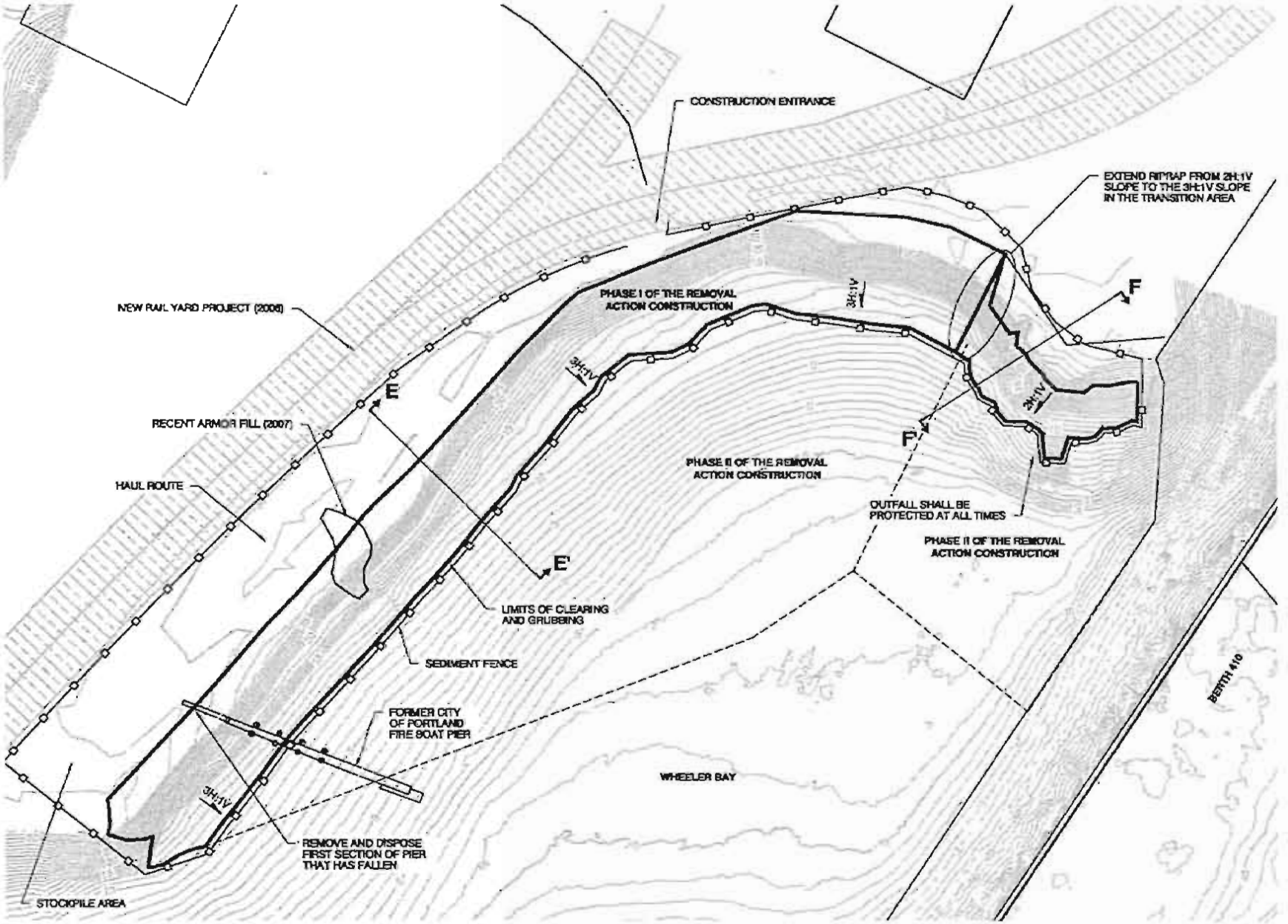
P,X 0034+0035 N 713966.09 Ft E 7619656.98 Ft. (near station 08W)
P,X 0045+0046 N 714021.66 Ft E 7619530.66 Ft (near station 06W)
P,Y 0050+0051 N 714030.26 Ft E 7619486.47 Ft
P,Y 0052+0053 N 714039.21 Ft E 7619470.59 Ft.
P,Y 0054+0055 N 714059.57 Ft E 7619374.46 Ft

Approx. Willow Height: upper ~~slope~~ slope ~ 1m; lower slope ~ 1/3-1/2m mixed some 1m
Approx. Grass Height: 2-3cm ht. - shorter on down slope; taller on upslope
Goose Grazing?
Geese present on grass, grazing not witnessed but grass lightly grazed throughout - especially lower half of slope.

Recorded by: Julie Fox

# Wheeler Bay Vegetation Observation

Date 1/23/09




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by _____

ANCHOR ENVIRONMENTAL CA, L.P.

PROJECT: _____ JOB NO.: _____

SUBJECT: _____ DATE: _____ TIME: _____

ATTENDEES: _____ PAGE: _____ OF: _____

_____ MADE BY: _____

_____ ROUTE TO: _____

☐ CALCULATIONS ☐ TELECON ☐ MEETING NOTES

Station Pix: 0002 – 0023

Geese Pix: 0001

Edge of bark mulch erosion and first row of willows { 0024 – 0032, 0036 – 0044, 0047 – 0049

East ↓ West

Bark erosion #1: 0034 + 0035 (looking upslope + looking downslope)

Bark erosion #2: 0045 + 0046 ( " )

Bark erosion #3: 0050 + 0051 ( " )

Bark erosion #4: 0052 + 0053 ( " )

Bark erosion #5: 0054 + 0055 ( " )

Misc willow Pix: 0056 + 0057

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | February 27, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 4, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On February 20, 2009, photographs were taken at 12 fixed photograph points along the Wheeler Bay bank. Photographs were taken in pairs; one downslope in the willows and one upslope in the grass. Additional photographs were taken of budding willows and spots of minor erosion.

## OBSERVATION RESULTS

Grass height was low and unchanged from Month 3 (2 to 3 centimeters). Geese were observed on the grass, with some active grazing. Grass was slightly grazed throughout, although more heavily grazed at the lower elevations. Higher elevation willows were approximately 1 meter tall. Lower elevation willows ranged from 0.5 to 1 meter in height. Approximately 50 to 60% of willows showed budding (see attached photographs).

Five small patches of bark mulch erosion at lower elevations were observed (see photographs). Erosion was similar to Month 3 observations and did not penetrate jute mat material. Some erosion was also present in lower elevation bark mulch due to the water reaching higher elevations. No indication of any sloughing, slope instability, or significant erosion from elevation +15 to +30 feet NGVD was observed. The bank is free from invasive species.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (2-20-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Budding willow

Bark mulch erosion A

Bark mulch erosion B

Bark mulch erosion C

Bark mulch erosion D

Bark mulch erosion E

High water erosion

Observation Date: 7/30/09

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Project Name: Wheeler Bay  Project No: 050332-01

Observation Crew: Julie Cox, Gabe Nagler

Datum (circle one): NAD 83/ WGS 84 / NAD 27  Weather: Sunny, 60°F, light wind

ORS N Int. ft

Photo Point ID: 01G  Time: 10:02

Coordinates:
Lat/Northing: 714114.53  Long/Easting: 7619254.44

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 0001 | – |

Photo Point ID: 02W  Time: 10:07

Coordinates:
Lat/Northing: 714093.87  Long/Easting: 7619249.11

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 0002 | – |

Photo Point ID: 03G  Time: 10:10

Coordinates:
Lat/Northing: 714074.57  Long/Easting: 7619385.13

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0003 | 0004 |

Photo Point ID: 04W  Time: 10:15

Coordinates:
Lat/Northing: 714055.32  Long/Easting: 7619379.23

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0005 | 0006 |

Photo Point ID: 05G  Time: 10:19

Coordinates:
Lat/Northing: 714032.58  Long/Easting: 7619528.50

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0007 | 0008 |

Photo Point ID: 08W  Time: 10:21

Coordinates:
Lat/Northing: 714014.37  Long/Easting: 7619523.29

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0009 | 0010 |

Photo Point ID: 07G  Time: 10:25

Coordinates:
Lat/Northing: 713984.07  Long/Easting: 7619666.99

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 0011 | 0013 |

Recorded by: Gabe Nagler

Observation Date: 2/20/09

ANCHOR

# Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time: 10:25

Coordinates:
Lat/Northing 713963.74 Long/Easting 7619656.19

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0013 | 0014 |

Photo Point ID: 09G Time: 10:32

Coordinates:
Lat/Northing 713894.08 Long/Easting 7619776.61

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0015 | 0016 |

Photo Point ID: 10W Time: 10:34

Coordinates:
Lat/Northing 713881.17 Long/Easting 7619759.00

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 0017 | 0018 |

Photo Point ID: 11G Time: 10:38

Coordinates:
Lat/Northing 713783.79 Long/Easting 7619810.63

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0019 | 0020 |

Photo Point ID: 12W Time: 10:39

Coordinates:
Lat/Northing 713781.10 Long/Easting 7619788.51

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0021 | 0022 |

28, 29, 35, 36

Comments (flooding, erosion, vandalism, plant mortality?):

- Grass height lower @ lower elevations.
- 50% - 60% of show budding/leaf production. (pic # 0025) → 43, 44
- Bank continues to wash away @ lower 1 ft of elevation from tide (pic # 0026, 0027, 0032 lower willows (last row) not woody
- Erosion present in a number of places in bank outlet.
  - A: near station 08 pic # 0030, 0031 713960.41 N, 7619654.49 E
  - B: near station 06 pic # 0033, 0034 714003.59 N, 7619536.30 E
  - C: channel-ward of 06 pic # 0037, 0038 714022.54 N, 7619490.19 E
  - D: very minor. next to erosion C. pic # 41, 42 714025.58 N, 7619480.00 E
  - E: near station #4. pic # 45, 46 714050.83 N, 7619380.60 E

Approx. Willow Height: unchanged.
Approx. Grass Height: ~2cm similar to month 3 observation
Goose Grazing? Yes similar grazing intensity as last month

