

Water Quality Monitoring Report

Grays Harbor Dredging Project ■ U.S. Army Corps of Engineers ■ September 2008

Water Quality Monitoring Report

Grays Harbor Dredging Project

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Acronyms and Abbreviations

BMP	best management practice
COR	Contracting Officer's Representative
Corps	U.S. Army Corps of Engineers
Ecology	Washington State Department of Ecology
°F	degrees Fahrenheit
FY	fiscal year
GPS	global positioning system
mg/l	milligrams per liter
MLLW	mean lower low water
NPM	Navigation Project Manager
NTU	nephelometric turbidity unit
POC	point of compliance
µS	microSiemens per centimeter

Chapter 1. Introduction

This report presents the results of water quality monitoring conducted by ICF Jones & Stokes during maintenance dredging of the federal navigation channel in the Port of Grays Harbor, Grays Harbor County, Washington (Appendix A, Figure 1). The objective of this monitoring was to ensure that the dredging project is compliant with Washington State water quality standards and the associated short-term modifications of water quality requested by the Washington State Department of Ecology (Ecology) through its water quality certification protocol for the 401 permit. The water quality certification (401 permit) and Water Quality Monitoring Plan are included in Appendix B. The water quality permit (401 permit) was issued to the U.S. Army Corps of Engineers (Corps) by Ecology on July 30, 2007. The Corps' Water Quality Monitoring Plan specifies measurements of turbidity, temperature, and dissolved oxygen, and sets the compliance point at 600 feet from the dredging activity.

The Corps used the data collected during dredge monitoring during January and February 2008 to document water quality conditions associated with dredging activities in inner Grays Harbor (Cow Point Reach) during the winter season (ICF Jones & Stokes March 2008). The purpose of this monitoring is to monitor water quality during the maintenance dredging window of July 16, 2008 to February 14, 2009. Specifically, the monitoring in August 2008 is to provide data for the Corps and Ecology to document compliance with the 401 permit conditions during low flow conditions.

1.1. Background

Dredging during fiscal year (FY) 2008 was authorized as part of routine dredging and disposal activities associated with the maintenance of the Grays Harbor and Chehalis River federal navigation channel. The purpose of channel maintenance dredging is to remove shoaling and maintain the efficiency and safety of deep-draft water transportation in Grays Harbor (U.S. Army Corps of Engineers 2006). Grays Harbor's federal navigation channel requires sporadic dredging to maintain the authorized depths of the channel and provide sea-going vessels with commercial access to the cities of Aberdeen, Hoquiam, and Cosmopolis. During FY 2008, dredging was conducted in the vicinity of Terminal 2, along the Cow Point reach (Appendix A, Figure 1).

1.2. Maintenance Dredging

American Construction Company (under contract to the Corps) began dredging the project area after July 16, 2008, and will conclude before February 14, 2009. Upon completion of dredging activities, portions of the deep water navigation channel will be restored to authorized dimensions. Authorized dimensions in the vicinity of Cow Point are 350 to 550 feet wide and 36 feet deep at mean lower low water (MLLW) with a 2-foot allowable overdepth. Authorized widths and depths vary at other locations along the federal deep water navigation channel and can be anywhere from 200 to 950 feet wide and up to 46 feet deep at MLLW.

Sand and silt were removed using a clamshell dredge and loaded onto a tug-propelled disposal scow, which transported the dredged sediments to the disposal sites. Sediments in the navigation channel have been tested according to the Dredged Material Evaluation Procedures and Disposal Site Management procedures and have been approved for unconfined, open-water disposal. The sediments were disposed of at the approved Point Chehalis and South Jetty open-water sites located near the mouth of the harbor. These sites are managed by the Washington State Department of Natural Resources.

Chapter 2. Methods

2.1. Water Quality Monitoring During Dredging

ICF Jones & Stokes monitored water quality during dredging under low flow conditions (August 19 through August 23, 2008) to determine if the dredging project was in compliance with Washington State water quality standards and the associated short-term modifications of water quality (specifically, turbidity and dissolved oxygen) granted by Ecology through the 401 water quality certification (Appendix B). Water quality monitoring at the disposal location was not required as part of this dredging project.

Water quality monitoring followed the protocols outlined in the Water Quality Monitoring Plan (Appendix B). The Water Quality Monitoring Plan indicated that background sampling points were collected at 100 feet upcurrent from the dredging activity. However, due to safety concerns, the background samples were collected approximately 300 feet upcurrent of the dredging activity. Point of compliance (POC) was established at 600 feet downcurrent from the point of dredging. Distances from dredge and disposal scow were measured using a laser rangefinder. Global positioning system (GPS) locations were taken, and recorded for each sample. Samples were taken at three depths: surface (approximately 2 feet below), mid-

depth, and near bottom (2 to 3 feet above the bottom). Samples were taken at least 1 hour after dredging had commenced. Field data are presented in Appendix C.

2.2. Timing

Monitoring of the clamshell dredging occurred on August 19, 20, 21, 22 and 23, 2008. Samples were taken twice daily approximately 4 hours apart. Monitoring took place only during daylight hours for safety reasons. As much as possible, samples were timed to correspond with a slack tide and either a strong ebb or a strong flood tide to the extent that these tides corresponded with active dredging during daylight hours.

2.3. Constituents Monitored

Temperature (degrees Fahrenheit [°F]), conductivity (microSiemens [μ S]), dissolved oxygen (milligrams per liter [mg/l]), acidity (pH), and turbidity (nephelometric turbidity units [NTUs]) were recorded at each monitoring station using a Troll 9500 water quality multi-meter (with In-Situ Rugged Reader control unit). The unit was rented from In-Situ Incorporated of Fort Collins, Colorado. The unit was calibrated and checked before shipment and then recalibrated daily during use, per procedures recommended by n-Situ.

2.3.1. Water Quality Criteria

Turbidity and dissolved oxygen were designated as the water quality criteria for the edge of the mixing zone. The water quality criteria were as follows:

- **Turbidity.** No more than 10 NTUs over background levels when background levels are less than or equal to 50 NTUs, or no more than 20% over background if background turbidity is greater than 50 NTUs.
- **Dissolved Oxygen.** No less than 5.0 mg/l dissolved oxygen.

2.4. Exceedance Protocol

Water quality criteria and exceedance protocol were specified in the water quality certification for the dredging project (Appendix B) at the designated POC (600 feet downstream of the dredging activity). If a potential exceedance for any parameter was detected, the exceedance protocol requires that the following steps will be taken:

2.4.1. Step 1: Verification of the Problem

- If monitoring indicates an exceedance in turbidity levels, another series of samples (top, mid-depth, and bottom of water column) must be taken immediately in the same location to repeat the measurement.
- If the exceedance still exists ('strike one'), river conditions must be photographed at the POC and then another series of samples must be taken at the nearest upstream background station to determine if the exceedance is caused by the dredging or by a change in background conditions (for example, due to a heavy rainfall event).
- The Corps' Contracting Officer's Representative (COR) or Navigation Project Manager (NPM) (for this dredging project, Steve Martin or Hiram Arden, respectively) must be notified by phone by the contractor as soon as it appears possible that there has been a measured exceedance.
- The Corps will then notify the dredging contractor that there is a measured exceedance and request that best management practices (BMPs) be implemented by the dredging contractor to reduce turbidity.

2.4.2. Step 2: Increased Monitoring

- Another sample will be taken no more than 1 hour after the exceedance is recorded to verify the dredging operation has been altered to reduce turbidity to within acceptable limits.
- If the second sample taken 1 hour later still shows an exceedance ('strike two'), the COR or NPM must be immediately notified by phone that there is still a measured exceedance.
- The Corps will then again notify the dredging contractor of the situation and request that all possible measures be taken to reduce turbidity.
- Finally, a third sample will be taken no more than 2 hours after the first exceedance is recorded.

2.4.3. Step 3: Stop Dredging or Disposal

- If the third sample taken 2 hours later still shows an exceedance ('strike three'), the COR or NPM must be notified immediately and the contractor will be ordered to stop work by the Corps. The Corps NPM will then notify Ecology of the situation.
- The dredging contractor will not resume in-water work until water quality standards are again met at the POC or documentation of a change in background levels has been accomplished.

2.4.4. Step 4: Continued Sampling until Compliance is Achieved

- After the dredging contractor has stopped work, samples will be collected at hourly intervals until water quality standards are again met or a natural cause of elevated levels is determined.
- Once compliance has again been achieved, the Corps will order the dredging contractor to begin work again.
- The COR or NPM will then notify Ecology that work has resumed.
- The normal schedule of water quality sampling will then resumed.

2.4.5. Step 5: Submit Incident Report

- An incident report will be prepared documenting any exceedances and will include the date, time, location, activity, water quality data collected, name of person collecting the data and names of persons notified of exceedance.
- Incident reports will be transmitted to the COR or NPM within 24 hours of the exceedance.
- Incident reports will include a summary of how the exceedance was resolved according to the above protocol.
- Ecology may require additional days of monitoring based on the incident report.

2.5. Daily Communication with the Corps Project Manager during Monitoring

Each day ICF Jones & Stokes communicated the results of the day's monitoring to the Corps NPM. If the Corps NPM could not be reached by phone, a voicemail message was left. If no confirmed exceedances were recorded, the Corps NPM was called at the end of day. If confirmed exceedances were recorded, the Corps NPM was called immediately after the sampling event during which the confirmed exceedance occurred. Because there was very limited access to a fax machine or internet connection for email (due to the location of the dredge site), measurements were verbally reported to the Corps NPM directly or via voicemail.

