Memorandum

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CC:	Robert Haddad, AGS
From:	David Chapman and Carolyn Wagner, Stratus Consulting Inc.
Date:	5/22/2007
Subject:	Molycorp Project Implementation Cost Estimates

Below are presented trustee cost estimates for implementing the non-groundwater proposed Molycorp NRDA compensatory restoration projects.

In this memorandum we present detailed descriptions on each of the assumptions used to develop the current cost estimates. At the end of the detailed descriptions, we present in Table A a summary of the Trustees' cost estimates

In developing these cost estimates, we have included an overall project contingency of 20% to account for unforeseen activities and costs associated with the following projects:

- Cabresto Fish Barrier
- Columbine Fish Barrier
- Fish Hatchery Passage
- Fawn Lakes
- Anderson Ranch

Below we provide a summary of the Trustee non-groundwater project implementation costs. The groundwater restoration project cost, in the amount of $2,500,000, is in addition to these detailed costs.

Summary of Trustee Project Costs Estimate

Projects		Cost
A –Cabresto		$359,000
B – Columbine		$248,300
C – Hatchery Fish Passage		$278,250
D – Fawn Lake		$135,800
E – Bitter Creek		$20,000
F – Anderson Ranch		$37,700
Sub-total		$1,079,050
Unforeseen Contingency and Oversight Costs - 25% of A, B, C, D, & F project costs)	20%	$211,810
Total Non-Groundwater Restoration Costs		**$1,290,860**

Cabresto Creek Barrier Restoration Project

Engineering Costs

Design Phase

The Design Phase Estimate is based on use of a conventional engineering analysis and design development process. This includes integration of hydrologic, geotechnical, structural, fish behavioral, and general civil engineering principles to minimize the potential for failure of the proposed facility. This analysis not only minimizes failure of the barrier but also failure by shoreline scour or barrier undermining and passage of the barrier by non-target fish species.

Site Investigation Needs

Hydrologic Needs

Identify or obtain hydrologic information to identify 'high design discharge' at barrier site

Topographic Survey

Identify low and high stream flow water surface elevations and surrounding terrain (optimizes design and assures that construction conforms with design)

Geotechnical Analysis

Conduct site soils investigation to determine bearing capacity and porosity, etc.

$20,000

Design and Specification

Development of design and barrier construction specifications based on information obtained from the Site Investigation, civil engineering principles, and desired barrier fish objectives.

$25,000

Engineering Design - Total Costs	**$45,000**

Construction Phase

The barrier would consist of a 3’ high concrete weir, symmetrical relative to the channel centerline, with flow plunging directly onto a concrete pad at the low design tail water surface. Flow plunging onto this pad would be diverted as sheet flow in the downstream direction at a velocity of over 10 fps and create a hydraulic jump downstream of the plunge pad. As discharge over the weir increases to the high design flow (yet to be determined), it would still not overtop abutment walls on both shorelines. Cutoff walls would extend into the embankment on each shoreline. The weir length and vertical distance from top of abutment walls to the weir crest would be determined by the design high discharge. Sidewalls would extend downstream from both sides of the barrier weir.

At higher weir discharges, depth on the plunge pad would be greater, but downstream velocity would still be high, and fish would have to swim upstream to the plunging flow, then swim over the plunging weir flow to pass the barrier. Details and elevations of this design are not yet reconciled. A 3’ vertical drop from forebay to tail water would occur at high design discharge, and would be enough to block non-target species from passing the barrier. The concrete weir could be constructed of either poured-in-place reinforced concrete, or (potentially) 2’x2’x6’ pre-cast concrete ecology blocks (such as at the Molycorp Red River mill water intake diversion dam).

