

**Practice: 396 - Aquatic Organism Passage**

**Scenario: #1 - Concrete Dam Removal**

**Scenario Description:**

The full or partial removal of a concrete or earthen dam which is restricting or impeding movement of aquatic organisms to restore aquatic organism passage, improve water quality, and promote functional river ecology and geomorphology. The extent of removal (full or partial) is determined through consultations with the dam owner in consideration of prevailing regulations and site historical status. Adjacent floodplain surfaces above and below the target dam are considered in the planning process to account for shifts in streamflow and geomorphic regime. Resulting channel dimensions and profile are determined on a site-specific basis to reflect--to the fullest extent possible--pre-dam conditions. Removal is completed with an assortment of equipment, including tracked excavators outfitted with hydraulic chisels, hammers and/or buckets with "thumbs", bull dozers, skid steers, cranes, front-end loaders, and dump trucks. Alternative demolition techniques may include the use of high explosives, diamond-chain, or similar circular saws to remove the dam in a piecewise manner. Removed materials are trucked away and disposed or recycled off-site. Associated practices for practice installation include: (326) Clearing and Snagging, (342) Critical Area Planting, (382) Fence, (390) Riparian Herbaceous Cover, (391) Riparian Forest Buffer, (612) Tree/Shrub Establishment, (395) Stream Habitat Improvement and Management, (410) Grade Stabilization Structure, (584) Channel Bed Stabilization, (580) Streambank and Shoreline Protection, (587) Structure for Water Control and (578) Stream Crossing.

**Before Situation:**

A channel-spanning concrete dam no longer has functional use, may be failing, or creates a hazard to downstream capital infrastructure or communities. The dam blocks upstream aquatic organism migration, and downstream migrants may be diverted into hydraulic structures that increase mortality or result in migration delays or dead-ends. The dam disrupts the downstream cycling and transport of sediment, woody material and nutrients. The pool created by the dam may impair water quality by increasing temperatures, capturing fine sediment--sometimes laden with heavy metals or other pollutants--later mobilized by high flow events, and creating slackwater habitat for invasive aquatic vegetation. Non-native or exotic fish species inhabit the pool and predate upon and/or displace native fish. Resource concerns include habitat degradation; Ponding, flooding, seasonal high water table, seeps, drifted snow, and Elevated water temperature.

**After Situation:**

A 7 foot tall, 85 foot long low head concrete dam is demolished and debris is removed. The geometry and slope of the reach impacted by removal of the dam are restored to pre-dam conditions to the fullest extent practicable. Aquatic organism passage and river ecology and geomorphic conditions are restored to pre-dam conditions to the fullest extent practicable. Resource Concerns are addressed within the context of the site.

**Scenario Feature Measure:** Linear Feet of Low Head Dam and Abutments

**Scenario Unit:** Linear Foot

**Scenario Typical Size:** 85

**Scenario Cost:** \$38,950.77

**Scenario Cost/Unit:** \$458.24

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Truck, dump, 12 CY	1215	Dump truck for moving bulk material. Typically capacity is 16 ton or 12 cubic yards. Includes equipment only.	Hour	\$98.04	80	\$7,843.20
Water management, Flooding & dewatering	969	Includes equipment, power unit and labor costs.	Acre Foot	\$129.48	4	\$517.92
Clearing and Grubbing	40	Clearing and Grubbing, includes materials, equipment and labor	Acre	\$286.67	1.5	\$430.01
Dozer, 140 HP	927	Track mounted Dozer with horsepower range of 125 to 160. Equipment and power unit costs. Labor not included.	Hour	\$125.87	20	\$2,517.40
Hydraulic Excavator, 2 CY	932	Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$193.04	60	\$11,582.40
Skidsteer, 80 HP	933	Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$43.69	60	\$2,621.40
Hauling, bulk, highway truck	1615	Hauling of bulk earthfill, rockfill, waste or debris. One-way travel distance using fully loaded highway dump trucks (typically 16 CY or 20 TN capacity). Includes equipment and labor for truck only. Does not include cost for loading truck.	Cubic Yard Mile	\$0.33	9200	\$3,036.00