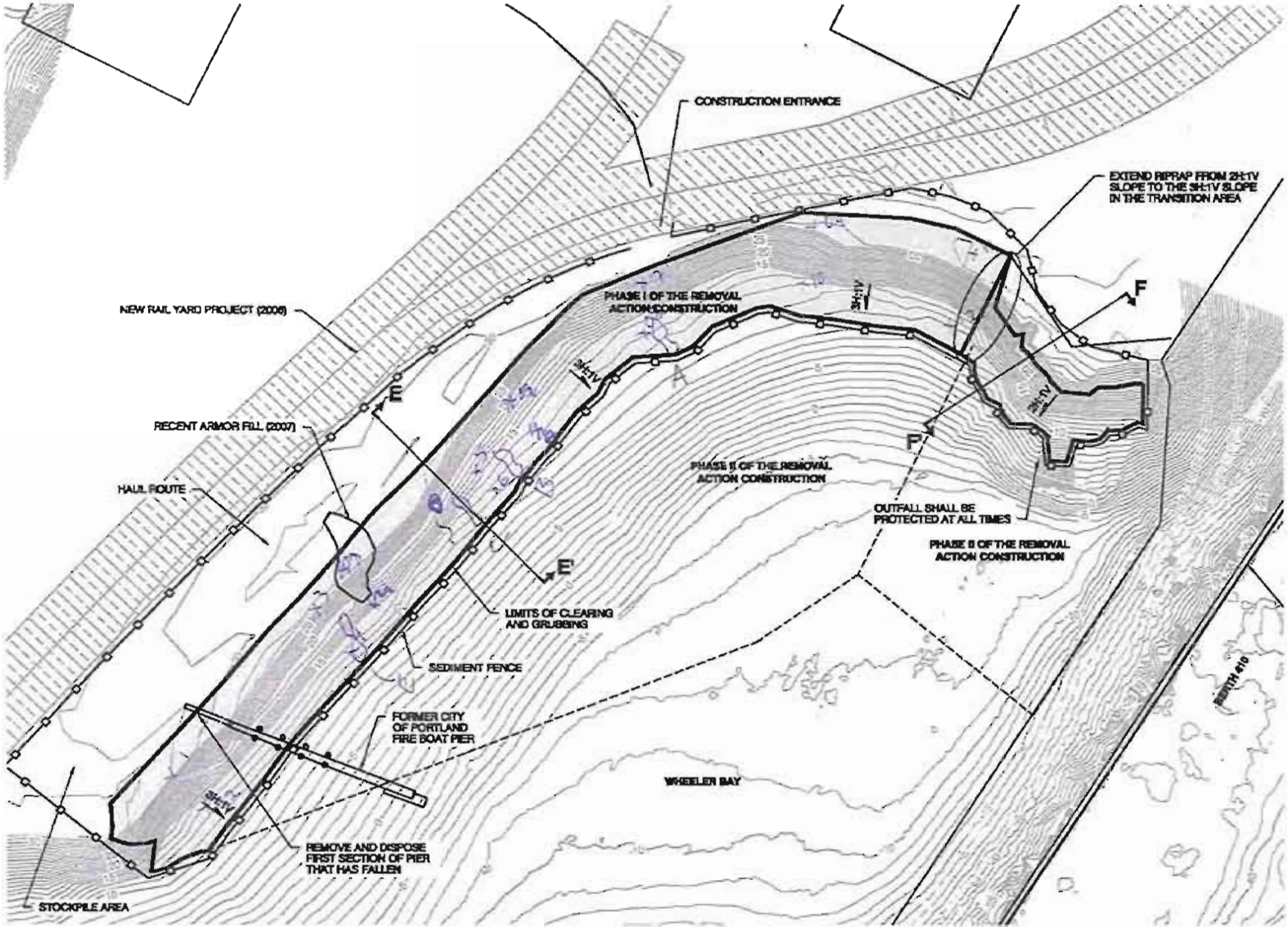
see pic 28, 29, 35, 36

Recorded by: Grace Nagler

# Wheeler Bay Vegetation Observation

Erosion points

Date 2/20/09




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by Gabe Nagler

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | March 30, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 5, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On March 23, 2009, photographs were taken at 12 fixed photograph points along the upper (grass) and lower (willow) slopes of the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of budding and leafing willows and spots of minor erosion.

## OBSERVATION RESULTS

Grass height did not noticeably change from Month 4 (2 to 3 centimeters), yet overall grass coverage is visibly greener and denser. The abundance of goose droppings scattered across the bank may be serving as fertilizer, thereby contributing to grass productivity. Although a few geese were observed grazing on the grass, the impact of grazing appears less damaging to overall grass growth compared to previous months.

Willow height did not change appreciably from last month. Approximately 20% of the willows averaged 1 meter tall, while 80% were at least 0.5-meter in height. Roughly, 10 to 15% of the willows showed no signs of life, while the remaining willows were in various stages of budding and leafing out (see attached photographs). Most of the willows located where bark mulch erosion has occurred due to the higher water elevations, appeared to be dead. No willows exhibited signs of grazing as indicated by intact leaves and buds.

The five small patches of bark mulch erosion that run perpendicular to the shoreline were observed to be unchanged from previous months, both in size and scope (see photographs). This erosion refers to the bark mulch only and does not penetrate beneath the erosion-control fabric. Similar superficial erosion was also observed along the lower edge of the slope

near the higher water elevations. No sloughing of the slope, movement of the armor stones, or erosion of other placed material was observed. In general, the bank appears to be stable and free from invasive species and noxious weeds.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (3-23-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Geese grazing near Station 03G

Budding willow

Leafing willow

Leafing willow

Leafing willow

Leafing willow

Bark mulch erosion

Bark mulch erosion

Bark mulch erosion

Lower slope bark mulch erosion

Lower slope bark mulch erosion

Lower slope bark mulch erosion

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Observation Date: 5/25/09

**Project Name:** **Project No:**

Observation Crew: Gabe Angles, Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 Weather: Rain

---

Photo Point ID: 01G Time: 10:29

Coordinates: Lat/Northing 45.60217 Long/Easting 122.77761

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 0006 | -- |

---

Photo Point ID: 02W Time: 10:32

Coordinates: Lat/Northing 45.60279 Long/Easting 122.77757

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 0007 | -- |

---

Photo Point ID: 03G Time: 10:35

Coordinates: Lat/Northing 45.60278 Long/Easting 122.77708

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0008 | |

0009 0010

---

Photo Point ID: 04W Time: 10:39

Coordinates: Lat/Northing 45.60273 Long/Easting 122.77709

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0011 | 0012 |

---

Photo Point ID: 05G Time: 10:38

Coordinates: Lat/Northing 45.60269 Long/Easting 122.77631

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0013 | 0014 |

---

Photo Point ID: 06W Time: 10:39

Coordinates: Lat/Northing 45.60267 Long/Easting 122.77554

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0015 | 0016 |

0008 willow

---

Photo Point ID: 07G Time: 10:40

Coordinates: Lat/Northing 45.60258 Long/Easting 122.77597

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 0017 | 0018 |

---

Recorded by: Gabe Angles

Observation Date: _____

ANCHOR

# Vegetation Observation Data Sheet

Project Name: _____ Project No: _____

3/23

Photo Point ID: 08W Time: 16:41

Coordinates: Lat/Northing 45.60252 Long/Easting 122.77603

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0019 | 0020 |

Photo Point ID: 09G Time: 16:41

Coordinates: Lat/Northing 45.60257 Long/Easting 122.77550

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0021 | 0022 |

Photo Point ID: 10W Time: 16:45 16:45

Coordinates: Lat/Northing 45.60251 Long/Easting 122.77559

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 0024 | 0025 |

Budding willows

Photo Point ID: 11G Time: 16:49

Coordinates: Lat/Northing 45.60210 Long/Easting 122.77540

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0026 | 0027 |

0027
16:??

Photo Point ID: 12W Time: 16

Coordinates: Lat/Northing 45.60204 Long/Easting 122.77545

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0028 | 0029 |

willow leaves
0031
0030
16:49
0035
0037

Comments (flooding, erosion, vandalism, plant mortality?):

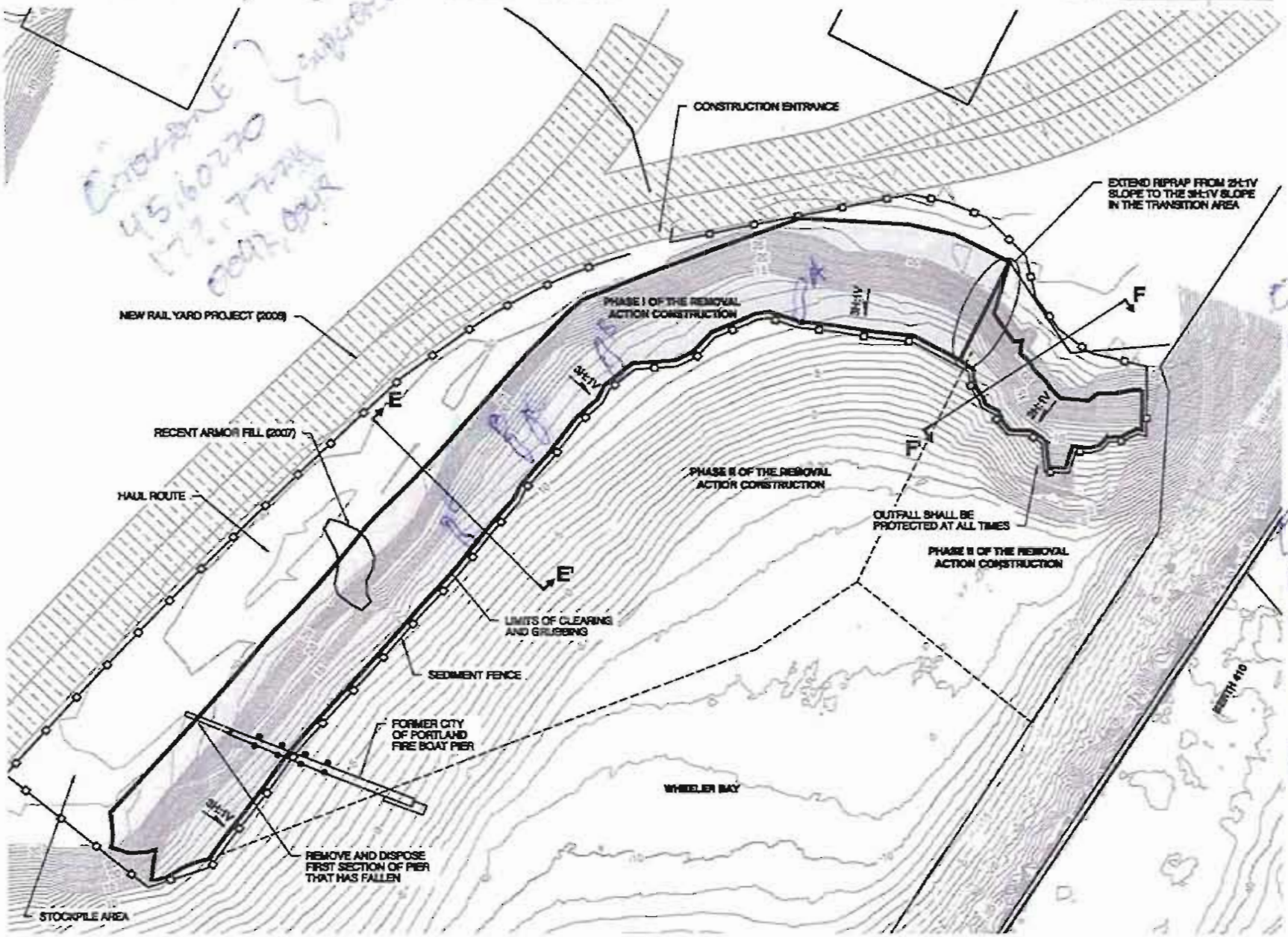
- High water mark above first line of willows
- No sloughing or spots of instability 0032, 0033, 0034, 0036
- 10-15% of willows show no signs of life. Remainder are budding

Approx. Willow Height: 90% 5m tall 20% 1m tall, trace very short 15cm
Approx. Grass Height: 2-3cm mechanically
Goose Grazing?
Yes. lots of goose droppings

Recorded by: GN, CJ

# Wheeler Bay Vegetation Observation

Date 3/6/14




ANCHOR ENVIRONMENTAL L.L.C.

Recorded by _____

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | May 12, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 6, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On April 27, 2009, an observation crew visited Wheeler Bay but could not collect observations at photograph points due to active irrigation. The observation crew returned on May 5, 2009 to complete the observation event. Photographs were taken at 12 fixed photograph points along the upper (grass) and lower (willow) slopes of the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of the two species of grass present and patches of low-density grass.

## OBSERVATION RESULTS

Grass height increased from Month 5 to 3 to 5 centimeters. Overall grass coverage is dense and green, except in patches at the lower elevation of the grass slope where bark mulch was observed underneath the erosion-control fabric. Patches of lower elevation grass are either showing a slow recovery or no recovery (see attached photographs). Grass primarily consists of two species: *F. occidentalis* and *B. carinatus*.

Willow height increased slightly from Month 5. Approximately 30% of the willows averaged 1 meter in height, while 70% were no more than 0.5-meter in height. Of that 70%, roughly 50% of the willows averaged 10 to 20 centimeters. Approximately 20% of the initial willow plantings do not appear to have survived. Overall willow ground cover remains low at approximately 5%.

