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October 12, 2007

Mr. Bud Baumgartner
Chairman
Calapooia Watershed Council
40684 McQueen Drive
Sweet Home, OR 97386

Ms. Denise Hoffert-Hay
Project Manager
Calapooia Watershed Council
2006 Chase Loop SW
Albany, Oregon 97321

SUBJECT: Brownsville Dam Removal Report- Brownsville, Oregon

Dear Mr. Baumgartner and Ms. Hoffert-Hay:

Cascade Earth Sciences (CES) is pleased to present the final report on the removal of the Brownsville Dam in August and September of 2007. As requested, we are supplying six copies of the report and an electronic copy by PDF.

If you have any questions, please do not hesitate to contact me at (541) 812-6614 or Steel Maloney at (541) 812-6627. CES has enjoyed working with you on this important watershed improvement project and we look forward to working with you on the installation of the irrigation diversion restoration in 2008.

Sincerely,

Cascade Earth Sciences

John D. Martin, R.G., CWRE
Project Manager / Principal Geologist

JDM/djp

Enc: Dam Removal Report (6)
c: Project File 2724012
Doc: Brownsville Dam Removal Report.doc

Brownsville Dam Removal Report

October 2007

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Brownsville Dam Removal Report

Prepared For:	Calapooia Watershed Council 2006 Chase Loop SW Albany, Oregon 97321
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Reviewed By:	Greg Thurman, PE, Managing Engineer Steel Maloney, Principal Hydrologist
Report Date:	October 12, 2007
Project Number:	2724012
Submitted By:	_____ John Martin, RG, CWRE, Principal Geologist

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ACKNOWLEDGEMENTS

CES would like to acknowledge and thank the following people and agencies for their assistance in the successful completion of the Brownsville Dam Removal Project:

Comment [jdm1]: Denise, edit or modify the following list as you see appropriate.

Bud Baumgartner	Calapooia Watershed Council (CWC), Council Chair, Forester
Denise Hoffert-Hay	CWC, Project Manager
Tara Putney	CWC, Coordinator
Bob Bostedt	CWC, Mechanical Engineer
Bob Danehy	CWC/Weyerhaeuser, Fisheries Biologist
Tim Otis	CWC, Civil/Forest Engineer
Douglass Fitting	Oregon Watershed Enhancement Board (OWEB), Hydrologist
Wendy Hudson	OWEB, Regional Program Representative
John Holbrook	Brownsville Canal Company
Bill Nelson	Brownsville Canal Company
Bill Sattler	City of Brownsville, City Planner
Jackie Nichols	Cascade Pacific Resource Conservation & Development Area, Inc. (CPRCD), Fiscal Agent
Karen Strohmeyer	CPRCD, Project Manager
Jared Rubin	Oregon Department of Environmental Quality, Basin Coordinator
Kirk Jarvie	Oregon Department of State Lands, Economic Revitalization Liason
Chuck Knoll	Linn County, County Engineer
Susan Novak	National Oceanic and Atmospheric Administration/Marine Fisheries Service (NOAA/NMFS), Engineer
Melissa Jundt	NOAA/NMFS, Fish Passage Engineer
Kerry Griffin	NOAA/NMFS, Restoration Center
Joel Watts	Oregon Department of Fish and Wildlife (ODFW), Fish Passage Engineer
Karen Hans	ODFW, Asstistant District Fisheries Biologist
Steve Mamoyac	ODFW, District Fisheries Biologist
Michael Lambert	ODFW, Fish Screening and Passage Program Manager
Desiree Tullos	Oregon State University, Assistant Professor, Biological/Ecological Engineering
Jan Stuart	U.S. Army Corps of Engineers, Regulatory Program Manager

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SHEETS

APPENDICES

1.0 INTRODUCTION

The Calapooia Watershed Council (CWC) selected Cascade Earth Sciences (CES) and our associate, Northwest Biological Consulting (referred to herein as the CES Team) to assist them in removing the Brownsville Dam on the Calapooia River while maintaining a diversion of 2.5 cubic feet per second. The diversion serves the Brownsville Canal Company and the City of Brownsville during each irrigation season. CES previously completed the required permitting in association with CWC and design phases for the dam removal. This report summarizes the dam removal activities.

2.0 SITE DESCRIPTION

2.1 Location and Legal Description

The Brownsville Dam (Site) is located at river mile 38.8 of the Calapooia River adjacent to the south of Northern Drive, approximately 2.5 miles west of the City of Brownsville, Oregon (Sheet AB-1). The Site is located on tax lot 400, Donation Land Claim (DLC) 58. An approximate location description is the northwest quarter of the northeast quarter of Section 4, Township 14 south, Range 2 west of the Willamette Meridian, Linn County, Oregon. Based on the United States Geological Survey (USGS) 7.5 minute series topographic map of the area (Brownsville Quadrangle), the latitude is 44.3878 north and the longitude is -122.9301 west (USGS, 1988).

The Brownsville Dam was constructed as a hollow-core concrete dam.