Chapter 3. Results

The field data can be found in Appendix C. All turbidity results are provided in NTUs and are presented in the order of surface reading, mid-depth reading, and bottom reading, unless otherwise indicated. To view data in a tabular format, please refer to Appendix D. No dissolved oxygen readings below the 5.0 mg/l standard were observed at any sampling location.

3.1. Compliance Monitoring Conditions

3.1.1. Background Characteristics

Grays Harbor is the estuary of the Chehalis, Hoquiam, and Humptulips Rivers. It is 13 miles long from east to west and is separated from the Pacific Ocean by two peninsulas. The physical characteristics (e.g., temperature, salinity) of the water column in the areas monitored reflect stratified conditions, with surface waters less saline than water at greater depths. Temperatures were also slightly stratified during the sampling, with surface water slightly warmer (61 °F to 64 °F) than water 2 to 3 feet above the bottom (58 °F to 60 °F). Currents (direction of flow) are influenced by tidal exchange and river discharge. High velocity currents were observed on several occasions, particularly during flood tide conditions. Background levels of turbidity tended to fluctuate. During monitoring (August 19 to August 23, 2008), background turbidity was generally low at the surface during slack and flood tides, within the range of 11 to 24 NTUs. Higher turbidity levels were measured at the surface during ebb tides (10 to 53 NTUs). Background turbidity at the mid- and bottom depths fell across a much wider range, with values ranging from 15 to 204 NTUs.

3.1.2. Dredging

Monitoring Summary

During the 5 consecutive days of sampling, the dredge operated near the Port of Grays Harbor docks for the first 3 days, then moved down river approximately 2,000 feet and continued dredging for the remaining 2 days of the monitoring period. During the first 3 days, potential exceedances occurred at the surface on August 19 during ebb tide conditions; at surface, mid-depth, and bottom depth on August 20 during flood tide conditions; at mid-depth and bottom depth on August 20 during slack tide conditions; and at mid-depth and bottom depth on August 21 during flood tide conditions. On the last 2 days of monitoring, after the dredge started working down river, there were no further potential exceedances.

Two of the potential exceedances were confirmed as exceedances following resampling. Both of these exceedances occurred at the mid-depth. However, both of the confirmed exceedances appeared to be brief in duration. Additional sampling was conducted on August 21, 2008 to determine the extent of the exceedance. Based on the turbidity values and tidal conditions, it appeared that this exceedance extended approximately 850 feet from the dredging activity. Before additional samples could be collected, the dredging activity was suspended while the barges were swapped, and maintenance was performed.

Results of daily sampling are discussed in detail below. Data sheets and a summary table of results are presented in Appendices C and D, respectively.

August 19, 2008 Ebb Tide Exceedance (Not Confirmed)

The dredge site was sampled during slack and ebb tide conditions on August 19, 2008. No potential exceedances occurred during the slack tide. A potential exceedance occurred during the ebb tide monitoring. Background turbidity readings could only be collected at the surface and mid-depth during the ebb tide as currents were too strong on the bottom to collect samples. Background turbidity readings at surface and mid-depth were 42.7 and 49.1 NTUs, respectively. POC turbidity readings were 58.8, 48.2, and 58.3 NTUs at surface, mid-depth, and bottom depth, respectively¹. Based on these measurements, the POC surface sample turbidity was greater than 10 NTUs above the surface background turbidity.

Because the surface reading at the POC exceeded the background level by more than 10 NTUs, the background turbidity measurement was repeated according to protocol; the second surface background reading was 52.8 NTUs, which was less than 10 NTUs from the POC measurement (58.3 NTUs for the POC surface sample). Because of the strong current and anchor not reliably maintaining sampling position 300 feet upcurrent from dredging activity, and to minimize the potential of drifting too close to the dredge, only the surface background was resampled. This was a safety decision. The potential exceedance was not confirmed.

August 20, 2008 Flood Tide Exceedance (Confirmed)

The dredge site was sampled during flood and slack tide conditions on August 20, 2008. Potential exceedances were observed at the surface, mid-depth, and bottom depth during the flood tide. Background measurements for surface, mid-depth and bottom depths were 18.8, 30.5, and 125.0 NTUs, respectively. POC measurements were 61.5, 73.4, and 154.3 NTUs, respectively. Thus, surface and mid-depth turbidities were more than 10 NTUs above background, and turbidity at the bottom depth was more than 20% above the background.

¹ Unless otherwise indicated, turbidity measures are reported in the order of surface, mid-depth, and bottom depth.

The background and POC sites were resampled. The resampled background turbidity levels at surface, mid-depth and bottom depth were 16.1, 22.8, and 109.9 NTUs, respectively. The resampled POC turbidity was 17.0, 43.5, and 124.0 NTUs, respectively. The exceedances were not confirmed for surface or bottom depth, but the mid-depth POC turbidity levels still exceeded the resampled background turbidity by more than 10 NTUs. Before the sites could be resampled a third time, the tide shifted from flood to slack tide (See slack tide monitoring below).

Photographs taken of the water surface during this confirmed exceedance are included in Appendix E. Because of the low elevation of the photographs (taken from the boat), delineation of the turbidity plume is not possible.

August 20, 2008 Slack Tide Exceedance (Not Confirmed)

The slack tide background turbidity readings were 12.4, 17.9, and 43.4 NTUs for surface, mid-depth, and bottom depth, respectively. POC turbidity readings were 18.1, 64.2, and 125.4 NTUs, respectively. The mid-depth and bottom depth measurements indicated that there were potential exceedances, and the background and POC locations were resampled. For all depths, the resampled POC turbidity was less than 10 NTUs greater than background turbidity, and the exceedance was not confirmed. It should be noted that slack tide is a relative term and currents are not still for long in the Cow Point reach. The tide during this slack tide sample was shifting from slack to ebb tide, which may have influenced the resample background and POC turbidity, particularly at mid-depth (i.e., the tide may have started to reverse at mid-depth and bottom depth by the time the measurement was taken).

August 21, 2008 Flood Tide Exceedance (Confirmed)

The dredge site was sampled during flood tide conditions in the afternoon on this day. A potential exceedance was observed at the mid-depth POC. Background turbidity readings were 17.8, 74.2, and 204.3 NTUs for surface, mid- and bottom depths, respectively. POC turbidity readings were 20.6, 163.5, and 216.0 NTUs respectively. The mid-depth sample at the POC was greater than 10 NTUs above the corresponding background turbidity.

Because the mid-depth NTU exceeded criteria, the background and POC locations were resampled. Background turbidity readings were 17.4, 51.4, and 155.7 NTUs for surface, mid- and bottom depths. POC turbidity readings were 26.4, 395.0, and 194.1 NTUs, respectively. Based on the resampling, an exceedance was confirmed during the flood tide at mid-depth. In addition to the mid-depth, the bottom depth sample also exceeded the background turbidity by more than 20%; however, since only one sample was more than 20% above the corresponding background turbidity, it was classified as a potential exceedance.

To determine the extent of the mid-depth exceedance (distance downcurrent from dredging activities), water quality measures were taken 200 feet downcurrent of the POC. Turbidity at mid-depth POC plus 200 feet was still greater than 20% above the background turbidity measurement at the mid-depth, but significantly lower than that measured at the POC during the resample (74.3 versus 395.0 NTUs, respectively). Turbidity at the bottom depth at POC plus 200 feet was slightly less than the background turbidity (153.5 versus 155.7 NTUs, respectively). The monitors, based on conditions of the currents, estimated that the turbidity at the mid-depth would have likely been within the compliance range (not greater than 20% above background) within 850 feet of the dredging activity.

Photographs taken of the water surface during this confirmed exceedance are included in Appendix E. At no time was a turbidity plume visible from the boat at the POC.

Before another set of samples could be collected, the dredge stopped dredging for about 1.5 hours to swap the barge, perform maintenance, and collect supplies.

Water quality monitoring was reinitiated during the following slack tide and no potential turbidity exceedances were measured.

August 22 – 23, 2008 (No Potential Exceedances Measured)

The following day (August 22, 2008), the dredge was moved to another location approximately 2,000 feet downriver. Dredging activities at this site were monitored on slack and ebb tides on August 22, 2008, and slack and flood tides on August 23, 2008. Both background and POC turbidities were always low and the POC turbidity was less than 10 NTUs above background turbidity. No potential exceedances were noted. The dredged material appeared to be coarser than at the previous dredge location. Dissolved oxygen always exceeded 5 mg/l.

Chapter 4. Discussion

There are several challenges inherent in monitoring water quality compliance for dredging. First, sampling occurs only during discreet time periods; therefore, conditions during unsampled periods are largely unknown. Second, in areas with currents, monitoring results are difficult to compare without the use of multiple continuous data recorders. Third, tidal environments limit the number of potential resampling events that can be achieved (i.e., the tide can shift stage before the second or third confirmation measurements can be collected). The Water Quality Monitoring Plan addresses these issues by sampling “worst case” scenarios (peak ebb conditions) and incorporating the resampling of the background station in the case of an exceedance. The Water Quality Monitoring Plan provided the necessary flexibility

and efficiency to the dredging operation, while protecting water quality through monitoring efforts.

Turbidity limits were consistently met at the surface, and no visible turbidity plume could be seen at the POC, even when the turbidity limit was exceeded at the mid- or bottom depths.