The five small patches of superficial bark mulch erosion that run perpendicular to the shoreline were observed to be unchanged from previous months, both in size and scope. The

erosion remains superficial and does not penetrate beneath the erosion-control fabric. Bark mulch erosion observed along the lower edge of the slope also appeared unchanged from previous months. No sloughing of the slope, movement of the armor stones, or erosion of other placed material was observed. The bank is stable and free from invasive species and noxious weeds.

Geese were observed at Wheeler Bay; however, minimal evidence of grazing was observed.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (5-5-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Low-density grass patches

Two grass species found throughout

Observation Date: 5/5/09

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Project Name: Project No:

Observation Crew: Gabe Nagler

Datum (circle one): NAD 83 / WGS 84 / NAD 27

Weather: overcast

Photo Point ID: 01G Time: 16:15

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 194 | – |

Photo Point ID: 02W Time: 16:17

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 195 | – |

Photo Point ID: 03G Time: 16:20

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 196 | 197 |

Photo Point ID: 04W Time: 16:25

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 198 | 199 |

Photo Point ID: 05G Time: 16:28

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 200 | 201 |

Photo Point ID: 06W Time: 16:30

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 202 | 203 |

Photo Point ID: 07G Time: 16:31

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 205 | 204 |

Recorded by: GN

Observation Date: 5/15/09

ANCHOR

# Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time: 16:52

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 206 | 207 |

Photo Point ID: 09G Time: 16:55

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 208 | 209 |

Photo Point ID: 10W Time: 16:57

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 300 | 301 |

Photo Point ID: 11G Time: 16:58

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 302 | 303 |

Photo Point ID: 12W Time: 16:39

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 304 | 305 |

Comments (flooding, erosion, vandalism, plant mortality?):

↳ similar to last month - no change

~ 10% willow mortality.

~ 30-40% heavily stunted

- patches of bare "grass" due to bark mulch substrate see photos

Armor stone movement? NO

Instability? none

Sloughing? none

Approx. Willow Height: 20~~0~~cm 30% - 1m 20% .5m 50% 20cm

Approx. Grass Height: 2 species, crab. 5cm bunch grass. 3-5 cm

Goose Grazing? Minimal

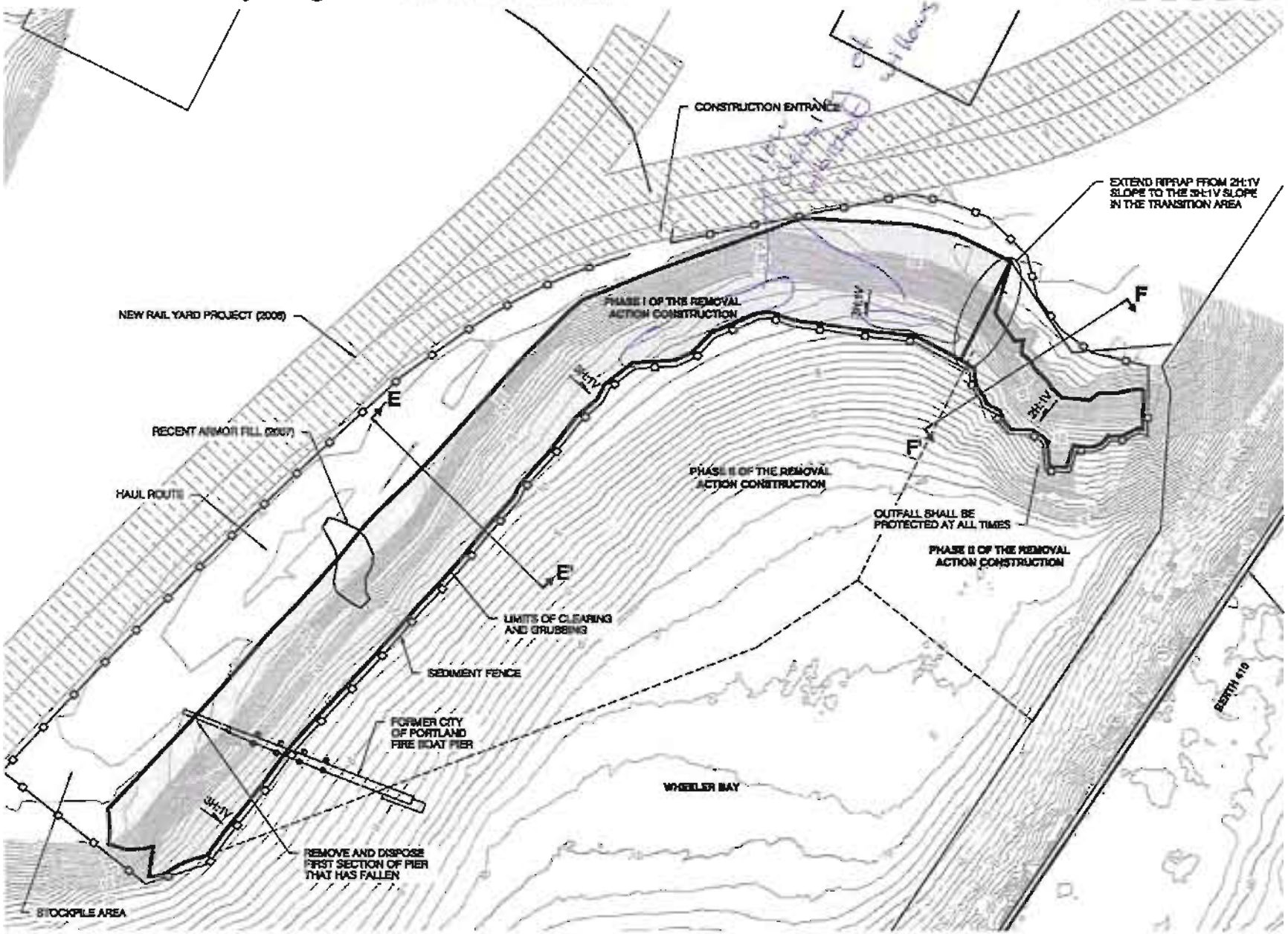
Invasive Species?

nope

Recorded by: CN

# Wheeler Bay Vegetation Observation

Date 5/5/09




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by Gabe Nagler

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | June 2, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 7, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On May 26, 2009, photographs were taken at 12 fixed photograph points along the upper (grass) and lower (willow) slopes of the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of the lupine present and patches of low-density grass. In addition, a more detailed accounting of willow survival and mortality was taken.

## OBSERVATION RESULTS

Grass height increased from Month 6 to 3 to 7centimeters. Overall grass coverage is dense and green except in patches at the lower elevation of the grass slope where bark mulch was observed underneath the erosion-control fabric (see attached photographs). Grass primarily consists of three species: *F. occidentalis*, *B. carinatus*, and *L. rivularis* (lupine). Lupine coverage is approximately 10 to 15% across the grass planting area (see photographs).

Willow mortality appears to be roughly 5 to 10%, which is lower than the estimated 10 to 20% in previous months. Willow height is highly variable and ranges from a few centimeters to 1.2 meters. A gradient between lower and upper elevation willows can be seen in terms of willow height and mortality. Higher elevation willows, especially those at the grass border, are much taller and vibrant than lower elevation plants.

The five small patches of bark mulch erosion that run perpendicular to the shoreline have stabilized in the last few months and are not continuing to deteriorate. The erosion remains superficial and does not penetrate beneath the erosion-control fabric. Bark mulch erosion observed along the lower edge of the slope also appeared unchanged from previous months.

No sloughing of the slope, movement of the armor stones, or erosion of all other placed material was observed. The bank is stable and free from invasive species and noxious weeds.

Minimal evidence of grazing was observed.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (5-26-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Low-density grass patches

Lupine found throughout grass planting

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

Observation Date: 5/26/09

Project Name: Project No:

Observation Crew: J. Fox, G. Nagler

Datum (circle one): NAD 83 / WGS 84 / NAD 27

Weather: Sunny, light wind

Photo station posts are stable. No GPS required

Photo Point ID: 01G Time: 15:30

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 03 | – |

Photo Point ID: 02W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | – |
|---|---|---|
| Photo ID # | 04 | – |

Photo Point ID: 03G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 05 | 06 |

Photo Point ID: 04W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 07 | 08 |

Photo Point ID: 05G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 09 | 10 |

Photo Point ID: 06W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 11 | 12 |

Photo Point ID: 07G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 13 | 14 |

Recorded by: GN, JF

ANCHOR

# Vegetation Observation Data Sheet

Observation Date: 5/26/09

Project Name:

Project No:

Photo Point ID: 08W Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 15 | 16 |

Photo Point ID: 09G Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | | |

Photo Point ID: 10W Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 17 | 18 |

Photo Point ID: 11G Time

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 19 | 20 |

Photo Point ID: 12W Time: 16:20

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 21 | 22 |

Comments (flooding, erosion, vandalism, plant mortality?):

Willows: 01,02 - 03,04

- 95% of non-lower willows alive } 1.2m leader shoot, no grazing
- lower willows 85% alive. }

03,04 - 05,06

- 5-5% greater mortality than 01,02-03,04

05,06 - 09,08 (07,08 ~~09,10~~)

- similar to 03,04 - 05,06

09,10 - 11,12

- similar to 05,06 - 07,08

- same

5% lupin cover in grass planting

Armor stone movement?

Instability? no

Sloughing? no

Approx. Willow Height: 0 - 1.2m

Approx. Grass Height: 3 - 7cm

Goose Grazing? some (light)

Invasive Species? none.

some raccoon digging near station 08. No effect on vegetation

Recorded by: GN, JF

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | June 26, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 8, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On June 19, 2009, photographs were taken at 12 fixed photograph points along the upper (grass) and lower (willow) slopes of the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline.

## OBSERVATION RESULTS

The grass planting area primarily consists of three species: *F. occidentalis*, *B. carinatus*, and *L. rivularis*. Estimated coverage and height values are summarized by species below. Overall coverage in the grass planting area is approximately 90%.

| Species | Coverage | Height |
|---|---|---|
| *L. rivularis* | 30–40% | 30 cm |
| *F. occidentalis* | 35% | 4 cm |
| *B. carinatus* | 15% | 15–20 cm |

Willow mortality remained at 5 to 10%. Willow height is variable and ranges from 15 centimeters to 1.5 meters. A gradient between lower and upper elevation willows can be seen in terms of willow height and mortality. Higher elevation willows, especially those at the grass border, are much taller than lower elevation plants.

The five small patches of bark mulch erosion that run perpendicular to the shoreline have stabilized in the last few months and are not continuing to deteriorate. The erosion remains superficial and does not penetrate beneath the erosion-control fabric. Bark mulch erosion observed along the lower edge of the slope also appeared unchanged from previous months.

No sloughing of the slope, movement of the armor stones, or erosion of other placed material was observed. The bank is stable and free from invasive species and noxious weeds.

Minimal evidence of grazing was observed.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (6-19-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Observation Date: 8/19/09

ANCHOR ENVIRONMENTAL, L.L.C.