Exclosures

Construction of three exclosures and some channel enhancement (stabilization) upstream of the barrier - costs	$20,000

Barrier

Barrier Construction - Includes stream flow bypass, excavation, concrete placement, upstream rip-rap placement, mobilization, and demobilization	$75,000
Engineering Construction - Total Costs	**$95,000**

Monitoring and Maintenance

Monitoring

Once per year for 3 years - $500 per trip	$1,500
Once per 3 years over the next 15 years	$3,000

Maintenance $7,000

Engineering Monitoring and Maintenance - Total Costs **$11,500**

Total Engineering Costs for Cabresto Barrier ***$151,500***

Biological Costs

Fish Removal

Labor

Includes costs for 2 trips per year (July and September) for 3 years in succession for 5 individuals (3 person crew in lower Cabresto and 2 in upper) with 40 hours each, including 8 hours for travel $103,114

Expenses

Includes vehicle, per diem, and misc. $8,070

Biological Implementation - Total Costs **$111,184**

Maintenance

Labor

Includes costs for 4 trips total, one in 5th, 7th, 9th, and 11th years for 3 individuals with 72 hours each, including 8 hours for travel $60,746

Expenses

Includes vehicle, per diem, and misc. costs are estimated using Molycorp's expenses per trip for 9 trips $8,347

Biological Maintenance - Total Costs **$69,093**

Monitoring		
	Monitoring costs, based on additional individual weighing and measuring RGCT and one Sr. Biologist analyzing results. Visits occur in all years of removal and maintenance (baseline estimates will occur during removal phase and change estimates during maintenance phase for a total of 7 trips – expenses included in removal and maintenance categories)	$7,172
	Biological Monitoring - Total Costs	**$7,172**
Total Biological Costs for Cabresto Barrier		***$187,449***
Permitting Costs		
Engineering & Environmental Permitting Costs		$20,000
	Permitting – Total Costs	**$20,000**
Total Estimated Costs for Cabresto Creek Barrier and Restoration Project		***$358,949***

Columbine Barrier and Preservation Project

Engineering Costs

Design Phase

The Design Phase Estimate is based on use of a conventional engineering analysis and design development process. This includes integration of hydrologic, geotechnical, structural, fish behavioral, and general civil engineering principles to minimize the potential for failure of the proposed facility. This analysis not only minimizes failure of the barrier but also failure by shoreline scour or barrier undermining and passage of the barrier by non-target fish species.

Site Investigation Needs

Hydrologic Needs

Identify or obtain hydrologic information to identify 'high design discharge' at barrier site

Topographic Survey

Identify low and high stream flow water surface elevations and surrounding terrain (optimizes design and assures that construction conforms with design)

Geotechnical Analysis

Conduct site soils investigation to determine bearing capacity and porosity, etc.

$25,000

Design and Specification

Development of design and barrier construction specifications based on information obtained from the Site Investigation, civil engineering principles, and desired barrier fish objectives.

$25,000

Engineering Design - Total Costs	**$50,000**

Construction Phase

The barrier would consist of a 3' high concrete weir, symmetrical relative to the channel centerline, with flow plunging directly onto a concrete pad at the low design tailwater surface. Flow plunging onto this pad would be diverted as sheet flow in the downstream direction at a velocity of over 10 fps and create a hydraulic jump downstream of the plunge pad (where there could be either a low profile curb or coarse boulders). As discharge over the weir increases to the high design flow (yet to be determined), it would still not overtop abutment walls on both shorelines. Cutoff walls would extend into the imported fill flood-control embankments on each shoreline. The weir length and vertical distance from top of abutment walls to the weir crest would be determined by the design high discharge. Sidewalls would extend downstream from both sides of the barrier weir.

At higher weir discharges, depth on the plunge pad would be greater, but downstream velocity would still be high, and fish would have to swim upstream to the plunging flow, then swim over the plunging weir flow to pass the barrier. Details and elevations of this design are not yet reconciled. A 3' vertical drop from forebay to tailwater would occur at high design discharge, and would be carefully analyzed to assure enough of a drop to block upstream passage at the barrier. The concrete weir could be constructed of either poured-in-place reinforced concrete, or (potentially) 2'x2'x6' pre-cast concrete ecology blocks (such as at the Molycorp Red River mill water intake diversion dam).