Chapter 5. Conclusions

Water quality monitoring, according to the water quality certification protocol, indicated that elevated turbidity levels (more than 10 NTUs over background with background levels of less than 50 NTUs and more than 20% over background with background levels of greater than 50 NTUs) were confirmed on two occasions at 600 feet downcurrent of active clamshell dredging of the navigation channel. Both confirmed exceedances occurred at mid-depth during flood tide conditions. On August 20, 2008, the tide shifted from flood to slack tide before a third set of measurements could be collected. The initial measurements during the following slack tide (1 hour after the flood tide exceedance was measured), indicated that the mid-depth measurement was still out of compliance. When resampled, the turbidity at the background station was quite a bit higher than the POC station, indicating that the tide changed swiftly to ebb flow, apparently moving turbid water into the area that the background samples were being collected.

Turbidity observations during this and previous monitoring at the site (ICF Jones & Stokes 2008) indicate that the background and POC turbidity levels can fluctuate significantly within the span of several minutes. Also, background turbidity levels can be quite high under certain tidal conditions (as high as 204.3 NTUs in this study). These elevated background turbidity levels appear to have been partially attributed to high velocity currents mobilizing sediments from the estuary bottom.

Use of the in-situ turbidity measurements beyond what is specified in the Water Quality Monitoring Plan is not necessary to meet the regulatory requirements of the water quality permit. However, additional sampling provides a more complete description of the dynamic water quality associated with dredging in an estuarine environment. Transitory and unevenly distributed pulses of turbidity appear to be inherent in clamshell dredging in areas with fine sediment and rapidly changing currents.

Chapter 6. References

ICF Jones & Stokes. 2008. Water Quality Monitoring Report. Grays Harbor Dredging Project. March. Contract: W912DW-05-D-1001 Task Order No. 26. (J&S 00070.08) Bellevue, WA. Prepared for U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers (Corps). 2006. Fiscal Years 2007 Through 2011 Maintenance Dredging and Disposal, Grays Harbor and Chehalis River Federal Navigation Project, Washington. Public Notice. Seattle District. July 28, 2006. Available at: <http://www.nws.usace.army.mil/ERS/reposit/FY07-11_Public_%20Notice1.pdf>. Accessed February 5, 2008.

Appendix A

Vicinity and Location Map

Appendix B

Water Quality Certification and Water Quality Monitoring Plan

Appendix A: Washington Department of Ecology's Section 401 Water Quality Certification



Rec'd 3/10/07

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

July 30, 2007

REGISTERED MAIL

Mr. Hiram Arden
U.S. Army Corps of Engineers
Seattle District Navigation Section
P.O. Box 3755
Seattle WA 98124-3755

**RE: Water Quality Certification - Order #4895/Corps Public Notice CENWS-
OD-TS-NS-25. Maintenance dredging of the Federally authorized navigation
channel in Grays Harbor, Grays Harbor County, Washington**

Dear Mr. Arden:

The above-referenced project has been reviewed in accordance with all pertinent rules and regulations. On behalf of the State of Washington, we certify that the work proposed in the public notice complies with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, as amended, and other appropriate requirements of State law. This certification is subject to the conditions contained in the enclosed Order and may be appealed by following the procedures described in the Order.

Pursuant to Section 307(c)(3) of the Coastal Zone Management Act of 1972 as amended, Ecology concurs with the Applicant's determination that this work is consistent with the approved Washington State Coastal Zone Management Program.

If you have any questions concerning the content of this letter, please contact Helen Pressley at (360) 407-6076.

Sincerely,

A handwritten signature in black ink, appearing to read "Brenden McFarland".

Brenden McFarland, Section Supervisor
Environmental Review and Transportation Section Manager
Shorelands and Environmental Assistance Program

cc: Penny Keys, Ecology



AUTHORITIES:

In exercising authority under 33 U.S.C. § 1341, 16 U.S.C. § 1456, RCW 90.48.120, and RCW 90.48.260, Ecology has examined this application pursuant to the following:

1. Conformance with applicable water quality-based, technology-based, and toxic or pretreatment effluent limitations as provided under 33 U.S.C. §§ 1311, 1312, 1313, 1316, and 1317 (FWPCA §§ 301, 303, 306 and 307);
2. Conformance with the state water quality standards contained in Chapter 173-201A WAC and authorized by 33 U.S.C. § 1313 and by Chapter 90.48 RCW, and with other applicable state laws; and
3. Conformance with the provision of using all known, available and reasonable methods to prevent and control pollution of state waters as required by RCW 90.48.010.

WATER QUALITY CERTIFICATION CONDITIONS:

Through issuance of this Order, Ecology certifies that it has reasonable assurance that the activity as proposed and conditioned will be conducted in a manner that will not violate applicable water quality standards and other appropriate requirements of state law. In view of the foregoing and in accordance with 33 U.S.C. § 1341, RCW 90.48.120, RCW 90.48.260, Chapter 173-200 WAC and Chapter 173-201A WAC, water quality certification is granted to the Applicant subject to the conditions within this Order.

Certification of this proposal does not authorize the Applicant to exceed applicable state water quality standards (Chapter 173-201A WAC), ground water standards (Chapter 173-200 WAC) or sediment quality standards (Chapter 173-204 WAC). Furthermore, nothing in this certification shall absolve the Applicant from liability for contamination and any subsequent cleanup of surface waters, ground waters or sediments occurring as a result of project construction or operations.

A. General Conditions:

- A1. For purposes of this Order, the term "Applicant" shall mean the U. S. Army Corps of Engineers (Corps) and its agents, assignees and contractors.
- A2. For purposes of this Order, all submittals required by its conditions shall be sent to Ecology's Headquarters Office, Attn: 401/CZM Federal Project Manager, P.O. Box 47600 Olympia, WA 98504-7600. Any submittals shall reference Order #4895 and Corps Reference # CENWS-OD-TS-NS-25.
- A3. Work authorized by this Order is limited to the work described in the revised Joint Aquatic Resources Permit Application (JARPA) received by Ecology on July 31, 2006. The

Applicant will be out of compliance with this Order and must submit an updated JARPA if the information contained in the JARPA is voided by subsequent changes to the project not authorized by this Order.

- A4. Within 30 days of receipt of an updated JARPA, Ecology will determine if the revised project requires a new water quality certification and public notice or if a modification to this Order is required.
 - A5. This Order does not exempt, and is provisional upon, compliance with other statutes and codes administered by federal, state, and local agencies.
 - A6. Copies of this Order shall be kept on the job site and readily available for reference by Ecology personnel, the construction superintendent, construction managers and lead workers, and state and local government inspectors.
 - A7. The Applicant shall provide access to the project site upon request by Ecology personnel for site inspections, monitoring, necessary data collection, and/or to ensure that conditions of this Order are being met.
 - A8. Nothing in this Order waives Ecology's authority to issue additional orders if Ecology determines that further actions are necessary to implement the water quality laws of the state. Further, Ecology retains continuing jurisdiction to make modifications hereto through supplemental order, if additional impacts due to project construction or operation are identified (e.g., violations of water quality standards, downstream erosion, etc.), or if additional conditions are necessary to further protect water quality.
 - A9. The Applicant shall ensure that all appropriate project engineers and contractors at the project site have read and understand relevant conditions of this Order and all permits, approvals, and documents referenced in this Order. The Applicant shall provide Ecology a signed statement (see Attachment A for an example) from each project engineer and contractor that they have read and understand the conditions of this Order and the above-referenced permits, plans, documents and approvals. These statements shall be provided to Ecology before construction begins at the project.
 - A11. This Order does not authorize direct, indirect, permanent, or temporary impacts to waters of the state or related aquatic resources, except as specifically provided for in conditions of this Order.
 - A12. Any person who fails to comply with any provision of this Order shall be liable for a penalty of up to ten thousand dollars (\$10,000) per violation for each day of continuing noncompliance.
-

B. Water Quality Conditions:

- B1. The dredging and disposal needed to maintain the navigation channel may result in the temporary exceedance of certain state water quality criteria or special conditions specified in Chapter 173-201A WAC. Under WAC 173-201A-410, Ecology may grant a "Short-term Modification" to allow for such exceedances of the criteria on a short-term basis when necessary or to otherwise protect the public interest". Ecology finds that maintenance of the navigation channel is an activity essential for the safe and efficient movement of commercial vessels to access to the cities of Aberdeen, Hoquiam, and Cosmopolis. In granting the following modifications, Ecology finds that supporting information clearly indicates the granting of mixing zones would not have a reasonable potential to: 1) cause a loss of sensitive or important habitat; 2) substantially interfere with the existing or characteristic uses of the lower Columbia River; 3) result in damage to the ecosystem; or 4) adversely affect public health.
- a. Temporary dilution zones, or mixing zones, are authorized for dredging and/or disposal to allow for temporary exceedances of certain water quality standards as a result of disturbing in-place sediments. Within the mixing zones, except as noted, water quality criteria are modified as follows:
 - i. **Turbidity:** The turbidity mixing zone distance for in-water activities authorized by this Order is 600 feet down current.
 - b. All other applicable water quality standards shall remain in effect in the mixing zones and all water quality standards are expected to be met outside of the mixing zones.
 - c. This modification does not authorize any in-water work during closure periods specified within this Order or the Biological Opinions. This modification is also granted on condition that all reasonable and appropriate "best management practices" are being undertaken to reduce the impacts that may cause exceedances of the water quality criteria.