# Vegetation Observation Data Sheet

**Project Name:** Wheeler Bay Veg **Project No:** 050352-01

Observation Crew: Julie Fox, Gabe Nagler

Datum (circle one): ~~NAD 83~~ / WGS 84 / NAD 27 — None taken station never was in place

Weather: Partly cloudy

---

Photo Point ID: 01G Time: 08.25

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 140 | -- |
| Photo ID # | 01 | -- |

---

Photo Point ID: 02W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 140 | -- |
| Photo ID # | 02 | -- |

---

Photo Point ID: 03G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 320 | 140 |
| Photo ID # | 03 | 04 |

---

Photo Point ID: 04W Time: 08.30

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 320 | 140 |
| Photo ID # | 05 | 06 |

---

Photo Point ID: 05G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 325 | 145 |
| Photo ID # | 07 | 08 |

---

Photo Point ID: 06W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 325 | 145 |
| Photo ID # | 09 | 10 |

---

Photo Point ID: 07G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| | | |
|---|---|---|
| Photo Bearing | 330 | 150 |
| Photo ID # | 11 | 12 |

---

150 willows in plot section

~400 willows

Recorded by: Gabe Nagler

ANCHOR

# Vegetation Observation Data Sheet

Observation Date: 6/19/09

Project Name:

Project No:

Photo Point ID: 08W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 13 | 14 |

Photo Point ID: 09G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 15 | 16 |

~90 willows

Photo Point ID: 10W Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 17 | 18 |

Photo Point ID: 11G Time: _____

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 19 | 20 |

~10 willows

Photo Point ID: 12W Time: 08:50

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 21 | 22 |

Comments (flooding, erosion, vandalism, plant mortality?):

no

some habitat rock erosion → see slope observation report

no additional mortality

Grass planting area combination of grass + lupin

bunch → 4cm, 35%

plug → 15-20cm, 15%

lupin → ~30 cm tall, 30-40% coverage

10% bare

Armor stone movement? no

Instability? no

Sloughing? no

Approx. Willow Height:

Approx. Grass Height:

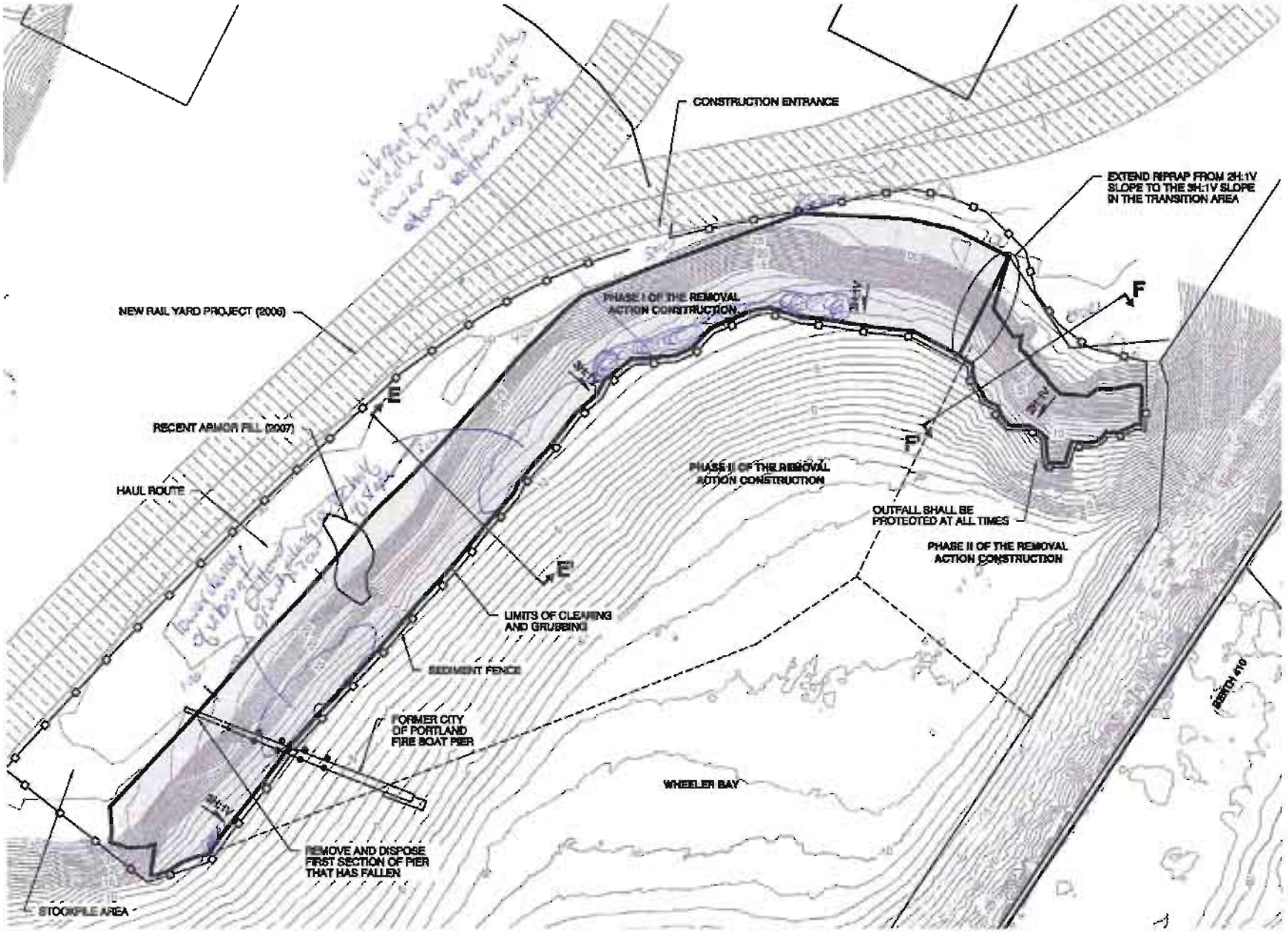
Goose Grazing? none

Invasive Species?

Recorded by: Gabe Wagler

# Wheeler Bay Vegetation Observation

Date 6/19/09




ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by Julie Fox

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | July 29, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 9, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On July 22, 2009, photographs were taken at 12 fixed photograph points along the top portion (grass) and lower section (willow) of the slopes along the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of live willows presumed dead and the rock armor layer.

## OBSERVATION RESULTS

The top portion (from elevation +20 to +30 feet NGVD) of the slope contains an abundance of flowering lupine and grass. Sections of grass along the slope are turning dormant and brown due to seasonal heat and lack of moisture. The cottonwoods planted at +20 feet NGVD are showing vigorous growth and reaching heights of over 1.5 meters.

The lower section (from elevation +15 to +20 feet NGVD) of the slope contains some flowering lupine and willows in various stages of growth. Willow height is variable and ranges from 0.3 to 1.5 meters. A gradient between lower and upper elevation willows can be seen in terms of willow height. Willows planted closer to +20 feet NGVD are taller than those planted near +15 feet NGVD. Potential willow mortality was estimated around 8%; however, many willows that were assumed dead are now showing growth (see attached photographs). Estimated coverage and height values are summarized in the table below. Willow and grass coverage appears on-target for year 3 goals.

| Species | Coverage | Height |
|---|---|---|
| Native Grass | 90% | 4–20 cm |
| Cottonwood | ~10% | 1–1.7 m |
| Willow | ~10% | 0.3–1.5 m |

There was no indication of any sloughing, erosion, or slope instability from elevation +15 to +30 feet NGVD. The rock armor layer is exposed along portions of the slope, but it is stable and shows no evidence of movement. No evidence of grazing was observed. The bank is free from invasive species, except for one small blackberry bush found in among the willow plantings.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (7-22-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Live willow (presumed dead)

Live willow (presumed dead)

Exposed but stable rock armor layer

Exposed but stable rock armor layer

Observation Date: 7/22/09

# ANCHOR Vegetation Observation Data Sheet

Project Name: Wheeler Bay  Project No:

Observation Crew: Julie Fox + Matt Wilson

Datum (circle one): ~~NAD 83~~ / WGS 84 / ~~NAD 27~~  Weather: Partly cloudy ~ 70°F

none taken. Photo point stakes remain in place

**Photo Point ID: 01G**  Time: 0930

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 140 | – |
| Photo ID # | 1 ~~2~~ | – |

**Photo Point ID: 02W**  Time: 0932

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 140 | -- |
| Photo ID # | 2 ~~3~~ | -- |

**Photo Point ID: 03G**  Time: 0942

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 320 | 140 |
| Photo ID # | ~~4~~, ~~5~~ | |

3, 4

**Photo Point ID: 04W**  Time: 0943

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 320 | 140 |
| Photo ID # | ~~6~~, 7 | |

5, 6

**Photo Point ID: 05G**  Time: 0944

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 325 | 145 |
| Photo ID # | ~~8~~, 9 | |

7, 8

**Photo Point ID: 06W**  Time: 0945

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 325 | 145 |
| Photo ID # | ~~10~~, 11 | |

9, 10

**Photo Point ID: 07G**  Time: 0946

Coordinates:

Lat/Northing: ——  Long/Easting: ——

| | | |
|---|---|---|
| Photo Bearing | 330 | 150 |
| Photo ID # | ~~12~~, 13 | |

11, 12

Recorded by: MWilson

Observation Date: 7/22/09

ANCHOR Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time: 0947

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | ~~14,15~~ 13,14 | |

Photo Point ID: 09G Time: 0948

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | ~~16,17~~ 15,16 | |

Photo Point ID: 10W Time: 0949

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | ~~18,19~~ 17,18 | |

Photo Point ID: 11G Time: 0950

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | ~~20,21~~ 19,20 | |

Photo Point ID: 12W Time: 0951

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | ~~22,23~~ 21,22 | |

Comments (flooding, erosion, vandalism, plant mortality?): – None observed

erosion blanket exposed at lower edge of contact point with bark mulch.

Grass percent coverage – 90% (of which ~35-40% is lupin)

Willow percent coverage – 10%

Lupin growing vigorously in grass area and is growing into bark mulch/~~weed~~ willow area.

small blackberry bush found in willow area in SE corner along lower edge.

| Not viable | Viable |
|---|---|
| IIII IIII IIII | 70+100 |
| IIII IIII IIII | 84+118 |
| IIII IIII II | 107 |
| | 479 |

8.35% nonviable rate
↳ mortality rate

Armor stone movement? None

Instability? – None

Sloughing? – None

Approx. Willow Height: 1–5 ft tall – variable

Approx. Grass Height: 1–6 inches – depends on type of grass

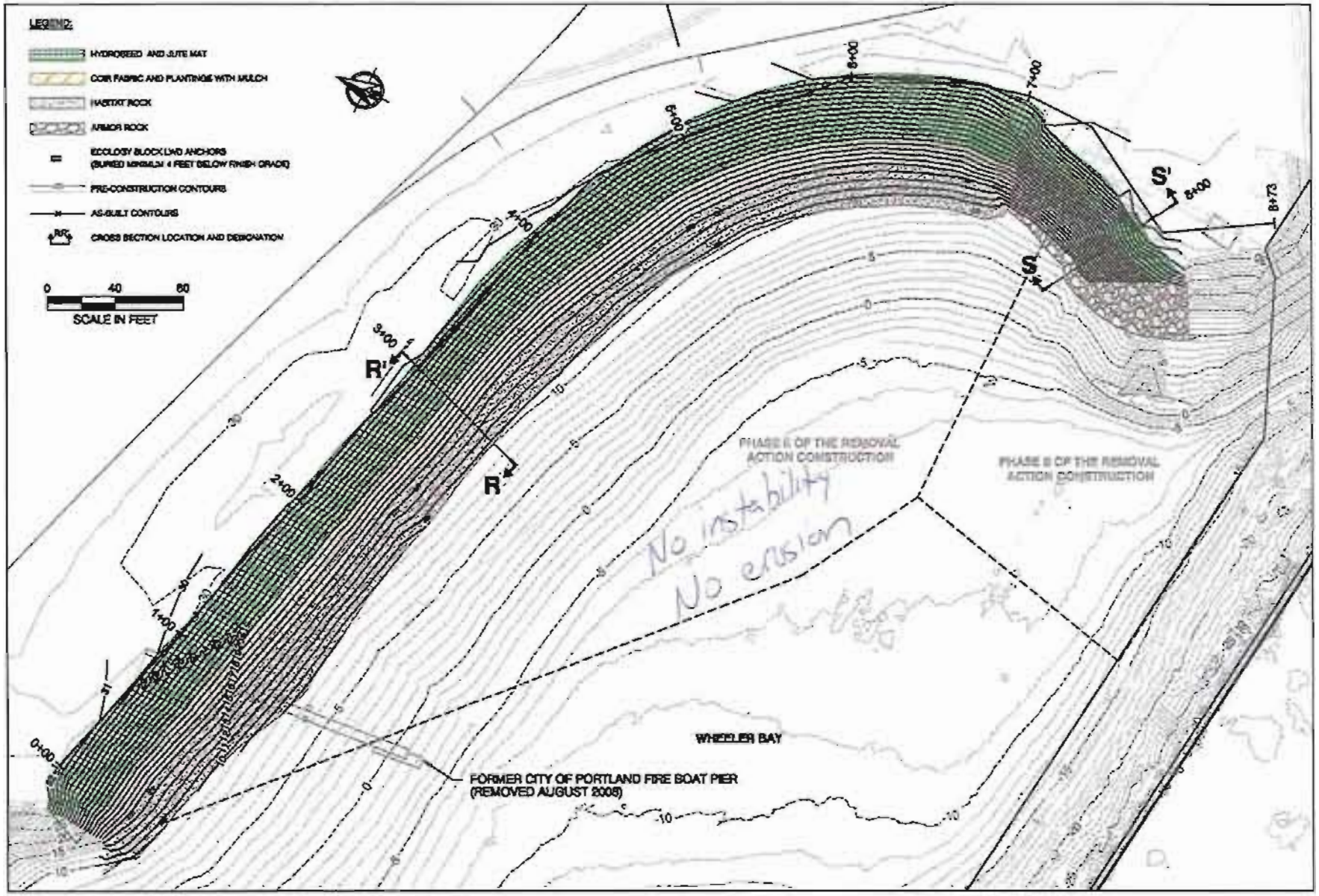
Goose Grazing? – None observed

Invasive Species? – None observed

Recorded by: M Wilson

# Wheeler Bay Slope + Armor Observation

Date 7/22/09




As-Built Wheeler Bay Shoreline Stabilization Surface Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by JF

