EF-A 01

Ridgefield Pits Alternatives Assessment – Conceptual Design

Reach: EF Lewis 6B, Dyer Cr 1 and 2
River mile: 7.3 - 8.3
Reference page in main document: 73

Assessment Project Description

During the flood of 1996, the East Fork Lewis River avulsed into a series of gravel mine pits (aka Ridgefield Pits) which it continues to occupy. As a result of stream capture, approximately 4,000 lineal feet of key spawning and rearing habitat have been lost and there are significant concerns with respect to other habitat factors including temperature, sediment transport, channel dynamics, and invasive species. Due to historical gravel mining in this area, there is a very large deficit of valley bottom material. The stream now courses through a series of large deep ponds that favor invasive and predatory species. The riparian and floodplain area is severely degraded and overrun with invasive plant species. The purpose of this assessment is to collect information to help evaluate alternatives for re-configuring this reach to enhance habitat. The information gathered will also help clarify opportunities and constraints associated with both active and passive restoration strategies in this area.

The objectives of the Ridgefield Pits Alternatives Assessment are the following:

1) Evaluate alternatives for this reach that will enhance habitat conditions and recover channel function to the extent possible. Alternatives should range from no-action to full reach re-configuration.
2) Develop conceptual designs for restoration alternatives. These might also include designs for restoration alternatives in lower Dyer Creek.
3) Conduct field data collection and technical analyses that are necessary to support the above objectives.

Data Collection and Analysis

The following data collection and analysis activities will be necessary to support the alternatives assessment. These activities have some overlap with data collection and analysis tasks outlined as part of the Daybreak Pits Avulsion Risk Assessment (project #EF-A 02). Conducting these assessments in tandem would reduce the total time and costs.

Site Topographic Survey

- Conduct a topographic survey of the key features of the site. The project area is bounded by the valley wall to the southwest and the Daybreak Pits area to the northeast, and encompasses approximately 200 acres. The survey will need to cover the entire valley bottom in order to conduct hydraulics analysis; however, a detailed topographic survey is not required and LiDAR data will likely be adequate for extending the survey data to areas far from the current river channel. The survey will need to primarily focus on the 200 acres that make up the spatial extent of potential treatments and will need to include key features such as terrace topography, levees, and the dimensions of the Ridgefield Pits. This data will be used to determine cut and fill quantities that may be associated with various treatment alternatives. Cross sections and channel profiles will be needed to support hydraulic analysis. Water surface elevations and the elevation of surface expressions of groundwater should be surveyed in order to calibrate the hydraulic model and to support the analysis. Data from past topographic surveys and available LiDAR data should be incorporated into the survey if these data sources are deemed accurate, up-to-date, and useful for the study.

Hydrology and Hydraulics

- Determine river flow volumes for a range of flood recurrence intervals to be used in the alternatives assessment. Develop flow duration relationships to be used in hydraulic analysis. Much of this information has been compiled as part of past investigations but should be updated with recent flow data.
- A hydraulic model will need to be developed in order to evaluate flow and sediment transport conditions through the reach. Hydraulic modeling will be used to evaluate existing conditions as well as the treatment alternatives that are developed as part of this effort. Hydraulic modeling should build off of existing hydraulics analysis to the extent possible. It is assumed that existing hydraulic models available for the site will require significant revision due to recent channel changes and may therefore have limited utility in this analysis; however, they may be useful for obtaining model parameters.
- Flood inundation extents at a range of flow levels should be mapped throughout the project area and depicted on aerial photo maps.
- Groundwater flow conditions, including the seasonal elevation of water tables and the transmissivity of streambed and terrace deposits should be characterized throughout the site. These data will help determine the required elevations, dimensions, and boundary material composition for treatment alternatives that require construction of new channels through the site. Groundwater analysis will require sampling wells and test pits throughout the floodplain terrace area.