C. Water Quality Monitoring Requirements:

- C1. The Applicant shall submit a Water Quality Monitoring Plan 30 days prior to dredging and disposal for Ecology's review. This plan shall include the following information:
- Name and phone number of person responsible for monitoring;
 - Map of sample locations
 - Parameter(s) to be monitored;
 - Sample method; and
 - Sample frequency.
-

- C2. Turbidity shall be monitored and recorded at a minimum of every four (4) hours (daylight hours only) during periods of active in-water work. Monitoring points shall be 100 feet upcurrent (representative background) 300 and 600 feet downcurrent. A turbidimeter is recommended, however, visual gauging of turbidity is acceptable. Visible project-related turbidity at 600 feet downcurrent from the discharge point is considered to be an exceedance of the standard.

If turbidity exceedances are observed, the Applicant shall modify the activity causing the problem and continue to monitor every four (4) hours.

If exceedances occur during two (2) consecutive measurements (four (4) hours apart), stop the activity causing the turbidity until the problem is resolved.

Reports of any exceedances should be forwarded to the Federal Permit Coordinator. Refer to Corps #CENWS-OD-TS-NS-25, Order #4895. Please either call (360) 407-6076, or fax to (360) 407-6902, e-mail at hpre461@ecy.wa.gov or in writing.

D. Dredging and Disposal Activities:

- D1. Dredging operations shall be conducted in a manner that minimizes the disturbance or siltation of adjacent waters and prevents the accidental discharge of petroleum products, chemicals or other toxic or deleterious substance into waters of the State.
- D2. This material will be placed in existing approved open water disposal sites, nearshore nourishment sites, and direct beach nourishment sites in Half Moon Bay and on South Beach.
- D3. All dredging is to be done using a clamshell dredge and a hopper dredge as appropriate. Use of any other type of dredge will require prior approval from the four DMMP agencies.
- D4. All debris (larger than 2 feet in any dimension) shall be removed from the dredged sediment prior to disposal. Similar sized debris found floating in the dredging or disposal area shall also be removed. All debris shall be disposed of at appropriate upland locations.
- D5. Each pass of the clamshell bucket shall be complete with no stockpiling allowed in the water.
- D6. Only barges with low walls or other containment devices around the perimeter of the barge shall be used for storage of dewatering discharges and excavated sediments in order to prevent and minimize sediments and turbid waters from entering marine water.
- D7. During dredging, the Applicant shall have a boat available on site at all times to retrieve debris from the water.

E. Timing Requirements:

- E1. This Order shall remain in effect for a period of five (5) years from date of issuance. Continuing maintenance dredging beyond the five year term of this Order will require separate certifications every five years.
- a. Ecology reserves the option to reassess the terms of this Order and amend or revoke, as necessary, in the event that:
 - i. new sources of potential contamination are discharged or otherwise stand to significantly affect the quality of sediments dredged from Grays Harbor, or
 - ii. new information indicates that dredging and/or disposal activities are having a significant adverse impact on water quality or characteristic uses of Grays Harbor.
- E2. In-water work shall only occur as specified in the United States Fish and Wildlife Service letter #1-3-06-I-0469 dated April 19, 2007. Work in or near the water that may affect fish migration, spawning, or rearing shall cease immediately upon a determination that fisheries resources may be adversely affected.

F. Emergency/Contingency Measures:

- F1. The Applicant shall develop and implement a Spill Prevention and Containment Plan for all aspects of this project.
- F2. The Applicant shall have adequate and appropriate spill response materials on hand to respond to emergency release of petroleum products or any other material into waters of the state.
- F3. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters.
- F4. Any work that is out of compliance with the provisions of this Order, or conditions causing distressed or dying fish, or any discharge of oil, fuel or chemicals into state waters, or onto land with a potential for entry into state waters, is prohibited. If these occur, the Applicant shall immediately take the following actions:
- a. Cease operations at the location of the violation or spill.
 - b. Assess the cause of the water quality problem and take appropriate measures to correct the problem and/or prevent further environmental damage.
 - c. Notify Ecology of the failure to comply. All spills causing a sheen or spillage of pollutants into waters of the state shall be reported immediately to Ecology's 24-Hour
-

Spill Response Team at 1-800-258-5990, **and** within 24 hours of spills or other events to Ecology's 401/CZM Federal Project Manager at (360) 407-6076.

- d. The Applicant shall submit a detailed written report to Ecology within five (5) days of the incident that describes the nature of the event, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information.

Compliance with this condition does not relieve the Applicant from responsibility to maintain continuous compliance with the terms and conditions of this Order or the resulting liability from failure to comply.

G. Reporting and Notification Requirement Conditions:

- G1. Applicant shall provide notice to Ecology's 401/CZM Federal Project Manager at least three (3) days prior to the start of construction and within 14 days after completion of construction at the project site. Notification, referencing Corps Reference #CENWS-OD-TS-NS-25, Order #4895 can take place by telephone to (360) 407-6076 or, fax to (360) 407-6902, e-mail at hpre461@ccy.wa.gov or in writing.
- G2. A **Dredging Plan** is required for any in-water disposal and shall be made available for review and approval at the pre-dredge meeting to be convened at the Seattle Corps of Engineers office prior to the start of dredging. One week prior to the pre-construction meeting, a copy of the plan shall be sent to the Federal Permit Coordinator, Department of Ecology, and P. O. Box 47600, Olympia WA 98504-7600 for review prior to the meeting.

H. Appeal Process:

You have a right to appeal this Order. To appeal this you must:

- File your appeal with the Pollution Control Hearings Board within 30 days of the "date of receipt" of this document. Filing means actual receipt by the Board during regular office hours
- Serve your appeal on the Department of Ecology within 30 days of the "date of receipt" of this document. Service may be accomplished by any of the procedures identified in WAC 371-08-305(10). "Date of receipt" is defined at RCW 43.21B.001(2).

Be sure to do the following:

- Include a copy of this document that you are appealing with your Notice of Appeal.
- Serve and file your appeal in paper form; electronic copies are not accepted.

1. To file your appeal with the Pollution Control Hearings Board

Mail appeal to:

Deliver your appeal in person to:

The Pollution Control Hearings Board
PO Box 40903
Olympia, WA 98504-0903

OR

The Pollution Control Hearings Board
4224 - 6th Ave SE Rowe Six, Bldg 2
Lacey, WA 98503

2. To serve your appeal on the Department of Ecology

Mail appeal to:

Deliver your appeal in person to:

The Department of Ecology
Appeals Coordinator
P.O. Box 47608
Olympia, WA 98504-7608

OR

The Department of Ecology
Appeals Coordinator
300 Desmond Dr SE
Lacey, WA 98503

3. And send a copy of your appeal to:

Helen Pressley
Department of Ecology
Headquarters Office
PO Box 47600
Olympia, WA 98504-7600

*For additional information visit the Environmental Hearings Office Website:
<http://www.eho.wa.gov>
To find laws and agency rules visit the Washington State Legislature Website:
<http://www1.leg.wa.gov/CodeReviser>*

Your appeal alone will not stay the effectiveness of this Order. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with Ch. 43.21B RCW.

Dated July 30, 2007 at Lacey, Washington.



Brenden McFarland, Section Manager
Shorelands and Environmental Assistance Program
Department of Ecology
State of Washington

Appendix B: Corps' Water Quality Monitoring Plan, as approved by Ecology

**Water Quality Monitoring Plan, Fiscal Year 2008
Grays Harbor Maintenance Dredging
September 2007**

This document outlines a water quality-monitoring plan to measure turbidity during upcoming maintenance dredging of the federally authorized navigation channel in Grays Harbor.

Constituent Monitored:

Turbidity (measured by hydrolab in NTUs), no more than 10 NTUs over background levels when background levels are less than or equal to 50 NTUs, or no more than 20% over background NTUs when background levels are greater than 50 NTUs, as per WAC 173-201A-210(1)(e).

Turbidity shall be monitored and recorded at a minimum of every four (4)

Determination of Background Levels:

- ❖ The water quality meter will be calibrated with standardized samples prior to the start of each day's monitoring, per the manufacturer's specifications.
- ❖ Background levels will be recorded prior to the first sampling within the mixing zone each day and as close as possible in time to the start of dredging and disposal operations.
- ❖ Samples will be collected at each background monitoring location; samples will be collected at the surface, mid-depth, and bottom of the water column to document the turbidity level at that background location.

Monitoring Locations

- ❖ Monitoring samples will be collected at a minimum of two points within the mixing zone and at the point of compliance.
- ❖ The water quality compliance points for dredging and disposal shall be as determined by Ecology and specified in the 401 Water Quality Certification. Data collected within the mixing zone will be collected for informational purposes only.

Points of Compliance:

- ❖ Points of compliance and associated mixing zones to be determined by Ecology and stipulated in the 401 Water Quality Certification for the project.
- ❖ Water quality samples will be collected at each monitoring location from the surface, mid-depth, and bottom of the water column to document the turbidity level at each monitoring location.
- ❖ Turbidity levels will be compared to background levels within each water column strata (i.e. surface levels at point of compliance compared to surface level at background station).

Frequency of Monitoring:

- ❖ Daily monitoring will involve at least 2 collection times during daylight hours only. No monitoring will occur before sunrise or after sunset due to inherent dangers in boat operation within Budd Inlet during these periods.
- ❖ Monitoring will correspond with (1) slack tide, and (2) strong ebb and/or flood tidal conditions to the extent that these times adequately reflect periods of active dredging operations.
- ❖ Dredging or disposal equipment will have been operating for at least one hour prior to the collection of water quality samples to ensure samples are reflective of water quality conditions during active operations.
- ❖ Monitoring will continue for at the above frequency for the first five (5) consecutive days of each dredging operation (i.e. clamshell dredging).