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | August 31, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 10, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On August 24, 2009, photographs were taken at 12 fixed photograph points along the top portion (grass) and lower section (willow) of the slopes along the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of live willows presumed dead, the rock armor layer, woody debris, and the habitat layer.

## OBSERVATION RESULTS

The top portion (from elevation +20 to +30 feet NGVD) of the slope contains native grasses and lupine nearing the end of bloom. Some sections of grass that had turned dormant and brown last month appeared more active and green. The cottonwoods planted at +20 feet NGVD appeared healthy and free from grazing and pest damage. Heights have reached over 1.5 meters.

The lower section (from elevation +15 to +20 feet NGVD) of the slope contains willows in various stages of growth, and some lupine nearing the end of bloom. Willow height continues to be variable and ranges from 0.3 to 1.5 meters. A gradient between lower and upper elevation willows can still be seen in terms of willow height. Willows planted closer to +20 feet NGVD are taller than those planted near +15 feet NGVD. All viable willows appeared healthy and free from grazing and pest damage. Potential willow mortality continues to decrease as more willows that were assumed dead show signs of growth. Estimated coverage and height values are summarized below. Willow and grass coverage appears on-target for year 3 goals.

| Species | Coverage | Height |
|---|---|---|
| Native Grass | 90% | 5–20 cm |
| Cottonwood | ~10% | 1–1.7 m |
| Willow | ~10% | 0.3–1.5 m |

There was no indication of any sloughing, erosion, or slope instability from elevation +15 to +30 feet NGVD. The rock armor layer is exposed along portions of the slope, but it is stable and shows no evidence of movement. A portion of the habitat layer that eroded along the northwest (channel-ward) end of the slope shows no further movement of the habitat layer. Please note that the intention of the habitat layer is to allow natural erosion and accretion and it will not be maintained. The large woody debris anchored into the slope showed no signs of movement and additional woody debris has accumulated since installation. No evidence of grazing was observed. The bank is free from invasive species, except for one small blackberry bush found among the willow plantings.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (8-24-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

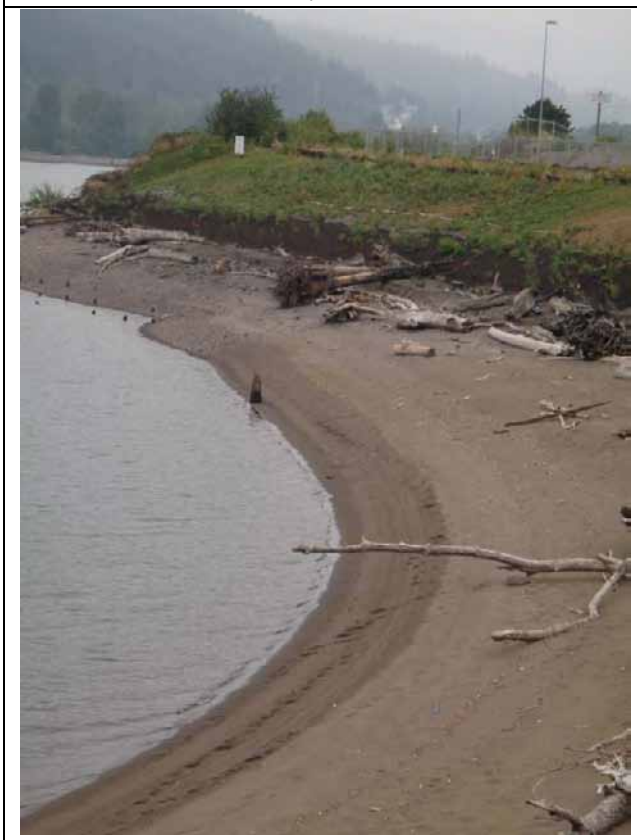
Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Live willows (presumed dead)

Exposed but stable rock armor layer



NW view of beach and slope

Woody debris

Section of slope where part of habitat layer eroded and stabilized to lower grade

Observation Date: 8-24-09

ANCHOR ENVIRONMENTAL, L.L.C. **Vegetation Observation Data Sheet**

Project Name: Project No:

Observation Crew: Gabe Nagler & Julie Fox

Datum (circle one): ~~NAD 83 / WGS 84 /~~ NAD 27 ?photo point stakes in place. none taken

Weather: Overcast, cool

Photo Point ID: 01G Time: 08:34

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 0179 | -- |

Photo Point ID: 02W Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 0180 | -- |

Photo Point ID: 03G Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0181 | 0183 |

Photo Point ID: 04W Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0183 | 0184 |

Photo Point ID: 05G Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0185 | 0186 |

Photo Point ID: 06W Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0187 | 0188 |

Photo Point ID: 07G Time:

Coordinates:

Lat/Northing: Long/Easting:

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 0189 | 0190 |

Recorded by: Gabe Nagler & Julie Fox

Observation Date: 8-24-09

ANCHOR ENVIRONMENTAL, LLC

# Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0191 | 0192 |

Photo Point ID: 09G Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0193 | 0192 |

Photo Point ID: 10W Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 0195 | 0196 |

Photo Point ID. 11G Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0197 | 0198 |

Photo Point ID: 12W Time:

Coordinates:

Lat/Northing Long/Easting

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0199 | 0200 |

Comments (flooding, erosion, vandalism, plant mortality?):

→ none

- grass: 5-10cm height, full coverage

-

Armor stone movement? NO

Instability? NO

Sloughing? None

Approx. Willow Height: 5 - 1 meter

Approx. Grass Height: 5-10cm

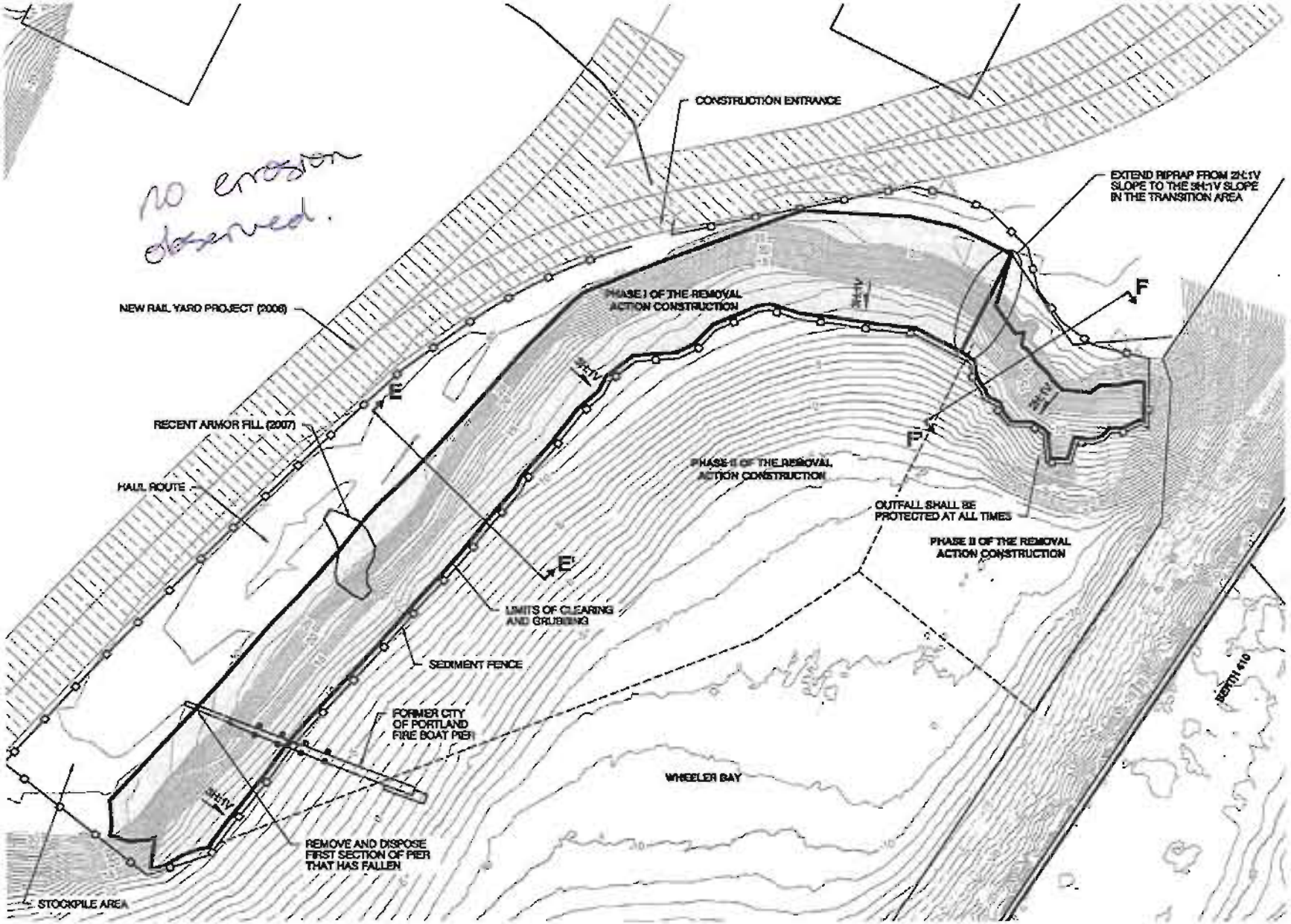
Goose Grazing? —

Invasive Species? —

Recorded by: Cassie Nagler, Julie Fox

# Wheeler Bay Vegetation Observation

Date 8/24/09




no erosion observed.

ANCHOR ENVIRONMENTAL, L.L.C.

Recorded by Gabe Nagle + Julie Fox

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | September 29, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 11, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On September 22, 2009, photographs were taken at 12 fixed photograph points along the top portion (grass) and lower section (willow) of the slopes along the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of the rock armor layer, woody debris, habitat layer, and willow leaves infected with mites.

## OBSERVATION RESULTS

The top portion (from elevation +20 to +30 feet NGVD) of the slope contains native grasses and lupine at the end of bloom. While the majority of the slope continues to show growth and vitality, sections of grass between Stations 03G and 07G still appear brown. This may be due, in part, to poorly distributed irrigation water. The cottonwoods planted at +20 feet NGVD appear healthy and free from grazing and pest damage.