2.2 Brownsville Dam Characteristics

The Brownsville Dam was constructed as a hollow-core concrete dam with downstream and upstream faces joined to a top or cover section. The concrete sections of which the faces and top were fabricated were approximately 12-inch-thick concrete with a ¾-inch rebar mat. The interior of the dam was filled with sand and gravel. The dam was located between two concrete abutments located on either side of the Calapooia River, north to south. The dam structure was approximately 110 feet long, north to south and approximately 14 feet wide, east to west. Height of the dam faces were approximately 6 feet tall for the downstream (west) face and 8 feet tall for the upstream (east) face.

3.0 BROWNSVILLE DAM REMOVAL

3.1 Removal Alternative Discussion

Representatives of the CWC and CES reviewed alternative approaches for dam removal prior to construction activities. Two major alternatives were reviewed: clean-water bypass with a cofferdam and partial cofferdam with active in-stream work.

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3.1.1 Clean-water Bypass

The clean-water bypass with a cofferdam consisted of using the existing Brownsville Canal, to which the dam was designed to divert water, as a bypass. The river water would be diverted into the canal upstream of the dam. A cofferdam would be placed around the dam to isolate it from any water that backflowed to the dam or seeped around the diversion. Dam removal could then take place without significant concern for a large sediment release. This alternative was not selected for the following reasons:

The Brownsville Dam was designed to divert water into the Brownsville Canal.

- Tremendous amount of fish salvage that would be required to rescue all exposed lamprey.
- Potential for on-going fish salvage if there was difficulty keeping the site dewatered.
- Concern over how high flows would be handled by the clean water bypass if there were a storm event during deconstruction.
- Amount of pumping that would be necessary to keep the work area dewatered.
- Disturbance to the stable, armored point bar on the south side. Potential to created increased erosion following dam's removal by disturbing this gravel bar.

3.1.2 Partial Cofferdam with Active In-Stream Work

This alternative was a two-stage process of removal. The first stage would consist of removing an approximately 15-foot long section (notch) from the north side to allow the river a continuous flow through the channel, then placing a cofferdam around the southern end and removing it in the second stage. This was the selected alternative and is described in Section 3.5.

3.2 Permits and Approvals

The following permits were required and received prior to the removal:

- Joint Permit – U.S. Army Corps of Engineers and Oregon Department of State Lands.
  - 401 Water Quality Certification – Oregon Department of Environmental Quality (ODEQ)
  - Biological Opinion – National Oceanic and Atmospheric Administration (NOAA)
  - Sediment Evaluation Framework Evaluation

- General Permit, National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit 1200-C– ODEQ

- Right of Way Encroachment Permit - Linn County Road Department

Appendix A includes copies of all permits. In addition to permitting, the following agencies were involved in reviewing proposed alternatives for the dam removal and pump installation, provided technical input or gave approval for the project:

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- NOAA National Marine Fisheries Service and the NOAA Open Rivers Initiative
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon State Historic Preservation Office (SHPO)
- Oregon Watershed Enhancement Board (OWEB)

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3.3 Photopoints and Photographs

Prior to the removal, a series of Photopoints (PP) were established:

- PP1 – located approximately 100 feet upstream of the former dam on the north bank by the parking lot.
- PP2 – located on the north abutment immediately adjacent to the former dam.
- PP3 – located approximately 80 feet downstream from the former dam on the north side.
- PP4 – located approximately 200 feet downstream from the former dam on the north side.

Photographs were taken from the photopoints both upstream and downstream before, during, and after the dam removal. In addition, a number of opportunity photographs were taken of different activities or significant events during the removal. Copies of selected photographs are presented in Appendix B.

3.4 Sediment Control and Monitoring

Sediment and erosion control best management practices used are included in the NPDES permit (Appendix A). Mr. Scott English, Erosion Control Inspector, completed installation and inspection for the project. Erosion controls included straw waddles, silt fences, isolation dams, and a turbidity curtain (Photographs 1 and 2).

Comment [DH2]: What do these numbers correspond to? Something in one of the appendices? Only one photo in the text right here shows the erosion control measures. None of the photos in the text are numbered.

Erosion controls included straw waddles (above), silt fences, isolation dams, and a turbidity curtain.

As required by the Joint Permit, turbidity was monitored every four hours during active work. To maintain impartiality, monitoring was conducted at approximately 10 a.m. and 2 p.m. every day of active work. Monitoring began on August 27, 2007, and ended on September 7, 2007. In addition, a final reading was collected one week following cessation of active work to gauge background conditions. Monitoring was conducted with a LaMotte Model 2020 Turbidimeter. Readings were collected from a station 100 feet upstream (background) of the work area and 200 feet downstream (compliance) from water actively moving. A comparison was then made between the readings from the two points; a variation of more than 5 nephelometric turbidity units (NTU) would result in taking action to reduce turbidity. The comparison readings varied from a low of -0.24 NTUs to 4.12 NTUs. Turbidity never exceeded the lowest action level of 5 NTUs. The comparison reading was measured at 0.01 NTUs on September 14, 2007. A copy of the turbidity log is presented in Appendix C.