Exceedance Protocol: an Adaptive Management Approach

Verification of the Problem

- ❖ If daily monitoring indicates an exceedance in turbidity levels at a particular monitoring location, another series of samples (top, mid-depth, and bottom of water column) will be taken immediately in the same location to repeat the measurement.
- ❖ If the exceedance still exists ('strike one'), another series of samples will be taken at the nearest upstream background station to determine whether the exceedance is caused by the dredging or disposal, or by a change in background conditions (for example due to a heavy rainfall event).
- ❖ The contractor will be immediately notified that there is a measured exceedance.
- ❖ As appropriate and applicable, best management practices (BMPs) will be implemented to reduce turbidity.

Increased Monitoring

- ❖ Another sample will be taken no more than 1 hour after the exceedance is recorded to verify that the contractor has slowed down or otherwise changed operations to reduce turbidity to within acceptable limits.
- ❖ If the second sample taken 1 hour later still shows an exceedance ('strike two'), the contractor will again be notified of the situation and asked to implement all measures possible to reduce turbidity. The Corps' Navigation Project Manager (NPM) (Hiram Arden, 206-764-3401) and/or Contracting Officer's Representative (COR) (Dr. Stephen Martin, 206-764-3631) will be notified of the situation.
- ❖ Finally, a third sample will be taken no more than 2 hours after the exceedance is recorded.
- ❖ If the third sample taken 2 hours later still shows an exceedance ("strike three"), the contractor will be ordered to stop work by the Corps.

Notification

- ❖ If exceedances are still occurring after the "three strikes" procedure is followed, the COR and NPM will be notified of the situation, and Ecology will be notified by the Corps of the situation.
- ❖ Samples will continue to be taken at hourly intervals until water quality standards are again met or a natural cause of elevated levels is determined (for

example, a side channel downstream of the background station is contributing suspended sediment).

- ❖ The contractor will not begin in-water work again until water quality standards are again met at the point of compliance or documentation of a change in background levels has been accomplished.
- ❖ Once compliance has again been achieved, the Corps will order the contractor to begin work again.
- ❖ The COR or NPM will then notify Ecology that work has resumed.

Termination of Monitoring Protocol: an Adaptive Management Approach

- ❖ If there are no exceedances of water quality conditions such that dredging or disposal is temporarily shut down within the five (5) consecutive days of monitoring, Ecology will be notified and sent the monitoring data; daily monitoring will then be terminated unless specifically directed otherwise by Ecology based on the collected monitoring data.
- ❖ If there are exceedances such that dredging or disposal is temporarily shut down during the five (5) consecutive days of monitoring, the Corps will consult with Ecology to determine the number of additional days of monitoring required with no exceedances in order to terminate monitoring or the project is completed.

Reporting:

- ❖ Any exceedances and/or shut downs will be reported to Ecology by the Corps by phone as soon as is practicable.
- ❖ Any shut downs will be documented with an incident report which will be transmitted to Ecology by fax and by mail within 2 working days of the incident.
- ❖ Within 60 days of termination of the dredging and disposal activities, the Corps will submit the water quality monitoring data and a summary report to Ecology.

Responsibility and Communication Plan:

- ❖ The Corps will oversee all water quality monitoring and will be responsible for coordinating and reporting information to Ecology.
- ❖ The NPM and COR will coordinate with the dredging contractor.
- ❖ The NPM and COR will coordinate with the water quality monitoring contractor.
- ❖ The Corps will supply Ecology with a Point of Contact list prior to commencement of the dredging and disposal activities. The Corps anticipates that Ecology will similarly supply the Corps with their Point of Contact list for the project.

Point of Contact List for Grays Harbor Dredging: Corps

Position	Contact Name	Office Phone	Cell Phone/other
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			phone
Navigation Project Manager	Hiram Arden	206-764-3401	206-909-7946
Contracting Officer's Representative	Dr. Stephen Martin	206-764-3631	

Appendix C

Field Data Forms

1

Water Quality Sampling Data Sheet

Date: 8/19/08	Name: mm CR	Time of Sample: 9:530
Tidal Stage: SLACK HIGH	Tidal Elevation:	
GPS Long: NOT AVAILABLE	GPS Lat: NOT AVAILABLE	
Weather Conditions: OVERCAST 10 MPA WIND		
Activity Taking Place: DREDGING		
Distance from Activity: 300 FT	Direction to Activity: WEST	
Point of Compliance: —	Duration of Activity prior to Sample: > 3 HRS	
Notes: FLOW/CURRENT/WIND ALL HEADING UP EAST (WHAT WOULD BE UPSTREAM)		
Type of Sample: Background Pt. of Compliance Mid Point		

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.8	16.1	—	7.004	62.3	32280	7.59
Mid Depth	23.6	28.4	—	6.512	59.24	35890	7.55
Bottom	45	72.6	—	6.574	59.05	36050	7.55

Date: 8/19/08	Name: CR mm	Time of Sample: 1630 1630
Tidal Stage: SLACK HIGH	Tidal Elevation:	
GPS Long: NA	GPS Lat: NA	
Weather Conditions: OVERCAST, DRIZZLE		
Activity Taking Place: DREDGING, JUST AFTER 30 min pause in dredging		
Distance from Activity: 600 FT	Direction to Activity: EAST	
Point of Compliance: —	Duration of Activity prior to Sample: > 3 HRS	
Notes: FLOW/CURRENT/WIND ALL HEADING UPSTREAM EAST		
Type of Sample: Background Pt. of Compliance Mid Point		

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.772	14.0 / 16.1	Y	6.775	61.45	33140	7.57
Mid Depth	16.585	14.7 / 28.4	Y	6.602	59.41	35840	7.57
Bottom	36.332	30 / 72.6	Y	6.480	58.97	36100	7.57

TO: HIRAM ARDEN
206 764 3308

2

Water Quality Sampling Data Sheet

Date: 19 AUG 08	Name: MM CR	Time of Sample: 1645
Tidal Stage: SLACK HIGH	Tidal Elevation:	
GPS Long: NA	GPS Latt: NA	
Weather Conditions: RAINING, WINDY		
Activity Taking Place: DREDGING		
Distance from Activity: 300'	Direction to Activity: EAST	
Point of Compliance: NO	Duration of Activity prior to Sample:	
Notes:		
Type of Sample: Background Pt. of Compliance <u>Mid Point</u>		

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	2.304	19.4 / 16.1	—	6.856	61.51	33000	7.54
Mid Depth	17.591	18.1 / 28.4	—	6.626	59.3	35980	7.57
Bottom	34.096	28.1 / 72.6	—	6.561	58.97	36250	7.57

Date:	Name:	Time of Sample:
Tidal Stage:	Tidal Elevation:	
GPS Long:	GPS Latt:	
Weather Conditions:		
Activity Taking Place:		
Distance from Activity:	Direction to Activity:	
Point of Compliance:	Duration of Activity prior to Sample:	
Notes:		
Type of Sample: Background Pt. of Compliance Mid Point		

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface						
Mid Depth						
Bottom						

Water Quality Sampling Data Sheet

Date: 19 AUG 08 Name: CR MM Time of Sample: 1835
 Tidal Stage: EBBING Tidal Elevation:
 GPS Long: NA GPS Latt: NA
 Weather Conditions: RAIN, WIND
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: EAST WEST (upstream)
 Point of Compliance: NO Duration of Activity prior to Sample: > 4 HR

Notes: anchor not holding well (lost big anchor when it snagged on dredge's line)
 STRONG CURRENT

* Strong current does not allow probe to approach bottom

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.0	42.7	-	7.230	62.06	32020	7.54
Mid Depth	15.17	49.1	-	6.779	60.83	34130	7.55
Bottom *							

↑ CURRENT KEPT PROBE FROM REACHING BOTTOM

Date: 19 AUG 2008 Name: MM CR Time of Sample: 1900
 Tidal Stage: EBBING Tidal Elevation:
 GPS Long: NA GPS Latt: NA
 Weather Conditions: RAIN
 Activity Taking Place: DREDGING
 Distance from Activity: 600 Direction to Activity: EAST
 Point of Compliance: YES Duration of Activity prior to Sample: > 4 HR

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.758	58.8 / 42.7	N	6.908	61.25	33210	7.55
Mid Depth	18.589	48.2 / 49.1	Y	6.641	60.97	33680	7.55
Bottom	37.8	58.3 / -	Y	6.554	59.81	35360	7.54

↑ BG BOTTOM COULD NOT GET DUE TO CURRENT NOT ALLOWING PROBE TO APPROACH BOTTOM

Water Quality Sampling Data Sheet

Date: 19 AUG 08		Name: MM CR		Time of Sample: 1915		
Tidal Stage: EBBING		Tidal Elevation:				
GPS Long: NA		GPS Latt: NA				
Weather Conditions: RAIN						
Activity Taking Place: DREDGING						
Distance from Activity: 300			Direction to Activity: WEST			
Point of Compliance: NO			Duration of Activity prior to Sample: > 4 HR			
Notes: RE-SAMPLE BACKGROUND DUE TO OUT OF COMPLIANCE @ SURFACE ONLY ONLY SURFACE DUE TO OUR SMALL ANCHOR AND SWIFT CURRENT TOWARDS DREDGE						
Type of Sample: Background Pt. of Compliance Mid Point 2ND B/L MADE POC @ SURFACE IN COMPLIANCE						
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	2.0	58.8 52.0	Y			
Mid Depth						
Bottom						

in compliance

L From Pt. of comp.