The lower section (from elevation +15 to +20 feet NGVD) of the slope contains willows in various stages of growth and some lupine at the end of bloom. A gradient between lower and upper elevation willows can still be seen in terms of willow height. Willows planted closer to +20 feet NGVD are still taller than those planted near +15 feet NGVD. This may be due to the observation made during this event that there is a difference in willow species planted at the various elevations. *Salix scouleriana* and *Salix hookeriana* were planted from +20 feet NGVD to approximately +17.5 feet NGVD. *Salix fluviatilis* was planted closer to +15 feet NGVD and is now showing more leaf biomass than in any month prior. Potential willow mortality seems to have stabilized; viable willows show continued signs of growth and appear free from grazing and pest damage, except for a few willows on the channel-ward

side of Stations 01G and 02W. These willows show evidence of blister galls similar to those caused by Eriophyid mites. Estimated coverage and height values are summarized below. Willow and grass coverage appears on-target for year 3 goals.

| Species | Coverage | Height |
|---|---|---|
| Native Grass | 90% | 5–10 cm |
| Cottonwood | ~10% | 1–1.7 m |
| Willow | ~10% | 0.75–1.5 m |

There was no indication of any sloughing, erosion, or slope instability from elevation +15 to +30 feet NGVD. The rock armor layer is exposed along portions of the slope below +10 feet NGVD due to previous habitat layer redistribution, but is stable and shows no evidence of movement. Please note that the intention of the habitat layer is to allow natural erosion and accretion and it will not be maintained. The large woody debris anchored to the slope showed no signs of movement, and additional woody debris has accumulated since installation. No evidence of grazing was observed. The bank is free from invasive species, except for several small blackberry bushes found among the willow plantings.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (9-22-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

Station 05G (view to the NW)

Station 05G (view to the SE)

Station 06W (view to the NW)

Station 06W (view to the SE)

Station 07G (view to the NW)

Station 07G (view to the SE)

Station 08W (view to the NW)

Station 08W (view to the SE)

Station 09G (view to the NW)

Station 09G (view to the SE)

Station 10W (view to the NW)

Station 10W (view to the SE)

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

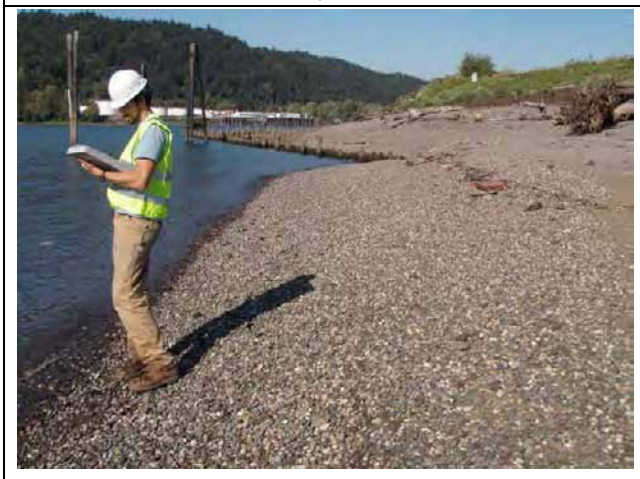
Station 12W (view to the SE)

Exposed but stable rock armor layer

Exposed but stable rock armor layer

Woody debris

Volunteer willow on beach



Redistributed habitat layer at low tide

Blister galls on willow leaves

Observation Date: 9-22-09

ANCHOR ENVIRONMENTAL, L.L.C. **Vegetation Observation Data Sheet**

Project Name: Project No:

Observation Crew: Julie Fox, Gabe Nagler

Datum (circle one): NAD 83 / WGS 84 / NAD 27 Weather: Sunny

001+002 Loop map

Photo Point ID: 01G Time: 09:30
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 003 | -- |

Photo Point ID: 02W Time: 09:32
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 004 | -- |

Photo Point ID: 03G Time: 0946
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 006 | 008 |

Photo Point ID: 04W Time: 0950
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 009 | 010 |

Photo Point ID: 05G Time: 10:03
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 012 | 013 |

Photo Point ID: 06W Time: 10:04
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 014 | 015 |

Photo Point ID: 07G Time: 10:06
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 016 | 017 |

Recorded by: Gabe Nagler / Julie Fox

Observation Date: 9-2209

ANCHOR ENVIRONMENTAL

# Vegetation Observation Data Sheet

Project Name: Project No:

Photo Point ID: 08W Time: 10:10
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 018 | 019 |

Photo Point ID: 08G Time: 10:16
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 020 | 021 |

Photo Point ID: 10W Time: 10:9
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 190 |
|---|---|---|
| Photo ID # | 022 | 025 |

Photo Point ID: 11G Time: 10:21
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 024 | 025 |

Photo Point ID: 12W Time: 10:24
Coordinates:
Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 026 | 027 |

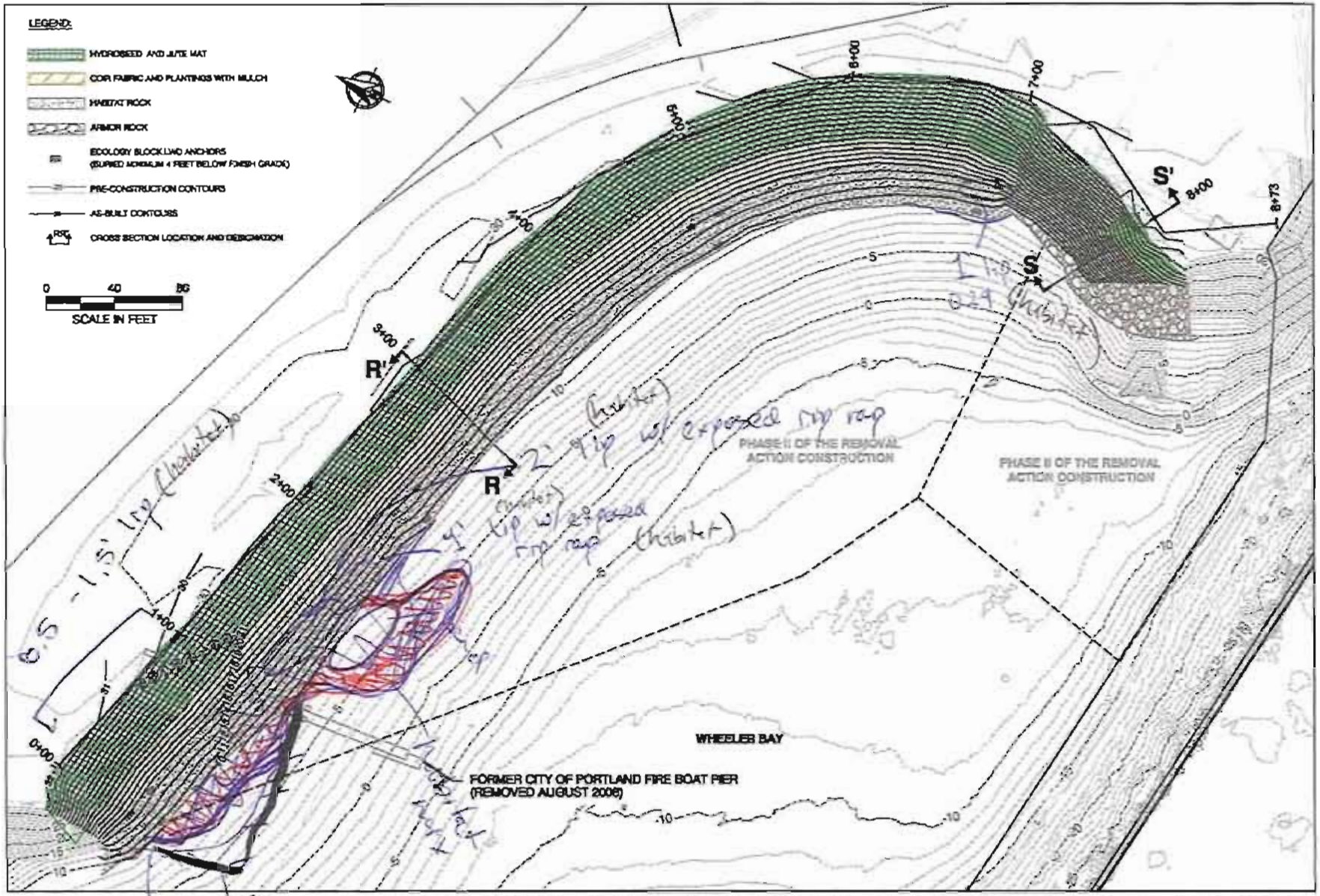
Comments (flooding, erosion, vandalism, plant mortality?):
Evidence of blister galls caused by Eriophyid mites
~~some fungus~~ observed on NW willow leaves 005-006.
Cottonwood vs. willow plt 011
/ upper slope
/ lower slope

Armor stone movement? no
Instability? no
Sloughing? no
Approx. Willow Height: lower: 3/4 upper: 1.5m
Approx. Grass Height: 5-10cm
Goose Grazing? none
Invasive Species?
spots of blackberry

Recorded by: Gabe Nagler / Julie Fox

# Wheeler Bay Slope + Armor Observation

Date 9-22-09




As-Built Wheeler Bay Shoreline Stabilization Surface Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

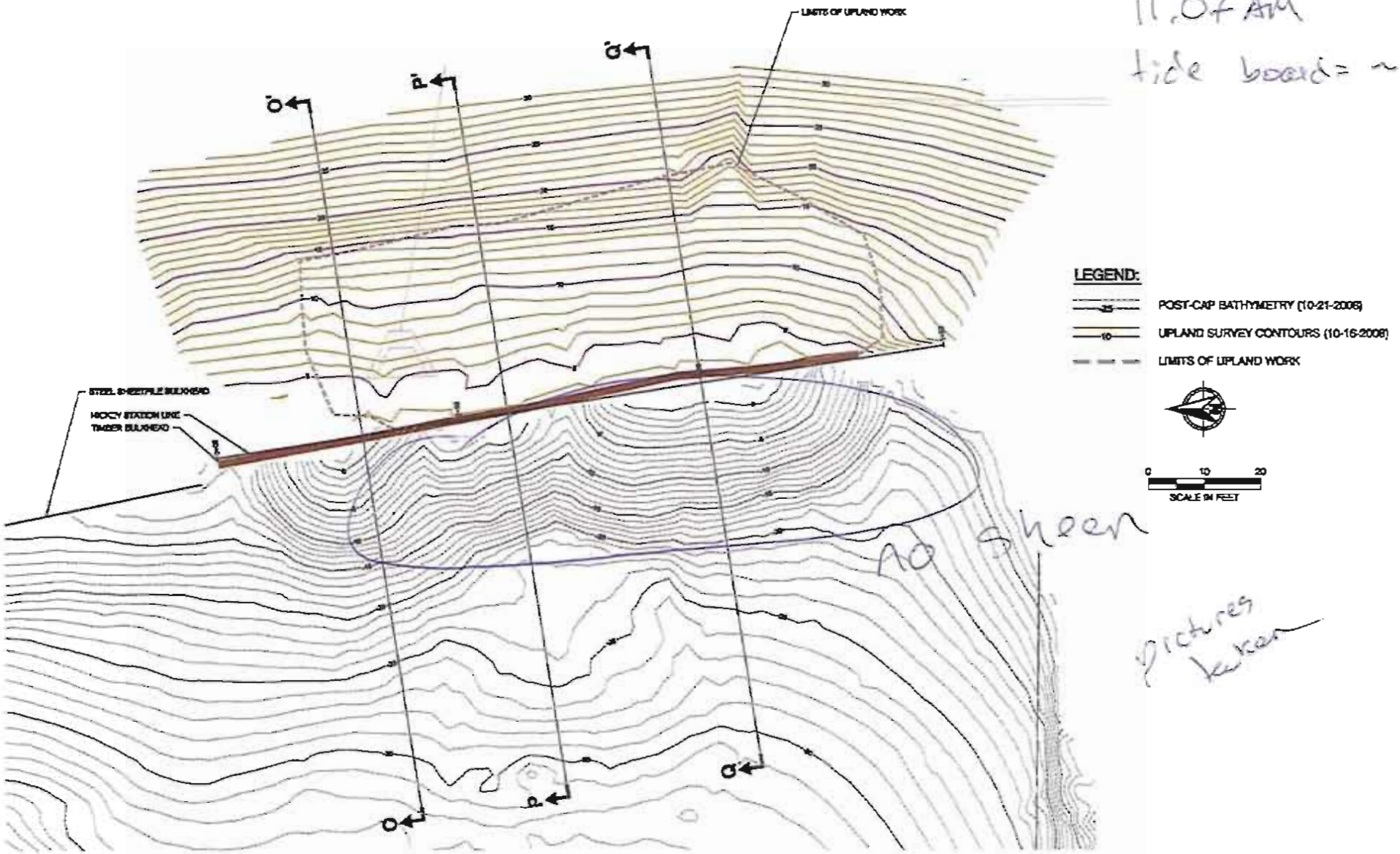
Recorded by Gabe Nagler + Julie Fox

# Head of Slip 3 Cap Transects Observation

Date 9/22/09

11:07 AM

tide board = ~1'




