PORTLAND HARBOR RI/FS

# ROUND 3A
# UPSTREAM & DOWNSTREAM SEDIMENT DATA REPORT
# ADDENDUM 1: RADIOISOTOPE CORES

DRAFT

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# TABLE OF CONTENTS

TABLE OF CONTENTS ..... i

LIST OF TABLES ..... i

LIST OF ACRONYMS ..... ii

1.0 INTRODUCTION ..... 3
1.1 Round 3A Sampling Objectives ..... 3
1.2 Report Organization ..... 4

2.0 DATA COLLECTION ACTIVITIES ..... 5

3.0 LABORATORY ANALYSES AND DATA MANAGEMENT ..... 6
3.1 Radioisotope Analyses ..... 6
3.2 Data Validation ..... 6
3.3 Data Quality And Usability ..... 7
3.4 Laboratory Deviations from QAPP ..... 8
3.5 Data Management ..... 8

4.0 ROUND 3A RESULTS ..... 9

5.0 REFERENCES ..... 10

# LIST OF TABLES

Table 4-1. Radioisotope Results for Round 3A Upstream Subsurface Sediment Samples

# LIST OF ACRONYMS

| | |
|---|---|
| $^{7}$Be | beryllium-7 |
| $^{137}$Cs | cesium-137 |
| EDD | electronic data deliverable |
| EPA | U.S. Environmental Protection Agency |
| EQuIS | Environmental Quality Information System |
| FSP | field sampling plan |
| FSR | field sampling report |
| $^{210}$Pb | lead-210 |
| LWG | Lower Willamette Group |
| MARLAP | Multi-Agency Radiological Laboratory Analytical Protocols |
| NRC | U.S. Nuclear Regulatory Commission |
| QA | quality assurance |
| QC | quality control |
| QAPP | quality assurance project plan |
| $^{226}$Ra | radium-226 |
| RI/FS | remedial investigation and feasibility study |
| RPD | relative percent difference |

# 1.0 INTRODUCTION

The remedial investigation and feasibility study (RI/FS) of the Portland Harbor Superfund Site includes several rounds of field sampling activities to investigate the nature and extent of contamination at the Site, to assess potential risk to human health and the environment, and to develop cleanup alternatives.

The Round 3A Upstream & Downstream Sediment Data Report (Round 3A Data Report; Integral 2007a) summarizes the results from the January 30 to February 8, 2007, sample collection effort. This Addendum 1 to the Round 3A Data Report presents the results from the radioisotope cores collected during the upstream sediment sample collection effort. A detailed description of the Round 3A sediment sampling, including the radioisotope cores, is included in the Round 3A Upstream & Downstream Sediment Field Sampling Report (FSR; Integral 2007b). Evaluation of all Round 3A upstream and downstream sediment data will be presented in the Round 3B Sediment Field Sampling Plan (FSP) Addendum.

Radioisotope analyses were conducted on sediment from cores collected in known long-term depositional areas in order to support the characterization of contaminant loading to the upper study area from upstream over time. The upstream sediment samples were collected and processed per the protocols used in Round 2A and Round 2B. Except where noted in the Round 3A FSR, all Round 3A subsurface sediment field activities, including vessel positioning, sample collection, sample handling and processing, and data management, followed guidelines specified in the Round 3A FSP for Upstream & Downstream Sediment Sampling (Integral 2006), the Round 2 Quality Assurance Project Plan (QAPP; Integral and Windward 2004), and the Round 2 Health and Safety Plan (Integral 2004).

## 1.1 ROUND 3A SAMPLING OBJECTIVES

The objectives of the overall Round 3 upstream and downstream sampling program are listed in Tables 1 and 2 of the Lower Willamette Group's (LWG's) response letter to the United States Environmental Protection Agency's (EPA's) Round 3 Data Gaps Memorandum (LWG 2006). The primary objectives of the upstream and downstream sampling program are summarized in the Round 3A Data Report (Integral 2007a).

## 1.2 REPORT ORGANIZATION

The remaining sections of this document include a summary of the data collection activities (Section 2); details on the laboratory sample analyses, data quality reviews, and data management (Section 3); the radioisotope results (Section 4); and references (Section 5).

# 2.0 DATA COLLECTION ACTIVITIES

During the January 30 to February 8, 2007 sampling event, subsurface sediment was collected for radioisotope analyses at three locations (RC01, RC02, and RC483) in the upper study area. The radioisotope chemistry core locations are shown in Figure 2-1 of the Round 3A Data Report (Integral 2007a). Radioisotope sample locations and corresponding station numbers are listed in Table 2-1 of Integral (2007a). Table 2-3 of Integral (2007a) summarizes the analyses performed for the subsurface sediment core stations, including the radioisotope cores. Core logs for the radioisotope cores are provided in Appendix C of Integral (2007a).

The radioisotope cores were subsectioned into 2-cm intervals throughout the entire depth of each core, with a subset of these segments submitted for radioisotope analysis per Figure 5-1 of the Round 3A FSP (Integral 2006). Round 3A sediment sampling and processing followed the procedures specified in the Round 3A FSP and the Round 2 QAPP (Integral and Windward 2004). Deviations from sample collection procedures and guidelines specified in the FSP and QAPP are discussed in the FSR (Integral 2007b). Deviations from the analytical methods specified in the FSP, project QAPP, and laboratory QAPP (Appendix E; Integral 2006) for radioisotope analysis are summarized in Section 3.4 in this data report addendum.