Date:		Name:		Time of Sample:		
Tidal Stage:		Tidal Elevation:				
GPS Long:		GPS Latt:				
Weather Conditions:						
Activity Taking Place:						
Distance from Activity:			Direction to Activity:			
Point of Compliance:			Duration of Activity prior to Sample:			
Notes:						
Type of Sample: Background Pt. of Compliance Mid Point						
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface						
Mid Depth						
Bottom						

5

Water Quality Sampling Data Sheet

Date: 20 AUG CR	Name: MM CR	Time of Sample: 1428
Tidal Stage: FLOODING	Tidal Elevation:	
GPS Long: 123° 50' 28.3 sec	GPS Latt: 46° 57' 38.2 sec	
Weather Conditions: RAIN 5-10 knot ^{out of} West Wind		
Activity Taking Place: DREDGING		
Distance from Activity: 300'	Direction to Activity: WEST EAST	
Point of Compliance: N	Duration of Activity prior to Sample: ~ 1 hr	

Notes: PH

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	
Surface	1.856	/ 18.8	—	7.472	62.28	27520	7.42
Mid Depth	16.1743	/ 30.5	—	7.315	60.68	30520	7.42
Bottom	35.399	/ 125	—	7.383	59.54	32420	7.43

Date: 20 AUG CR	Name: MM CR	Time of Sample: 1453
Tidal Stage: FLOODING	Tidal Elevation:	
GPS Long: W 123° 50' 16.2"	GPS Latt: 46° 57' 37.5"	
Weather Conditions: RAIN 5-10 knot ^{out of} West Wind		
Activity Taking Place: DREDGING		
Distance from Activity: 600'	Direction to Activity: WEST	
Point of Compliance: 9	Duration of Activity prior to Sample: ~ 1 hr	

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	
Surface	3.1	/ 61.5 18.8	N	7.465	61.31	29340	7.42
Mid Depth	21.279	/ 73.4 30.5	N	7.335	59.83	31970	7.43
Bottom	43.03	/ 154.3 125	N	7.270	59.64	32140	7.44

Water Quality Sampling Data Sheet

Date: 20 AUG 08	Name: MIAA CR	Time of Sample: 1511
Tidal Stage: FLOODING	Tidal Elevation:	
GPS Long: 123 50 29.5	GPS Latt: 46° 57 38.1	
Weather Conditions: OVERCAST 10 Knot wind		
Activity Taking Place: dredging		
Distance from Activity: 300'	Direction to Activity: West	
Point of Compliance: N	Duration of Activity prior to Sample: ~1.5 hr	

Notes:

BACKGROUND 2 FLOOD

Type of Sample: Background Pt. of Compliance Mid Point

RE-CHECK

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	
Surface	1.822	16.1	-	7.553	62.29	22780	7.38
Mid Depth	18.144	22.8	-	7.576	60.71	30710	7.45
Bottom	37.374	109.9	-	7.623	59.06	32980	7.46

PH
7.38
7.45
7.46

Date: 20 AUG 08	Name: MIAA CR	Time of Sample: 1528
Tidal Stage: FLOODING	Tidal Elevation:	
GPS Long: W 123 50.269	GPS Latt: 46° 57.618	
Weather Conditions: WINDY - overcast		
Activity Taking Place: dredging		
Distance from Activity: 600'	Direction to Activity: east	
Point of Compliance: Y	Duration of Activity prior to Sample: ~2 hr	

Notes:

Re-check POC

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	
Surface	1.796	17.0 16.1	Y	7.696	61.43	29520	7.44
Mid Depth	21.360	48.5 22.8	N	7.604	59.44	32990	7.45
Bottom	41.373	124 109.9	Y	7.605	58.97	33080	7.42

PH
7.44
7.45
7.42

123
50.269
41.373

Water Quality Sampling Data Sheet

Date: 20 AUG 2008 Name: MM CR Time of Sample: 1634
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: 123° 50.519 GPS Latt: 46° 57.638
 Weather Conditions: ~~15-20~~ 20-25 knot wind
 Activity Taking Place: dredging
 Distance from Activity: 300' Direction to Activity: ~~W~~ EAST
 Point of Compliance: N Duration of Activity prior to Sample: ~ 2.5 h.
 Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	2.122	12.4	—	7.749	62.53	28040	7.49
Mid Depth	19.960	17.9	—	7.666	59.48	32350	7.46
Bottom	39.0	43.3	—	7.685	58.65	33160	7.47

Date: 20 AUG 2008 Name: MM CR Time of Sample: 1653
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: 123° 50.257 GPS Latt: 46° 57.606
 Weather Conditions: 20-25 knot wind
 Activity Taking Place: dredge
 Distance from Activity: 600' Direction to Activity: West
 Point of Compliance: Y Duration of Activity prior to Sample: ~ 2.5 hr
 Notes: out of comp took second readings - still over (not recorded) dredging stopped, readings improved. dredging stopped ~ 1702. ^{back date change} decided to take second background reading. tugboat ~~removes dredge barge @ 1710~~

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.701	18.1 / 12.4	Y	7.619	61.92	29340	7.44
Mid Depth	20.486	64.2 / 17.9	N	7.492	58.82	33090	7.44
Bottom	40.906	125.4 / 43.3	N	7.446	58.9	33140	7.44

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Water Quality Sampling Data Sheet

Date: 20 Aug 08 Name: MMCR Time of Sample: 1718
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: 123° 50.516 GPS Latt: 46° 57.635
 Weather Conditions: 20-25 knot wind
 Activity Taking Place: Dredge
 Distance from Activity: 300' Direction to Activity: EAST
 Point of Compliance: N Duration of Activity prior to Sample: ~3 hr

Notes: tug boat removed spoils barge. Second background check after POC in OOC.
 Dredge resumes work 1711 & one barge (see photo) 3940

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	pH
Surface	1.817	24.7	-	7.724	61.38	29320	7.49
Mid Depth	20.468	70.5	-	7.677	58.81	32920	7.47
Bottom	40.451	39.8	-	7.693	58.58	33230	7.48

Date: 20 AUG 08 Name: MMCR Time of Sample: 1731
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: 123° 50.273 GPS Latt: 46° 57.627
 Weather Conditions: 20-25 knot wind, RAIN
 Activity Taking Place: dredge
 Distance from Activity: 600' Direction to Activity: WEST
 Point of Compliance: 2nd reading Duration of Activity prior to Sample: ~3 hr

Notes: reading at end of slack tide. most likely tide is shifting. Non-comp still a possibility

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	pH
Surface	1.93	16.2 / 24.7	Y	7.809	61.69	29650	7.49
Mid Depth	23.343	15.3 / 70.5	Y	7.713	58.9	32960	7.47
Bottom	46.483	38 / 39.8	Y	7.732	58.73	33100	7.45

9

Water Quality Sampling Data Sheet

Date: 21 AUG 08	Name: MM CR	Time of Sample: 1300
Tidal Stage: FLOOD	Tidal Elevation:	
GPS Long: 123° 50' 42.0"	GPS Latt: 46° 57' 38.2"	
Weather Conditions: PARTLY SUNNY		
Activity Taking Place: DREDGING		
Distance from Activity: 300'	Direction to Activity: EAST	
Point of Compliance: —	Duration of Activity prior to Sample: > 4 hr	

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.883	17.8	—	7.498	64.96	19110	7.32
Mid Depth	19.286	74.2	—	7.426	61.02	28580	7.38
Bottom	38.050	204.3	—	7.585	59.97	30630	7.42

Date: 21 AUG 08	Name: CR MM	Time of Sample: 1313
Tidal Stage: FLOOD	Tidal Elevation:	
GPS Long: 123° 50' 28.6"	GPS Latt: 46° 57' 36.8"	
Weather Conditions: PART SUN ☺		
Activity Taking Place: DREDGING		
Distance from Activity: 600'	Direction to Activity: WEST	
Point of Compliance: Y	Duration of Activity prior to Sample: > 4 hr	

Notes: 082/POC/1000

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.623	20.6	Y	7.460	64.75	19530	7.31
Mid Depth	20.132	74.2	(N)	7.420	60.95	28990	7.39
Bottom	40.67	204.3	Y	7.667	59.86	30800	7.42

Water Quality Sampling Data Sheet

Date: 21 AUG 08		Name: CR MM		Time of Sample: 1329		
Tidal Stage: FLOOD		Tidal Elevation:				
GPS Long: 123° 50' 41.6"		GPS Lat: 46° 57' 39.0"				
Weather Conditions: PARTLY SUNNY, 5 KNOT WIND OUT OF WEST						
Activity Taking Place: DREDGING						
Distance from Activity: 300'			Direction to Activity: EAST			
Point of Compliance: N			Duration of Activity prior to Sample: > 4 hr			
Notes: 2ND BACKGROUND READING FOR VERIFICATION 1ST POC WOULD STILL BE OUT OF COMPLIANCE WHEN COMPARED TO THESE 2ND BACKGROUND READINGS						
Type of Sample: Background Pt. of Compliance Mid Point #2						
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	1.571	20.6 / 17.4	Y	7.763	64.75	20190
Mid Depth	20.175	163.5 / 51.4	(N)	7.872	61.52	26620
Bottom	40.355	216 / 155.7	(N)	9.354	59.96	30670

pH
7.34
7.39
7.43

1ST POC READINGS

Date: 21 AUG 08		Name: CR MM		Time of Sample: 1341		
Tidal Stage: FLOOD		Tidal Elevation:				
GPS Long: 123° 50' 28.8"		GPS Lat: 46° 57' 37.1"				
Weather Conditions: PARTLY SUNNY, 5 KNOT WIND OUT OF WEST						
Activity Taking Place: DREDGING						
Distance from Activity: 600'			Direction to Activity: WEST			
Point of Compliance: Y			Duration of Activity prior to Sample: > 4 HRS			
Notes: 2ND POC PHOTOS 64-69						
Type of Sample: Background Pt. of Compliance Mid Point #2						
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	1.493	26.4 / 17.4	Y	7.123	64.92	20430
Mid Depth	18.111	395.0 / 51.4	(N)	6.701	61.35	27530
Bottom	37.152	194.1 / 155.7	(N)	7.783	59.82	30820

pH
7.34
7.27
7.43

2ND BG

Water Quality Sampling Data Sheet

Date: 21 AUG 08 Name: CR MM Time of Sample: 1358
 Tidal Stage: FLOOD Tidal Elevation:
 GPS Long: W 123° 50' 25.2" GPS Latt: N 46° 57' 36.6"
 Weather Conditions: PARTLY SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: POC + 200' Direction to Activity: WEST
 Point of Compliance: NO Duration of Activity prior to Sample: > 4 hr
 Notes: EVALUATING HOW FAR DOWNCURRENT NC EXTENDS
 DUE TO TIDE STARTING TO GO SLACK AND DISTANCE FROM ACTIVITY
 WE BELIEVE UPSTREAM/EAST EXTENT OF TURBIDITY TO BE POC+250'
 Type of Sample: Background Pt. of Compliance Mid Point POC+200'