As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations

Terminal 4, Portland, Oregon

ANCHOR QEA

Recorded by Gabe Nagler

ANCHOR QEA

6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224
Phone 503.670.1108
Fax 503.670.1128
www.anchorqea.com

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | John Verduin, P.E.; Anchor QEA | **Date:** | October 29, 2009 |
| **From:** | Gabe Nagler and Julie Fox; Anchor QEA | **Project:** | 050332-01 |
| **Cc:** | Elizabeth Appy and Ben Hung; Anchor QEA | | |
| **Re:** | Wheeler Bay Interim Monitoring Vegetation Observation Report – Month 12, Terminal 4 Removal Action, Port of Portland | | |

## DESCRIPTION OF DAILY ACTIVITY

On October 22, 2009, photographs were taken at 12 fixed photograph points along the top portion (grass) and lower section (willow) of the slopes along the Wheeler Bay bank. Photographs were taken in opposing pairs at each point parallel to the shoreline. Additional photographs were taken of willows exhibiting signs of light goose grazing.

## OBSERVATION RESULTS

The top portion (from elevation +20 to +30 feet NGVD) of the slope contains native grasses and lupine at the end of bloom. Growth within the grass planting area has slowed due to shorter days and lower temperatures. The cottonwoods planted at +20 feet NGVD appear healthy and free from grazing and pest damage.

The lower section (from elevation +15 to +20 feet NGVD) of the slope contains willows in various stages of growth. A gradient between lower and upper elevation willows can still be seen in terms of willow height. Willows planted closer to +20 feet NGVD are still taller than those planted near +15 feet NGVD. This may be due to the difference in willow species planted at the various elevations, observed during the Month 11 event. *Salix scouleriana* and *Salix hookeriana* were planted from +20 feet NGVD to approximately +17.5 feet NGVD. *Salix fluviatilis* was planted closer to +15 feet NGVD. Potential willow mortality continues to remain stable; viable willows show continued signs of growth and appear free from significant grazing. A percentage of willows show minor signs of goose grazing (see photographs). Estimated coverage and height values are summarized below. Willow and grass coverage appears on-target for year 3 goals.

| Species | Coverage | Height |
|---|---|---|
| Native Grass | 90% | 5–8 cm |
| Cottonwood | ~10% | 1–1.5 m |
| Willow | ~10% | 0.2–1.5 m |

There was no indication of any sloughing, erosion, or slope instability from elevation +15 to +30 feet NGVD. Due to prior habitat layer redistribution, the rock armor layer is exposed along portions of the slope below +10 feet NGVD, but is stable and shows no evidence of movement. Please note that the intention of the habitat layer is to allow natural erosion and accretion and it will not be maintained. The large woody debris anchored to the slope showed no signs of movement, and additional woody debris has accumulated since installation. The bank is free from invasive species, except for several small blackberry bushes found among the willow plantings.

# ATTACHMENTS

## Wheeler Bay Interim Monitoring Photographs (10-22-2009)

Station 01G (view to the SE)

Station 02W (view to the SE)

Station 03G (view to the NW)

Station 03G (view to the SE)

Station 04W (view to the NW)

Station 04W (view to the SE)

| | |
|---|---|
|  |  |
| Station 05G (view to the NW) | Station 05G (view to the SE) |
|  |  |
| Station 06W (view to the NW) | Station 06W (view to the SE) |
|  |  |
| Station 07G (view to the NW) | Station 07G (view to the SE) |

| | |
|---|---|
|  |  |
| Station 08W (view to the NW) | Station 08W (view to the SE) |
|  |  |
| Station 09G (view to the NW) | Station 09G (view to the SE) |
|  |  |
| Station 10W (view to the NW) | Station 10W (view to the SE) |

Station 11G (view to the NW)

Station 11G (view to the SE)

Station 12W (view to the NW)

Station 12W (view to the SE)

Grazed willow

Grazed willow

Observation Date: 10/22/09

ANCHOR ENVIRONMENTAL, LLC

# Vegetation Observation Data Sheet

Project Name: Project No:

Observation Crew: Gabe Nagler + Julie Fox

Datum (circle one): NAD 83 / WGS 84 / NAD 27 N/A

Weather: overcast / foggy 60° light wind

No coordinates taken - stakes in place

Photo Point ID: 01G Time: 12:05

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | - |
|---|---|---|
| Photo ID # | 0657 | - |

Photo Point ID: 02W Time: 12:06

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 140 | -- |
|---|---|---|
| Photo ID # | 0658 | -- |

Photo Point ID: 03G Time: 12:09

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0659 | 0660 |

Photo Point ID: 04W Time: 12:10

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0661 | 0662 |

Photo Point ID: 05G Time: 12:12 SF

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0663 | 0664 |

Photo Point ID: 06W Time: 12:13 SF

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 325 | 145 |
|---|---|---|
| Photo ID # | 0665 | 0666 |

Photo Point ID: 07G Time: 12:18

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 330 | 150 |
|---|---|---|
| Photo ID # | 0667 | 0668 |

Recorded by: JF

Observation Date: 10/22/09

ANCHOR ENVIRONMENTAL, L.L.C. **Vegetation Observation Data Sheet**

Project Name: Project No:

Photo Point ID: 08W Time: 12:19

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 320 | 140 |
|---|---|---|
| Photo ID # | 0669 | 0670 |

Photo Point ID: 09G Time: 12:23

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0671 | 0672 |

Photo Point ID: 10W Time: 12:24

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 340 | 180 |
|---|---|---|
| Photo ID # | 0673 | 0674 |

Photo Point ID: 11G Time: 12:29

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0675 | 0676 |

Photo Point ID: 12W Time: 12:30

Coordinates:

Lat/Northing _____ Long/Easting _____

| Photo Bearing | 375 | 220 |
|---|---|---|
| Photo ID # | 0677 | 0678 |

Comments (flooding, erosion, vandalism, plant mortality?):

Willow + grass showing signs of dormancy.

No signs of flooding, erosion, vandalism, or plant mortality.

Several willows between stations 02W + 04W show signs of light grazing. Pix 0679 + 0680.

No signs of rip/rap or movement in enclosed LWD.

0709 + 0710 - overview pix of habitat redistributing

Armor stone movement? No

Instability? No

Sloughing? No

Approx. Willow Height: 0.2m - 1.5m

Approx. Grass Height: ~5cm

Goose Grazing? Yes, see above comment

Invasive Species? ~3 blackberry bushes

Recorded by: JF

# APPENDIX C
# WHEELER BAY VEGETATION MONITORING PHOTOGRAPHS

| | |
|---|---|
|  |  |
| Station 01G (view to the SE) 11-24-2008 | Station 02W (view to the SE) 11-24-2008 |
|  |  |
| Station 01G (view to the SE) 12-31-2008 | Station 02W (view to the SE) 12-31-2008 |
|  |  |
| Station 01G (view to the SE) 01-23-2009 | Station 02W (view to the SE) 01-23-2009 |

Station 01G (view to the SE) 02-20-2009

Station 02W (view to the SE) 02-20-2009

Station 01G (view to the SE) 03-23-2009

Station 02W (view to the SE) 03-23-2009

Station 01G (view to the SE) 05-05-2009

Station 02W (view to the SE) 05-05-2009

Station 01G (view to the SE) 05-26-2009

Station 02W (view to the SE) 05-26-2009

Station 01G (view to the SE) 06-19-2009

Station 02W (view to the SE) 06-19-2009

Station 01G (view to the SE) 07-22-2009

Station 02W (view to the SE) 07-22-2009

Station 01G (view to the SE) 08-24-2009

Station 02W (view to the SE) 08-24-2009

Station 01G (view to the SE) 09-22-2009

Station 02W (view to the SE) 09-22-2009

Station 01G (view to the SE) 10-22-2009

Station 02W (view to the SE) 10-22-2009

Station 03G (view to the NW) 11-24-2008

Station 04W (view to the NW) 11-24-2008

Station 03G (view to the NW) 12-31-2008

Station 04W (view to the NW) 12-31-2008

Station 03G (view to the NW) 01-23-2009

Station 04W (view to the NW) 01-23-2009

Station 03G (view to the NW) 02-20-2009

Station 04W (view to the NW) 02-20-2009

Station 03G (view to the NW) 03-23-2009

Station 04W (view to the NW) 03-23-2009

Station 03G (view to the NW) 05-05-2009

Station 04W (view to the NW) 05-05-2009

| | |
|---|---|
|  |  |
| Station 03G (view to the NW) 05-26-2009 | Station 04W (view to the NW) 05-26-2009 |
|  |  |
| Station 03G (view to the NW) 06-19-2008 | Station 04W (view to the NW) 06-19-2008 |
|  |  |
| Station 03G (view to the NW) 07-22-2009 | Station 04W (view to the NW) 07-22-2009 |

Station 03G (view to the NW) 08-24-2009

Station 04W (view to the NW) 08-24-2009

Station 03G (view to the NW) 09-22-2009

Station 04W (view to the NW) 09-22-2009

Station 03G (view to the NW) 10-22-2009

Station 04W (view to the NW) 10-22-2009

Station 03G (view to the SE) 11-24-2008

Station 04W (view to the SE) 11-24-2008

Station 03G (view to the SE) 12-31-2008

Station 04W (view to the SE) 12-31-2008

Station 03G (view to the SE) 01-23-2009

Station 04W (view to the SE) 01-23-2009

| | |
|---|---|
|  |  |
| Station 03G (view to the SE) 02-20-2009 | Station 04W (view to the SE) 02-20-2009 |
|  |  |
| Station 03G (view to the SE) 03-23-2009 | Station 04W (view to the SE) 03-23-2009 |
|  |  |
| Station 03G (view to the SE) 05-05-2009 | Station 04W (view to the SE) 05-05-2009 |