Barrier

Barrier Construction - Includes stream flow bypass, excavation, concrete placement, upstream rip-rap placement, mobilization, and demobilization	$75,000
Engineering Construction - Total Costs	**$75,000**

Monitoring and Maintenance

Monitoring

Once per year for 3 years - $500 per trip	$1,500
Once per 3 years over the next 15 years	$3,000

Maintenance

$7,000

Engineering Monitoring and Maintenance - Total Costs	**$11,500**

Total Engineering Costs for Columbine Barrier ***$136,500***

Biological Costs

Fish Removal

Labor

Includes costs for 3 trips per year (July, August, and September) for 3 years in succession for 4 individuals with 16 hours each, including 8 hours for travel. $43,344

Expenses

Includes vehicle, per diem, and misc. costs are estimated using Molycorp's expenses per trip for 9 trips $16,097

Biological Implementation - Total Costs $59,441

Maintenance

Labor

Includes costs for 4 trips total, one in 4th, 5th, 6th, and 8th years for 3 individuals with 72 hours each, including 8 hours for travel. $20,822

Expenses

Includes vehicle, per diem, and misc. costs $4,360

Biological Maintenance – Total Costs $25,182

Monitoring

Monitoring costs, based on additional individual weighing and measuring RGCT and one Sr. Biologist analyzing results. Visits occur in all years of removal and maintenance (baseline estimates will occur during removal phase and change estimates during maintenance phase for a total of 7 trips – expenses included in removal and maintenance categories) $7,172

Biological Monitoring – Total Costs $7,172

Total Biological Costs for Columbine Barrier $91,795

Permitting Costs

Engineering & Environmental Permitting Costs $20,000

Total Permitting Costs for Columbine Barrier $20,000

Total Estimated Costs for Columbine Creek Barrier and Preservation Project $248,295

Upstream Passage for Adult Brown Trout at the Red River Fish Hatchery

Engineering Costs

Design Phase

This will include the engineering site investigations - topography/bathymetry, hydrology, hydraulic, and geotechnical.

Site Investigation Needs

Topography/bathymetry, hydrology/hydraulic, geotechnical studies $25,000

Design and Specification

Development of design and construction specifications based on information obtained from the Site Investigation and civil engineering principles. Preparation of Bid documents. $35,000

Engineering Design - Total Costs	**$60,000**

Construction Phase

Construction

Construction of fish ladder - includes dewatering and stream flow bypass, ladder and weir cap concrete placement, mobilization, and demobilization. $125,000

On-site engineering and inspection during construction $20,000

Mobilize/demobilize $15,000

Engineering Construction - Total Cost	**$160,000**

Monitoring & Maintenance

Monitoring

Once per year for 3 years (2010-2012) - 500 per trip $1,500
Once per 4 years between 2016 and 2024 - 500 per trip $1,500

Maintenance

Every other year for 15 years - $1750 per trip $12,250

Engineering Monitoring and Maintenance – Total Costs 15,250

Total Engineering Costs for Fish Hatchery Fish Passage Project $235,250

Biological Costs

Monitoring

Labor

Includes costs for 3 trips total: one in 4th, 7th, and 10th yr. Costs based on: 10 hrs for a Sr. Ecologist, and 40 hrs each for a Fisheries Biologist, an Environmental Specialist, and a Fisheries Tech 1 $9,140

Expenses

Includes vehicle, per diem, misc, and depreciation of supplies $3,860

Total Monitoring Phase Costs $13,000

Total Biological Costs for Fish Hatchery Fish Passage Project $13,000

Permitting Costs

Engineering & Environmental Permitting Costs

Estimated Costs assume a 404 permit, EA from the USFS, permits from the state engineers office $30,000