Sediment Transport and Geomorphic Analysis

- Substrate and sediment sampling will be required at multiple locations throughout the site to characterize the erodibility of riverbed, riverbank, and floodplain materials. These data will support incipient motion calculations used to characterize bed and bank mobility conditions for the existing condition and the various restoration alternatives.
- Equilibrium sediment conditions should be characterized to determine trends in sediment aggradation and incision. This will require estimating potential sediment volumes contributed from upstream sources. It is assumed that the volume of upstream-derived sediment needed for the analysis can be estimated without completing a detailed sediment budget for the basin.
- Evaluate the rate of filling of the Ridgefield Pits by comparing post-avulsion pit volumes to current pit volumes and by using sediment budget and transport data. Update existing estimates (WEST 2001) of the time required for the river to naturally fill the pits.
- Estimate the ability of the river to transport sand and larger material through the avulsed reach at a range of flows. Estimate the amount of bed material likely to be trapped within the ponds and determine the likely impact to the stream reach below the pits.
- Historic flooding and channel migration conditions should be characterized. Historic conditions, in combination with existing conditions and land-use, can help to identify treatment alternatives that may be well-suited to the site.
- Build off of existing analyses (e.g. WEST 2001). Include a review of past assumptions and data sources and incorporate newer data.

Aquatic Species Surveys

- Conduct presence/absence surveys for salmon and trout and other important aquatic species, such as western pond turtles and red-legged frogs. Conduct surveys also for invasive and predatory species within the Ridgefield Pits and in upstream and downstream locations.

Temperature Monitoring

- Temperature monitoring should be conducted to determine the temporal and spatial temperature profile of the mainstem river in relationship to the ponds. This assessment overlaps with the Temperature and Groundwater Assessment (EF-A 03) and will be covered under that project if it is carried forward.
- Two loggers will be placed in each pond (top and bottom of the water column) to establish the temperature profile of each captured mine pit. As many as 14 data loggers will be placed throughout the reach to detect changes in temperature related to the captured mine pits. At least 1 temperature logger will collect ambient air temperatures throughout the season.
- The temperature monitoring period will extend from June 1st to October 31st. Logger calibration and deployment will follow WA Department of Ecology temperature monitoring protocol. Logger locations will be geo-referenced using GPS waypoints and aerial photographs, and other notes regarding their specific location.

Evaluation of Treatment Alternatives

Treatment alternatives will be determined as part of the analysis and in consideration of stakeholder objectives. A few of the potential treatment alternatives that might be considered are included below. The alternatives to be evaluated range from no-action to full reach re-configuration. These alternatives will be evaluated as to their impact on channel processes and habitat conditions. There will likely be additional alternatives or combination alternatives that will be developed as part of the analysis.

- No action: This alternative should be considered in the analysis and evaluated with respect to existing and future impacts on aquatic species.
- Habitat enhancement within the existing alignment: This alternative assumes that no major site re-configuration occurs but that existing habitat is enhanced to the extent possible. Enhancement activities may include, but are not limited to: 1) installation of habitat features (e.g. LWD, boulders) in the channel and pond areas, 2) restoration of riparian, floodplain, and wetland vegetation, including control of invasive species, 3) manipulation of connected ponds to maximize rearing conditions, and 4) pumping or otherwise routing cool groundwater flow into the pits to reduce high summer temperatures.
- Fill ponds: Completely or partially fill existing ponds using local and off-site materials. It will be necessary to ensure that materials within the maximum scour-depth of the channel are appropriately-sized to satisfy sediment transport and habitat requirements. Material from other projects, such as levee removals, excavation for wetlands, or excavation for off-channel rearing could potentially be used to fill the pits. Required volumes, sources, and costs should be provided, as well as the potential effects on channel processes and habitat.
- Isolate the pits from the river: This alternative would use fill material to isolate the pits from the existing river channel. The channel would be left more or less in its current location. The river channel itself could be potentially filled to

restore the long profile, or left to refill on its own. For this alternative, it will be necessary to evaluate 1) the effects of continued subsurface connection with the pits, 2) potential for re-avulsion into the pits, and 3) the effect of impacts to flooding and channel migration processes.

- Re-route the river channel: This alternative would completely re-route the river out of the pits and into a new alignment, either into its pre-1996 channel (to the north) or to the south of the existing channel location. The considerations listed for the previous alternative also apply to this alternative.
- Full site re-configuration: There may be multiple options for site re-configuration that would require less import of material than complete re-filling of the pits. For example, it may be possible to fill the pits with floodplain material to establish a pool-riffle low-flow channel with a frequently inundated 'lowered' floodplain that continues to collect overbank material and re-build grade over time. Such alternatives would require comprehensive hydraulic and geomorphic investigations to determine their likelihood of success and impacts to short-term and long-term habitat conditions.