# 3.0 LABORATORY ANALYSES AND DATA MANAGEMENT

This section describes the laboratory methods used to analyze the sediment samples for radioisotopes. Any deviations from the analytical methods detailed in the radioisotope laboratory's QAPP (Appendix E; Integral 2006) are described below. The data management subsection describes the data validation process from receipt of the laboratory data package to the generation of a final validated electronic data deliverable (EDD).

## 3.1 RADIOISOTOPE ANALYSES

Texas A&M University at Galveston's (TAMU-G) Laboratory for Oceanographic and Environmental Research performed the radioisotope analysis. Thirty-five samples from core RC01, 38 samples from core RC02, and 38 samples from core RC483 were submitted to the laboratory for the analysis of radioisotopes beryllium-7 ($^{7}$Be), radium-226 ($^{226}$Ra), cesium-137 ($^{137}$Cs), and lead-210 ($^{210}$Pb). Analytical methods followed those described in the laboratory's QAPP.

Sediment samples of approximately 10 grams were assayed by non-destructive gamma counting for one to two days in a low-background, high-efficiency high-purity Germanium well detector for radioisotopes $^{7}$Be, $^{226}$Ra, and $^{137}$Cs. For radioisotope $^{210}$Pb, approximately 1 gram of sediment underwent wet chemical digestion followed by polonium separation and plating for alpha counting using a Quad Alpha Spectrometer with ultra-low background surface barrier detectors.

## 3.2 DATA VALIDATION

The Round 2 QAPP requires that approximately 10% of the sediment data undergo full validation, and the remaining data are subjected to Level 3 data validation, unless problems are encountered. The Round 3A radioisotope data were fully validated with 100% verification of the results. The full validation effort was deemed necessary due to the number of transcription errors found during the 10% check. Initial validation of the radioisotope data was performed by TAMU-G, followed by full validation performed by Integral.

The radioisotope data were validated in accordance with guidance specified by the U.S. Nuclear Regulatory Commission's (NRC's) Regulatory Guide 4.15 – Quality Assurance for Radiological Monitoring Programs (NRC 2006), by the Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP; EPA et al. 2004), and by *Guidance on Environmental Data Verification and Validation* (EPA 2002). Data qualifiers were assigned during data validation if applicable

control limits were not met, in general accordance with the EPA data validation guidelines and the QC requirements included in the referenced methods.

The following laboratory deliverables were reviewed during the full data validation:

- The case narrative discussing analytical problems (if any) and procedures
- Chain-of-custody documentation and laboratory sample receipt logs
- Instrument background and blank results
- Results for laboratory replicates
- Radioisotope results for the sediment samples
- Instrument standard reference material results for $^{7}$Be, $^{226}$Ra, and $^{137}$Cs analyses, and internal standard results for $^{210}$Pb analysis
- Review of instrument data to verify radioisotope results.

Any errors found during the data verification process were reported to the laboratory. The laboratory then made corrections to their calculation sheets and regenerated their data report. The revised EDDs were then incorporated into the project database, as described in Section 3.5.

## 3.3 DATA QUALITY AND USABILITY

Data quality and usability were evaluated based on guidance specified by the NRC's Regulatory Guide 4.15 (NRC 2006), by the MARLAP Manual (EPA et al. 2004), and by EPA (2002).

The precision, accuracy, representativeness, and comparibility of the data were assessed during data validation in general accordance with the Round 2 QAPP, and details of this evaluation are included in Appendix A. Completeness is calculated by comparing the total number of acceptable data (non-rejected data) to the total number of data points generated. Completeness for the Round 3A radioisotope data is 100%, which exceeds the QAPP completeness objective of 95%.

All radioisotope data are considered acceptable as reported by the laboratory, and are fully usable for all data uses summarized in the Round 3A FSP for Upstream & Downstream Sediment Sampling (Integral 2006).

## 3.4 LABORATORY DEVIATIONS FROM QAPP

The radioisotope samples were analyzed according to methods described in the FSP (Integral 2006) and QAPP (Appendix E; Integral 2006) with no deviations.

## 3.5 DATA MANAGEMENT

Once the laboratory completed its internal quality assurance/quality control (QA/QC) checks, it provided the analytical data in an Excel® format. During the data validation effort, the information in the EDD was verified against the raw data reporting sheets from the laboratory. The laboratory was then instructed to correct errors and track changes in the EDD for verification purposes. Integral then imported the corrected results into the project's Environmental Quality Information System (EQuIS) database as described in the Round 3A Data Report (Integral 2007a).

# 4.0 ROUND 3A RESULTS

A total of 111 samples (35 samples from core RC01, 38 samples from core RC02, and 38 samples from core RC483) were submitted for $^{7}$Be, $^{226}$Ra, $^{137}$Cs, and $^{210}$Pb radioisotope analyses. Results for the Round 3A radioisotope cores are summarized in Table 4-1.

# 5.0 REFERENCES

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