Station 03G (view to the SE) 05-26-2009

Station 04W (view to the SE) 05-26-2009

Station 03G (view to the SE) 06-19-2008

Station 04W (view to the SE) 06-19-2008

Station 03G (view to the SE) 07-22-2009

Station 04W (view to the SE) 07-22-2009


Station 03G (view to the SE) 08-24-2009


Station 04W (view to the SE) 08-24-2009


Station 03G (view to the SE) 09-22-2009


Station 04W (view to the SE) 09-22-2009


Station 03G (view to the SE) 10-22-2009


Station 04W (view to the SE) 10-22-2009

Station 05G (view to the NW) 11-24-2008

Station 06W (view to the NW) 11-24-2008

Station 05G (view to the NW) 12-31-2008

Station 06W (view to the NW) 12-31-2008

Station 05G (view to the NW) 01-23-2009

Station 06W (view to the NW) 01-23-2009

| | |
|---|---|
|  |  |
| Station 05G (view to the NW) 02-20-2009 | Station 06W (view to the NW) 02-20-2009 |
|  |  |
| Station 05G (view to the NW) 03-23-2009 | Station 06W (view to the NW) 03-23-2009 |
|  |  |
| Station 05G (view to the NW) 05-05-2009 | Station 06W (view to the NW) 05-05-2009 |

| | |
|---|---|
|  |  |
| Station 05G (view to the NW) 05-26-2009 | Station 06W (view to the NW) 05-26-2009 |
|  |  |
| Station 05G (view to the NW) 06-19-2008 | Station 06W (view to the NW) 06-19-2008 |
|  |  |
| Station 05G (view to the NW) 07-22-2009 | Station 06W (view to the NW) 07-22-2009 |

Station 05G (view to the NW) 08-24-2009

Station 06W (view to the NW) 08-24-2009

Station 05G (view to the NW) 09-22-2009

Station 06W (view to the NW) 09-22-2009

Station 05G (view to the NW) 10-22-2009

Station 06W (view to the NW) 10-22-2009

| | |
|---|---|
|  |  |
| Station 05G (view to the SE) 11-24-2008 | Station 06W (view to the SE) 11-24-2008 |
|  |  |
| Station 05G (view to the SE) 12-31-2008 | Station 06W (view to the SE) 12-31-2008 |
|  |  |
| Station 05G (view to the SE) 01-23-2009 | Station 06W (view to the SE) 01-23-2009 |

Station 05G (view to the SE) 02-20-2009

Station 06W (view to the SE) 02-20-2009

Station 05G (view to the SE) 03-23-2009

Station 06W (view to the SE) 03-23-2009

Station 05G (view to the SE) 05-05-2009

Station 06W (view to the SE) 05-05-2009

Station 05G (view to the SE) 05-26-2009

Station 06W (view to the SE) 05-26-2009

Station 05G (view to the SE) 06-19-2008

Station 06W (view to the SE) 06-19-2008

Station 05G (view to the SE) 07-22-2009

Station 06W (view to the SE) 07-22-2009

Station 05G (view to the SE) 08-24-2009

Station 06W (view to the SE) 08-24-2009

Station 05G (view to the SE) 09-22-2009

Station 06W (view to the SE) 09-22-2009

Station 05G (view to the SE) 10-22-2009

Station 06W (view to the SE) 10-22-2009

| | |
|---|---|
|  |  |
| Station 07G (view to the NW) 11-24-2008 | Station 08W (view to the NW) 11-24-2008 |
|  |  |
| Station 07G (view to the NW) 12-31-2008 | Station 08W (view to the NW) 12-31-2008 |
|  |  |
| Station 07G (view to the NW) 01-23-2009 | Station 08W (view to the NW) 01-23-2009 |

| | |
|---|---|
|  |  |
| Station 07G (view to the NW) 02-20-2009 | Station 08W (view to the NW) 02-20-2009 |
|  |  |
| Station 07G (view to the NW) 03-23-2009 | Station 08W (view to the NW) 03-23-2009 |
|  |  |
| Station 07G (view to the NW) 05-05-2009 | Station 08W (view to the NW) 05-05-2009 |

| | |
|---|---|
|  |  |
| Station 07G (view to the NW) 05-26-2009 | Station 08W (view to the NW) 05-26-2009 |
|  |  |
| Station 07G (view to the NW) 06-19-2008 | Station 08W (view to the NW) 06-19-2008 |
|  |  |
| Station 07G (view to the NW) 07-22-2009 | Station 08W (view to the NW) 07-22-2009 |

| | |
|---|---|
|  |  |
| Station 07G (view to the NW) 08-24-2009 | Station 08W (view to the NW) 08-24-2009 |
|  |  |
| Station 07G (view to the NW) 09-22-2009 | Station 08W (view to the NW) 09-22-2009 |
|  |  |
| Station 07G (view to the NW) 10-22-2009 | Station 08W (view to the NW) 10-22-2009 |

Station 07G (view to the SE) 11-24-2008

Station 08W (view to the SE) 11-24-2008

Station 07G (view to the SE) 12-31-2008

Station 08W (view to the SE) 12-31-2008

Station 07G (view to the SE) 01-23-2009

Station 08W (view to the SE) 01-23-2009

| | |
|---|---|
|  |  |
| Station 07G (view to the SE) 02-20-2009 | Station 08W (view to the SE) 02-20-2009 |
|  |  |
| Station 07G (view to the SE) 03-23-2009 | Station 08W (view to the SE) 03-23-2009 |
|  |  |
| Station 07G (view to the SE) 05-05-2009 | Station 08W (view to the SE) 05-05-2009 |

Station 07G (view to the SE) 05-26-2009

Station 08W (view to the SE) 05-26-2009

Station 07G (view to the SE) 06-19-2008

Station 08W (view to the SE) 06-19-2008

Station 07G (view to the SE) 07-22-2009

Station 08W (view to the SE) 07-22-2009

Station 07G (view to the SE) 08-24-2009

Station 08W (view to the SE) 08-24-2009

Station 07G (view to the SE) 09-22-2009

Station 08W (view to the SE) 09-22-2009

Station 07G (view to the SE) 10-22-2009

Station 08W (view to the SE) 10-22-2009

| | |
|---|---|
|  |  |
| Station 09G (view to the NW) 11-24-2008 | Station 10W (view to the NW) 11-24-2008 |
|  |  |
| Station 09G (view to the NW) 12-31-2008 | Station 10W (view to the NW) 12-31-2008 |
|  |  |
| Station 09G (view to the NW) 01-23-2009 | Station 10W (view to the NW) 01-23-2009 |

| | |
|---|---|
|  |  |
| Station 09G (view to the NW) 02-20-2009 | Station 10W (view to the NW) 02-20-2009 |
|  |  |
| Station 09G (view to the NW) 03-23-2009 | Station 10W (view to the NW) 03-23-2009 |
|  |  |
| Station 09G (view to the NW) 05-05-2009 | Station 10W (view to the NW) 05-05-2009 |

| | |
|---|---|
|  |  |
| Station 09G (view to the NW) 05-26-2009 | Station 10W (view to the NW) 05-26-2009 |
|  |  |
| Station 09G (view to the NW) 06-19-2008 | Station 10W (view to the NW) 06-19-2008 |
|  |  |
| Station 09G (view to the NW) 07-22-2009 | Station 10W (view to the NW) 07-22-2009 |

Station 09G (view to the NW) 08-24-2009

Station 10W (view to the NW) 08-24-2009

Station 09G (view to the NW) 09-22-2009

Station 10W (view to the NW) 09-22-2009

Station 09G (view to the NW) 10-22-2009

Station 10W (view to the NW) 10-22-2009

Station 09G (view to the SE) 11-24-2008

Station 10W (view to the SE) 11-24-2008

Station 09G (view to the SE) 12-31-2008

Station 10W (view to the SE) 12-31-2008

Station 09G (view to the SE) 01-23-2009

Station 10W (view to the SE) 01-23-2009

| | |
|---|---|
|  |  |
| Station 09G (view to the SE) 02-20-2009 | Station 10W (view to the SE) 02-20-2009 |
|  |  |
| Station 09G (view to the SE) 03-23-2009 | Station 10W (view to the SE) 03-23-2009 |
|  |  |
| Station 09G (view to the SE) 05-05-2009 | Station 10W (view to the SE) 05-05-2009 |

| | |
|---|---|
|  Station 09G (view to the SE) 05-26-2009 |  Station 10W (view to the SE) 05-26-2009 |
|  Station 09G (view to the SE) 06-19-2008 |  Station 10W (view to the SE) 06-19-2008 |
|  Station 09G (view to the SE) 07-22-2009 |  Station 10W (view to the SE) 07-22-2009 |

Station 09G (view to the SE) 08-24-2009

Station 10W (view to the SE) 08-24-2009

Station 09G (view to the SE) 09-22-2009

Station 10W (view to the SE) 09-22-2009

Station 09G (view to the SE) 10-22-2009

Station 10W (view to the SE) 10-22-2009

Station 11G (view to the NW) 11-24-2008

Station 12W (view to the NW) 11-24-2008

Station 11G (view to the NW) 12-31-2008

Station 12W (view to the NW) 12-31-2008

Station 11G (view to the NW) 01-23-2009

Station 12W (view to the NW) 01-23-2009

Station 11G (view to the NW) 02-20-2009

Station 12W (view to the NW) 02-20-2009

Station 11G (view to the NW) 03-23-2009

Station 12W (view to the NW) 03-23-2009

Station 11G (view to the NW) 05-05-2009

Station 12W (view to the NW) 05-05-2009

| | |
|---|---|
|  |  |
| Station 11G (view to the NW) 05-26-2009 | Station 12W (view to the NW) 05-26-2009 |
|  |  |
| Station 11G (view to the NW) 06-19-2008 | Station 12W (view to the NW) 06-19-2008 |
|  |  |
| Station 11G (view to the NW) 07-22-2009 | Station 12W (view to the NW) 07-22-2009 |


Station 11G (view to the NW) 08-24-2009


Station 12W (view to the NW) 08-24-2009


Station 11G (view to the NW) 09-22-2009


Station 12W (view to the NW) 09-22-2009


Station 11G (view to the NW) 10-22-2009


Station 12W (view to the NW) 10-22-2009

Station 11G (view to the SE) 11-24-2008

Station 12W (view to the SE) 11-24-2008

Station 11G (view to the SE) 12-31-2008

Station 12W (view to the SE) 12-31-2008

Station 11G (view to the SE) 01-23-2009

Station 12W (view to the SE) 01-23-2009

Station 11G (view to the SE) 02-20-2009

Station 12W (view to the SE) 02-20-2009

Station 11G (view to the SE) 03-23-2009

Station 12W (view to the SE) 03-23-2009

Station 11G (view to the SE) 05-05-2009

Station 12W (view to the SE) 05-05-2009

| | |
|---|---|
|  |  |
| Station 11G (view to the SE) 05-26-2009 | Station 12W (view to the SE) 05-26-2009 |
|  |  |
| Station 11G (view to the SE) 06-19-2008 | Station 12W (view to the SE) 06-19-2008 |
|  |  |
| Station 11G (view to the SE) 07-22-2009 | Station 12W (view to the SE) 07-22-2009 |

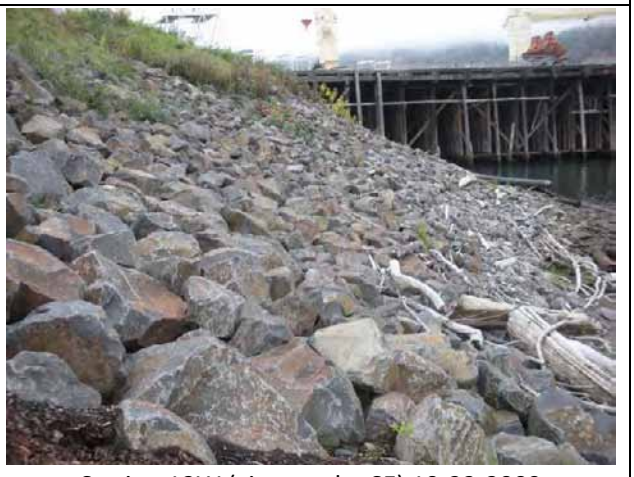
Station 11G (view to the SE) 08-24-2009

Station 12W (view to the SE) 08-24-2009

Station 11G (view to the SE) 09-22-2009

Station 12W (view to the SE) 09-22-2009

Station 11G (view to the SE) 10-22-2009



Station 12W (view to the SE) 10-22-2009