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.767	20.8 17.4	Y	7.593	64.62	21310	7.35
Mid Depth	20.876	74.3 51.4	N	7.547	60.26	30030	7.42
Bottom	39.613	153.5 155.7	Y	7.777	59.78	30840	7.44

MUCH REDUCED FROM POC

Date: 21 AUG 08 Name: CR MM Time of Sample: 1729
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: W 123° 50.739' GPS Latt: N 46° 57.635'
 Weather Conditions: PARTLY SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: EAST
 Point of Compliance: N Duration of Activity prior to Sample: > 4 hrs +
 Notes: 1.5 hr break
 Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.530	- 14.7	-	8.260	63.68	27080	7.57
Mid Depth	22.642	- 26.0	-	8.028	59.32	31950	7.49
Bottom	43.991	- 54.9	-	8.105	58.98	32240	7.49

12

Water Quality Sampling Data Sheet

Date: 21 AUG 08	Name: CR MM	Time of Sample: 1743
Tidal Stage: SLACK	Tidal Elevation:	
GPS Long: 123° 53.522'	GPS Latt: 46° 57.604'	
Weather Conditions: PARTLY SUNNY		
Activity Taking Place: DREDGING		
Distance from Activity: 600'	Direction to Activity: WEST	
Point of Compliance: 4	Duration of Activity prior to Sample: >4hr + 1.5h break	
Notes:		

Type of Sample:	Background	<u>Pt. of Compliance</u>	Mid Point				
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.594	16.7 14.7	Y	8.073	63.61	26920	7.53
Mid Depth	21.791	21.2 26.0	Y	8.078	59.09	32080	7.49
Bottom	43.429	24.8 54.9	Y	8.160	58.92	32390	7.5

Date:	Name:	Time of Sample:				
Tidal Stage:	Tidal Elevation:					
GPS Long:	GPS Latt:					
Weather Conditions:						
Activity Taking Place:						
Distance from Activity:	Direction to Activity:					
Point of Compliance:	Duration of Activity prior to Sample:					
Notes:						
Type of Sample:	Background	Pt. of Compliance	Mid Point			
Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface						
Mid Depth						
Bottom						

Water Quality Sampling Data Sheet

Date: 22 AUG 08 Name: CR MM Time of Sample: 1830
 Tidal Stage: SLACK (EBBING) Tidal Elevation:
 GPS Long: 123° 51' 02.3" GPS Latt: 46° 57' 42.2"
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: WEST
 Point of Compliance: N Duration of Activity prior to Sample: ~1hr

Notes: LATE START DUE TO DREDGE NOT WORKING, PERFORMING MAINT. AND REPAIRS. TIDE INTO EBB BUT NOT GREAT CURRENT.

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.666	11.1	—	8.804	64.30	23160	7.56
Mid Depth	24.340	16.7	—	9.008	59.84	29870	7.59
Bottom	48.356	14.9	—	9.038	59.48	30070	7.58

Date: 22 AUG 08 Name: CR MM Time of Sample: 1843
 Tidal Stage: SLACK (EBBING) Tidal Elevation:
 GPS Long: 123° 51' 13.9" GPS Latt: 46° 57' 46.4"
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 600' Direction to Activity: EAST
 Point of Compliance: Y Duration of Activity prior to Sample: ~1hr

Notes: INTERMITTENT DREDGING

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.684	11.2 / 11.1	Y	9.104	65.22	21980	7.62
Mid Depth	19.573	14.4 / 16.7	Y	8.992	59.69	29960	7.58
Bottom	40.969	12.8 / 14.9	Y	9.079	59.50	30050	7.57

Water Quality Sampling Data Sheet

Date: 22 AUG 08 Name: CR MM Time of Sample: 1856
 Tidal Stage: SLACK (EBBING) Tidal Elevation:
 GPS Long: 123° 51' 11.9" GPS Lat: 46° 57' 44.8"
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: EAST
 Point of Compliance: ~~A~~ N Duration of Activity prior to Sample: ~2hr

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.52	10.2 / 11.1	NA	8.973	64.61	22640	7.59
Mid Depth	19.919	18.4 / 16.7	NA	8.917	59.96	29740	7.56
Bottom	39.371	41.0 / 14.9	NA	9.019	59.64	30010	7.51

Date: 22 AUG 08 Name: CR MM Time of Sample: 1949
 Tidal Stage: EBBING Tidal Elevation:
 GPS Long: 123° 51' 01.8" GPS Lat: 46° 57' 42.9"
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: WEST
 Point of Compliance: N Duration of Activity prior to Sample: > 2hr

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.292	- / 10.0	-	8.651	65.19	19920	7.53
Mid Depth	22.931	- / 17.5	-	8.860	59.75	29900	7.56
Bottom	44.715	- / 15.2	-	8.842	59.59	30010	7.50

Water Quality Sampling Data Sheet

Date: 22 AUG 08	Name: CR MM	Time of Sample: 2000
Tidal Stage: EBBING	Tidal Elevation:	
GPS Long: W 123° 51.254	GPS Latt: N 46° 57.774	
Weather Conditions: SETTING SUN		
Activity Taking Place: DREDGING		
Distance from Activity: 600Y	Direction to Activity: EAST	
Point of Compliance: Y	Duration of Activity prior to Sample: ~ 2 hr	

Notes:
 * Current increasing, probe probably not reaching bottom

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	1.431	12.4 10.0	Y	8.675	64.88	20510
Mid Depth	17.297	23.2 17.5	Y	8.780	60.49	29060
Bottom *	30.775	12.6 15.2	Y	8.798	60.23	29430

PLA
7.51
7.54
7.55

GETTING TOO LATE TO DO MID POINT

Date:	Name:	Time of Sample:
Tidal Stage:	Tidal Elevation:	
GPS Long:	GPS Latt:	
Weather Conditions:		
Activity Taking Place:		
Distance from Activity:	Direction to Activity:	
Point of Compliance:	Duration of Activity prior to Sample:	

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface		 				
Mid Depth		 				
Bottom		 				

Water Quality Sampling Data Sheet

Date: 23 AUG 08 Name: MM CR Time of Sample: 1202
 Tidal Stage: LOW SLACK Tidal Elevation:
 GPS Long: 123° 51.166 GPS Latt: 46° 57.754
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 300' Direction to Activity: WEST
 Point of Compliance: N Duration of Activity prior to Sample: >4 hr

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	1.477	13.0	—	8.467	64.55	15660
Mid Depth	18.755	56.8	—	8.520	62.38	23360
Bottom	38.297	23.9	—	9.197	60.93	29530

PH
7.38
7.45
7.58

Date: 23 AUG 08 Name: MM CR Time of Sample: 1214
 Tidal Stage: SLACK Tidal Elevation:
 GPS Long: 123 51.369 GPS Latt: 46° 57.806
 Weather Conditions: SUNNY
 Activity Taking Place: DREDGING
 Distance from Activity: 600' Direction to Activity: EAST
 Point of Compliance: Y Duration of Activity prior to Sample: >4 hr

Notes: dredging ceased just after last sample - we will not take midpoint

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)
Surface	1.571	15.1 13.0	Y	8.526	64.36	16140
Mid Depth	15.226	22.9 56.8	Y	8.518	63.08	20420
Bottom	29.832	32.7 23.9	Y	9.104	61.05	29250

PH
7.39
7.44
7.57

17

Water Quality Sampling Data Sheet

Date: 23 AUG 08	Name: MM CR	Time of Sample: 1432
Tidal Stage: FLOOD	Tidal Elevation:	
GPS Long: 123° 51.321	GPS Latt: 46° 57.799	
Weather Conditions: SUNNY, 5-10 KNOT WIND		
Activity Taking Place: DREDGING		
Distance from Activity: 300'	Direction to Activity: EAST	
Point of Compliance: N	Duration of Activity prior to Sample: >4 hr	

Notes:

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.390	13.5	—	9.134	64.7	17950	7.48
Mid Depth	14.622	15.5	—	9.566	62.64	24360	7.57
Bottom	31.764	72.1	—	10.068	60.89	29920	7.64