It is likely that some of the alternatives will have an impact on lower Dyer Creek, which flows through the site at the downstream end (south/west side) of the project area. Potential impacts to Dyer Creek, and any recommended habitat enhancements, should be included in the analysis of each alternative.

A recommended treatment alternative should be developed as part of this evaluation and carried forward to the 30% design level.

Access and Landownership

Access can be obtained at multiple locations throughout the site. Boat access will be required for bathymetric surveys of the mainstem East Fork Lewis River channel through the Ridgefield Pits. This site spans private and Clark County lands. No work will occur without the consent of willing landowners.


EF 38
EF 36
EF 34
DE 01
DE-P-01
River Mile 7
DE 02
Dean Creek
EF 35
Daybreak Pits
EF-A 01
Dyer Creek
EF-A 02
Ridgefield Pits
River Mile 8
Flow
0 125 250 500 750 1,000 Feet
N
Hydromodifications (from 2004 Habitat Assessment and WDFW data)
Levees (identified using LiDAR and site observations)
Improved and unimproved roadways (may include fill material)
Bank stabilization / armoring
Powerline
Project Opportunities
Parcel boundaries
Clark County Parcels
Streams
2-foot LiDAR contours
2007 aerial photography provided by Clark County
EF-A 01
RIDGEFIELD PITS ALTERNATIVES EVALUATION
PROJECT OVERVIEW MAP

Planning-level cost estimate for EF-A 01

Note: This is a preliminary cost estimate for planning purposes. Actual costs may vary substantially from these estimates. This estimate is based on assumptions for time requirements and material quantities. Additional information obtained during site investigations will be needed to determine actual quantities and costs. Estimates are based on 2009 costs.

Description	Unit	Quantity	Unit Cost	Total Cost	Comment
Site Topographic Survey	LS	1	$24,000	$24,000	Includes a crew of 3 for 1.5 weeks of surveying. Assumes existing survey data can be used for portions of the site where channel (or other) changes have not occurred.
Data Reduction and Analysis	LS	1	$4,000	$4,000	Includes CAD time and data QA/QC
Hydrology and Hydraulics	LS	1	$15,000	$15,000	Assumes 3 weeks for a hydrologist / engineer. Includes development of a hydraulic model.
Sediment Transport Analysis	LS	1	$15,000	$15,000	Assumes 0.5 week field work for two staff and 2 weeks analysis from an engineer/geomorphologist
Groundwater Monitoring	LS	1	$16,000	$16,000	Assumes 6 groundwater wells are installed and 6 test pits/pump tests are conducted. Includes purchase of data loggers and logger servicing (deployment and retrieval)
Geomorphology Analysis	LS	1	$10,000	$10,000	Assumes 2 weeks for a professional fluvial geomorphologist
Aquatic Species Surveys	LS	1	$14,000	$14,000	Assumes 2 weeks and two staff for field work and data processing
Temperature monitoring	LS	1	$10,000	$10,000	Assumes 14 data loggers. Includes equipment, deployment, retrieval, and data reduction.
Development and Evaluation of Treatment Alternatives	LS	1	$20,000	$20,000	Includes selection of a preferred alternative. Assumes 2 weeks for 2 professional engineers / fluvial geomorphologists
30% Level Design for Preferred Alternative	LS	1	$30,000	$30,000	Assumes CAD and engineering time for 15 design sheets
Implementation Sub-Total				**$158,000**	
Concept Level Implementation Contingency (20%)				$31,600	
Implementation Total				**$189,600**	
Project Delivery					Items below are calculated as a percent of the construction sub-total
Development of final report (15%)				$23,700	
Contract Administation (5%)				$7,900	
Project Delivery Sub-Total				**$31,600**	
TOTAL ESTIMATE				**$221,000**	rounded to nearest $1,000

General Notes:

Cost includes a 20% implementation contingency

All costs are figured on hourly rates of contracted workers. Entities conducting these activities in-house may be able to realize cost savings depending on hourly rates.

Costs do not include meetings with stakeholders, presentations, or multiple revisions of materials

Costs do not include wetland inventory and impacts analysis

Costs do not include any permitting

Time and resource efficiencies can be gained by conducting this project in conjunction with EF-A 02

Key

LS = Lump sum