

Appendix I

Long-Term Maintenance and Monitoring Plan Outline

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This appendix provides an outline of the Long-Term Monitoring and Maintenance Plan (LTMMP) for the LDW upper reach remedial design (RD). An annotated outline will be provided with the Pre-Final (90%) RD and the LTMMP will remain as an annotated outline in the Final (100%) RD. The implementing entity will complete and implement the LTMMP after construction is complete.

The purpose of the LTMMP is to specify the actions that will be taken to assess the long-term remedy performance in terms of the Record of Decision criteria and the integrity of the remedial actions, and to present maintenance or adaptive management activities that will be conducted in the event that performance objectives are not being met. The LTMMP will describe details of long-term monitoring and maintenance, including performance standards; sampling intervals, analytes, location density, and frequency; interim benchmarks; and associated follow-up actions.

The LTMMP will be developed in accordance with *Guidance for Management of Superfund Remedies in Post Construction* (EPA, 2017) and will include elements from the baseline study designs and recommendations as described in the Pre-Design Studies Data Evaluation Report (Windward, 2020). The LTMMP will include both LDW-wide monitoring elements and elements specific to the remedy in the upper reach, such as specific monitoring requirements for caps, enhanced natural recovery (ENR) areas, and monitored natural recovery (MNR) in benthic sediment cleanup objective (SCO) areas. It is expected that the LTMMP will be amended to include specific requirements for the middle and lower reaches following their construction.

1. Introduction

- a. Purpose
- b. Project organization: U.S. Environmental Protection Agency, Washington State Department of Ecology, Implementing Entity, and other parties
- c. Project background
 - i. Description of remedial actions
 - (a) Upper Reach
 - (b) Middle Reach (TBD)
 - (c) Lower Reach (TBD)
 - ii. Baseline monitoring
- d. Long-term monitoring objectives
 - i. Measuring progress toward compliance with cleanup levels
 - ii. Remedy performance
 - iii. Risk communication
- e. Summary and schedule of monitoring components

2. LDW-Wide Monitoring
 - a. LDW-wide and area-wide monitoring components
 - i. Sediments
 - ii. Tissue
 - iii. Surface water
 - b. Phasing of LDW-wide monitoring with remediation of the upper reach, middle reach, and lower reach
3. Technology-Specific Monitoring Requirements
 - a. Monitoring in technology areas
 - i. Cap areas
 - (a) Physical monitoring (e.g., bathymetric surveys)
 - (b) Sediment chemistry
 - ii. ENR areas
 - (a) Sediment chemistry
 - iii. MNR to benthic SCO areas
 - (a) Sediment chemistry
 - iv. Mitigation sites (if applicable)
 - b. Contingency monitoring
 - i. Event-driven physical monitoring for cap and mitigation areas
 - (a) Vessel grounding
 - (b) Seismic event
 - (c) High-flow event
 - c. Maintenance
 - i. Cap areas
 - ii. Mitigation sites (if applicable)
4. Methods
 - a. Field methods
 - b. Laboratory methods
 - c. Quality control and quality assurance procedures
 - d. Data management
5. Monitoring and Maintenance Documentation and Reporting
 - a. Report outline
 - b. Five-year reviews
6. Estimated Annual and Periodic Costs
7. References

Appendices

- A. LTMMP Quality Assurance Project Plan
- B. Health and Safety Plan

References

EPA (U.S. Environmental Protection Agency), 2017. *Guidance for Management of Superfund Remedies in Post Construction*. Office of Superfund Remediation and Technology Innovation. OLEM 9200.3-105. February 2017.

Windward, 2020. *Lower Duwamish Waterway Pre-Design Studies Data Evaluation Report (Task 6)*. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.