Total Permitting Costs for Fish Hatchery Fish Passage Project $30,000

Total Estimated Costs for Fish Hatchery Fish Passage Project $278,250

Fawn Lakes Riparian Enhancement Project

Engineering Costs

Design Phase

Rosgen Survey	$10,000
Engineering Design – Total Costs	**$10,000**

Construction Phase

Remove earthen access ramp and asphalt pad (approx. 300 sq. ft, transition from the highway), restore to natural grade and highway embankment gradient. These amounts to approx. 1,100 cu yd of spoil, to be hauled to the USFS Ranger Station and stockpiled	$32,000
Rock weirs and material/transport	$15,000
Place guardrail at highway	$1,500
Protect the power pole in the floodplain from flooding damage	$500
Mobilize and demobilize	$15,000
Engineering Construction – Total Costs	**$64,000**

Total Engineering Costs for Fawn Lakes ***$74,000***

Biological Costs

Implementation

Re-plant to natural vegetation after fill removal, including stabilization of the disturbed area from potential flood flows and protection with a layer of filter cloth and overlying river rock.
$9,800

Remove 10 spruce trees over 6-8 acre area, excavate in primary and flood channels, place root wads from trees in channels and back fill to anchor root wads in the stream channels
$10,000

Remove small trees (thinning) and spruce branches, place in brush piles (improve squirrel habitat).
$10,000

Biological Implementation – Total Costs	**$29,800**

Monitoring

Includes monitoring vegetation density, diversity, and health
$17,000

Biological Monitoring – Total Costs	**$17,000**

Total Biological Costs for Fawn Lakes	***$46,800***

Maintenance Costs

For planting or regrading (both engineering and biological – labeled as engineering maintenance costs in summary table)
$5,000

Permitting Costs

Estimated Costs assume a 404 permit, FONSI from the USFS, permits from the state highway department
$10,000

Permitting – Total Costs	**$10,000**

Total Estimated Costs for Fawn Lakes Riparian Enhancement Project	***$135,800***

Anderson Ranch Wetland Preservation Project

Please note that these costs do not include BLM's environmental assessment and other associated transfer costs. Those costs will be included in the BLM's oversight sheets.

Engineering Costs

No engineering construction costs associated with this project. Molycorp will survey land and transfer to Trustees with specified fence in place.

Monitoring & Maintenance

Monitoring

Assumes monitoring every other year from 2010 to 2016 (8 trips) @ $500 per trip $4,000

Maintenance $9,500

Engineering Monitoring and Maintenance – Total Costs $13,500

Total Engineering Costs for Anderson Ranch Wetland Preservation Project $13,500

Biological costs

Monitoring

Includes monitoring vegetation density, diversity, and health. $24,200

Biological Monitoring – Total Cost $24,200

Total Biological Costs $24,200

Total Estimated Costs for Anderson Ranch Wetland Preservation Project $37,700

Table A Trustee 4/13/07 Cost Estimate (Non-discounted costs)

Projects	Engineering Design Costs	Engineering Construction Costs	Engineering Maintenance & Monitoring Costs	Biological Implementation Costs	Biological Maintenance Costs	Biological Monitoring Costs	Engineering Permit Costs	Sub-total
A –Cabresto	$45,000	$95,000	$11,500	$111,200	$69,100	$7,200	$20,000	$359,000
B – Columbine	$50,000	$75,000	$11,500	$59,400	$25,200	$7,200	$20,000	$248,300
C – Hatchery Fish Passage	$60,000	$160,000	$15,250			$13,000	$30,000	$278,250
D – Fawn Lake	$10,000	$64,000	$5,000	$29,800		$17,000	$10,000	$135,800
E – Bitter Creek								$20,000
F – Anderson Ranch	$0	$0	$13,500			$24,200		$37,700
TOTAL	$165,000	$394,000	$56,750	$200,400	$94,300	$68,600	$80,000	$1,079,050
Unforeseen Contingency and Oversight Costs - 25% of A, B, C, D, & F project costs							20%	$211,810.00
						Total Non-Groundwater Restoration Costs		**$1,290,860**