Date: 23 AUG 08	Name: CR MM	Time of Sample: 1443
Tidal Stage: FLOOD	Tidal Elevation:	
GPS Long: 123° 51.152	GPS Latt: 46° 57.718	
Weather Conditions: SUNNY 5-10 KNOT WIND		
Activity Taking Place: DREDGING		
Distance from Activity: 600'	Direction to Activity: WEST	
Point of Compliance: Y	Duration of Activity prior to Sample: >4 hr	

Notes: 1st turbidity reading resulted from probe striking bottom. Took second reading. Re-sampled bottom for five continuous minutes to ensure 2nd reading was accurate

Type of Sample: Background Pt. of Compliance Mid Point

Parameter	Depth (ft)	Turbidity (NTU) Actual/Bckgrd	Compliance (yes or no)	Dissolved Oxygen (mg/L)	Temp (C)	Salinity (PSU)	PH
Surface	1.533	13.9	Y	9.047	66.07	16890	7.49
Mid Depth	16.960	19.6	Y	9.521	62.55	26280	7.60
Bottom *	34.949	159.7	Y	9.585	60.90	30070	7.61

78.3
2nd reading

FIRST READING OF 159.7 WAS DUE TO SEDIMENT CAUGHT IN PROBE WHEN HIT BOTTOM. 2ND READING AT BOTTOM MORE ACCURATE. MONITORED BOTTOM READING FOR ABOUT 5 MINUTES TO BE SURE

Appendix D

Water Quality Compliance Data

Appendix D: Table 1. Dredging Water Quality Compliance Data – Grays Harbor Dredging Fiscal Year 2008 – Low Flow Conditions

Date	Time	Tidal Stage	Location	Surface ¹					Mid-Depth ²					Bottom ³				
				Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)	Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)	Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)
8/19/08	1530	Slack	Background	1.8	16.1	7.004	62.3	32280	23.6	28.4	6.512	59.24	35890	45	72.6	6.574	59.05	36050
8/19/08	1630	Slack	POC	1.8	14.0	6.775	61.45	33140	16.6	14.7	6.602	59.41	35840	36.3	30.0	6.480	58.97	36100
8/19/08	1645	Slack	Mid-Point	2.3	19.4	6.856	61.51	33000	17.6	18.1	6.626	59.30	35980	34.1	28.1	6.561	58.97	36250
8/19/08	1835	Ebb	Background	1.0	42.7	7.230	62.06	32020	15.2	49.1	6.779	60.82	34130	N/A (a)				
8/19/08	1900	Ebb	POC	1.8	58.8 (d)	6.908	61.25	33210	18.6	48.2	6.641	60.97	33680	67.8	58.3	6.554	59.81	35360
8/19/08	1915	Ebb	Background (Resample)	2.0	52.8	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C
8/20/08	1428	Flood	Background	1.9	18.8	7.472	62.28	27520	17.1	30.5	7.315	60.68	30520	35.4	125.0	7.383	59.54	32420
8/20/08	1453	Flood	POC	3.1	61.5 (d)	7.465	61.31	31970	21.3	73.4 (b)	7.335	59.83	31970	43.0	154.3 (d)	7.270	59.64	32140
8/20/08	1511	Flood	Background (resample)	1.8	16.1	7.553	62.29	27780	18.1	22.8	7.576	60.71	30710	37.4	109.9	7.623	59.06	32980
8/20/08	1528	Flood	POC (resample)	1.8	17.0	7.696	61.43	29520	21.4	43.5 (c)	7.604	59.44	32590	41.4	124.0	7.605	58.97	33080
8/20/08	1634	Slack	Background	2.1	12.4	7.749	62.53	28040	20.0	17.9	7.666	59.48	32350	39.0	43.3	7.685	58.65	33160
8/20/08	1653	Slack	POC	1.7	18.1	7.619	61.92	29340	20.5	64.2(e)	7.492	58.82	33090	40.9	125.4 (e)	7.446	58.90	33140
8/20/08	1718	Slack	Background (resample)	1.8	24.7	7.724	61.83	29320	20.5	70.5	7.677	58.81	32920	40.5	39.8	7.693	58.58	33230
8/20/08	1731	Slack	POC (resample)	1.9	16.2	7.809	61.69	29650	23.3	15.3	7.713	58.90	32960	46.5	38.0	7.732	58.73	33100
8/21/08	1300	Flood	Background	1.9	17.8	7.498	64.96	19110	19.3	74.2	7.426	61.02	28580	38.1	204.3	7.585	59.97	30630
8/21/08	1313	Flood	POC	1.6	20.6	7.460	64.75	19530	20.1	163.5 (b)	7.420	60.95	28990	40.7	216.0	7.667	59.86	30800
8/21/08	1329	Flood	Background (resample)	1.6	17.4	7.763	64.75	20190	20.2	51.4	7.872	61.52	26620	40.4	155.7	9.354	59.96	30670
8/21/08	1341	Flood	POC (resample)	1.5	26.4	7.123	64.92	20430	18.1	395.0 (c)	6.701	61.35	27530	37.2	194.1 (b)	7.783	59.82	30820
8/21/08	1358	Flood	POC + 200'	1.8	20.8	7.593	64.62	21310	20.9	74.3 (f)	7.547	60.26	30030	39.6	153.5	7.717	59.78	30840
8/21/08	1729	Slack	Background	1.5	14.7	8.260	63.68	27080	22.6	26.0	8.028	59.32	31950	44.0	54.9	8.105	58.98	32240
8/21/08	1743	Slack	POC	1.6	16.7	8.073	63.61	26920	21.8	21.2	8.078	59.09	32080	43.4	24.8	8.160	58.92	32390

Date	Time	Tidal Stage	Location	Surface ¹					Mid-Depth ²					Bottom ³				
				Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)	Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)	Depth (feet)	Turbidity (NTU)	DO (mg/l)	Temp (°F)	Conductivity (µS)
8/22/08	1830	Slack	Background	1.7	11.1	8.804	64.30	23160	24.3	16.7	9.008	59.84	29870	48.4	14.9	9.038	59.48	30070
8/22/08	1843	Slack	POC	1.7	11.2	9.104	65.22	21980	19.6	14.4	8.992	59.69	29960	41.0	12.8	9.079	59.50	30050
8/22/08	1949	Ebb	Background	1.3	10.0	8.651	65.19	19920	22.9	17.5	8.860	59.75	29900	44.7	15.2	8.842	59.59	30010
8/22/08	2000	Ebb	POC	1.4	12.4	8.675	64.88	20510	17.3	23.2	8.780	60.48	29060	30.8	12.6	8.798	60.23	29430
8/23/08	1202	Slack	Background	1.5	13.0	8.467	64.55	15660	18.8	56.8	8.520	62.38	23360	38.3	23.9	9.197	60.93	29530
8/23/08	1214	Slack	POC	1.6	15.1	8.526	64.36	16140	15.2	22.9	8.518	63.08	20420	29.8	32.7	9.104	61.05	29250
8/23/08	1432	Flood	Background	1.4	13.5	9.134	64.70	17950	14.6	15.5	9.566	62.64	24360	31.8	72.1	10.068	60.89	29920
8/23/08	1443	Flood	POC	1.5	13.9	90.47	66.07	16890	17.0	19.6	9.521	62.55	26280	34.9	78.3	9.585	60.90	30070

Notes:

Compliance standards at the compliance point were (1) turbidity no greater than 10 NTUs above background if background < 50 NTUs, and no greater than 20% of background above background if background > 50 NTUs.

Compliance standards at the point of compliance for DO were (2) DO no lower than 5 mg/l.

Sampling locations for the Background point were located 300 feet "up current" from dredging activity.

Sampling locations for the Compliance point were located 600 feet "down current" from dredging activity. Exceedances are highlighted in yellow.

1 Surface = ~2 feet below surface of water

POC = Point of Compliance

a Current too strong to collect bottom sample

2 Mid-Depth = mid-depth between water surface and bottom

N/C = not collected

b Sample exceeded background turbidity by greater than 10 NTUs or 20% greater if background is > 50 NTUs

3 Bottom = ~2 feet above bottom

c Sample confirmed exceedance as it also exceeded confirmed background turbidity by greater than 10 NTUs or 20% greater if background is > 50 NTUs

d Sample exceeded background turbidity by greater than 10 NTUs; however, subsequent samples did not exceed background by greater than 10 NTUs or 20% greater if background is > 50 NTUs at the POC or showed increased levels of background turbidity. Therefore, this sample is not considered a true exceedance.

e Although resample indicated compliance, the tide had started to shift from slack to ebb

f Additional sample to evaluate extent of exceedance

Appendix E

Photographs

Photo 1. Monitoring water quality.



Photo 2. Dredging Patriot and barge.



Photo 3. Actively dredging, grabbing from the bottom and pulling up.



Photo 4. Depositing dredge material into barge.



Photo 5. Surface conditions for the verified exceedance on the 20th flood sample at the point of compliance.



Photo 6. Surface conditions for the verified exceedance on the 21st flood sample at the point of compliance.



Table 1. Photo Index

Photo Number	Date	Time	Caption
1	8/20/2008	16:39	Monitoring water quality.
2	8/20/2008	16:39	Dredging <i>Patriot</i> and barge.
3	8/21/2008	13:31	Actively dredging, grabbing from the bottom and pulling up.
4	8/21/2008	13:31	Depositing dredge material into barge.
5	8/20/2008	15:42	Surface conditions for the verified exceedance on the 20th flood sample at the point of compliance.
6	8/21/2008	13:54	Surface conditions for the verified exceedance on the 21st flood sample at the point of compliance.