**Labor**

**Labor**

Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	80	\$2,387.20
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$20.32	60	\$1,219.20
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	160	\$4,315.20
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.72	40	\$1,468.80

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.88	2	\$517.76
Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	1	\$494.28

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**Scenario: #2 - Culvert Replacement**

**Scenario Description:**

A corrugated metal (galvanized steel or aluminum) pipe culvert (CMP) of any shape (round, elliptical, or squash) used where a field access road intersects with a stream crossing. The aquatic organism passage (AOP) will provide and promote stream ecological and geomorphic function. CMPs used for AOP are filled with a mixture of rock and gravel sized to emulate site stream conditions and geomorphic units in the channel. The simulated streambed material is continuous throughout the culvert barrel, and blended with the intact streambed at the culvert inlet and outlet. Any associated road surface reinstallation is not included as part of this practice. If the reinstallation of a field access lane is needed, consider the planning and application of the associated road surface reinstallation through (560) Access Road. Other associated practices include, but is not limited to (342) Critical Area Planting, (382) Fence, (390) Riparian Herbaceous Cover, (391) Riparian Forest Buffer, (612) Tree/Shrub Establishment; (395) Stream Habitat Improvement and Management, (410) Grade Stabilization Structure, (584) Channel Bed Stabilization, (580) Streambank and Shoreline Protection.

**Before Situation:**

An existing undersized culvert has contributed to general bed and bank scour downstream of a road crossing, and may have contributed to deposition of sediment upstream of the road crossing, or has been designed for typical stormwater capacity, but is inadequate for proper aquatic organism passage. An undersized culvert is causing the associated road to be overtopped by high flows, resulting in outright failure and landowner accessibility problems. An upstream impoundment created by the undersized culvert has contributed to water quality problems including high water temperatures and sediment deposition. An inadequately sized culvert results in native aquatic organisms being unable to pass through the road crossing because the culvert outlet is perched above the downstream pool, and high velocities are not negotiable by animals that are able to leap into the culvert barrel. Resource concerns addressed include: INADEQUATE HABITAT FOR FISH AND WILDLIFE –Habitat degradation; EXCESS WATER – Ponding, flooding, seasonal high water table, seeps, and drifted snow; WATER QUALITY DEGRADATION – Elevated water temperature; SOIL EROSION– Excessive bank erosion from streams shorelines or water conveyance channels.

**After Situation:**

The undersized culvert is replaced with a CMP sized, placed, and backfilled with material determined by geomorphic analyses performed in a reference upstream reach of the crossing location. Geomorphic and ecological functions are preserved through the crossing site, enhancing AOP, water quality, and culvert longevity. In addition, because the culvert is sized to transport the streamflow, the culvert requires decreased maintenance activities over time. Landowners are able to access their property across a range of flows, and are able to seek and receive emergency and post-flood recovery services.

**Scenario Feature Measure: CMP**

**Scenario Unit: Each**

**Scenario Typical Size: 1**

**Scenario Cost: \$4,665.15**

**Scenario Cost/Unit: \$4,665.15**

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Equipment/Installation</b>						
Hydraulic Excavator, 2 CY	932	Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$193.04	6	\$1,158.24
Earthfill, Manually Compacted	50	Earthfill, manually compacted, includes equipment and labor	Cubic yard	\$5.24	96	\$503.04
<b>Labor</b>						
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$26.97	6	\$161.82
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	4	\$119.36
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$20.32	6	\$121.92
<b>Materials</b>						
Pipe, CMP, 14-12 gauge, weight priced	1589	14 and 12 gauge galvanized helical corrugated metal pipe priced by the weight of the pipe materials. Materials only.	Pound	\$0.75	2600	\$1,950.00

**Materials**

Aggregate, river rock	1834	Well graded, rounded mineral substrates derived from local riverine settings. Includes materials and local delivery	Ton	\$21.25	4	\$85.00
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**Mobilization**

Mobilization, large equipment	1140	Equipment >150HP or typical weights greater than 30,000 pounds or loads requiring over width or over length permits.	Each	\$494.28	1	\$494.28
Mobilization, very small equipment	1137	Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously.	Each	\$71.49	1	\$71.49