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3.5 Construction

As described in Section 3.1.2., the dam was removed in two stages. The CES Team mobilized to the site on August 22, 2007. Actual construction (dam removal) began on August 27, 2007, with final cleanup, site restoration, and demobilization completed on September 8, 2007. Two excavators and two 10-yard dump trucks were employed for the construction activities.

Access routes for equipment were created on both sides of the river. On the north side of the river, two access points were created: the first on the east end of the parking lot to give access to the narrowest point on the river as an equipment crossing point[1], and the second in front of the canal mouth to give access to the north abutment (Photograph 3). Most of the activity would be taking place on the south side of the river so a base camp was set up between a hazelnut orchard and the river. An access ramp from the base camp on the south side was created over a man-made berm to the gravel bar on the south side of the river (Photograph 4). From this point, equipment had access to the southern portion of the dam or across the bar to the north side of the river.

3.5.1 North Side Construction

Removal of the notch on the north side began mid-day on August 27, 2007. Personnel used an excavator equipped with a jackhammer and mounted on top of the north side abutment to break open the concrete (Photograph 5). Another excavator with a bucket and thumb was used to remove the broken pieces, rebar, and gravel fill. By the end of the first day, the notch was completed and water was flowing freely past the dam. Construction was completed on the north side around mid-day on August 28, 2007.

An excavator equipped with a jackhammer broke open the concrete.

3.5.2 South Side Construction

Prior to construction on the south side, large concrete blocks were placed around the portion of the dam with exposure to active water (i.e., north and west sides) and draped with plastic, where needed, to reduce flow-through of water (Photograph 6). The blocks abutted the gravel bar northeast of the dam, wrapped around north end of the notched dam, and continued south to the southern bank below the dam. Water in the isolated work area was then pumped into the Brownsville Canal to reduce the amount of sediment-laden water entering the river downstream of the dam.

Removal of the top of the southern portion of the dam and gravel fill was accomplished with an excavator and jackhammer as was done on the north side. The excavator was mounted on the top of the remaining portion of the dam. Removal began at the north end of the notch and proceeded

[1] The original plan was to have a staging area in the parking lot on the north side, but it was decided to eliminate this to reduce risk of injury to the expected high volume of general public in that area during the construction activities. To avoid this and to reduce disturbance of the river, the crossing point at the narrows near the east end of the parking lot and adjacent to Warren Creek was selected.

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southward. As large sections of concrete were isolated by the jackhammer, workers cut the rebar with saws, and the sections were removed with the other excavator.

Following removal of the top, the first 4 to 6 feet of the upstream face was removed. However, the bottom 2 to 4-foot portion of the upstream face remained in place due to water and gravel on both sides of the face. Water was seeping into the work area through the permeable gravel bar and a larger pump was needed to dewater the area in order to access the lower portions of the upstream face. While waiting on the pump, activities moved to the downstream face, which posed few problems in removal. Following installation of the larger pump and dewatering to the canal, the upstream face was removed (Photograph 7). Construction related to the dam removal was completed on September 5, 2007. A total of approximately 480 cubic yards of dam debris and fill material were removed from the site and recycled at a concrete plant, less than the 700 cubic yards estimated in the Joint Permit.

3.5.3 Construction-Related Activities

Fish Recovery

As the notch was created, the pool behind the dam slowly dropped. The ODFW and other personnel conducted fish and lamprey recovery activities during the lowering of the pool. The slow rate of pool drop allowed many of the fish to move into the active water, and as such, very few fish and lamprey required recovery.

Wood Remnants

During completion of the north-side notch in the dam and placement of the cement blocks, large timbers with rebar and other wood remnants were encountered in the streambed and gravel bar (Photograph 8). The CWC notified the SHPO of the remnants and requested information on their disposition. At the request of SHPO and CWC, CES photographed and mapped the remnants prior to continued work. As directed, remnants were left in place except where they directly hindered the completion of the dam removal. It was not determined whether the remnants were related to the original wood crib dam or to a later construction. A copy of the remnant location map is included in Appendix C.

Large timbers with rebar and other wood remnants were encountered in the streambed and gravel bar.

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Sediment Study

Dr. Desiree Tullos of Oregon State University (OSU) requested the assistance of the CES Team in conducting a sediment study of the Calapooia. At the direction of Dr. Tullos, an excavation was made in the gravel bar to allow Dr. Tullos and her students to analyze the sediment characteristics from surface to base in the bar. In addition, Dr. Tullos had columns of colored rocks placed into excavations to allow assessment of sediment travel during the rainy season (i.e., as the flow rate of the river increases in the winter, the colored rocks are expected to be carried downstream where they can be identified and mapped during the low water period).

4.0 CLEANUP AND RESTORATION

4.1 Site Cleanup

Final cleanup of the site began on September 5, 2007, and was completed on September 8, 2007. Cleanup consisted of hand removal of the remaining large pieces of concrete and all rebar that could be located[2].

4.2 Restoration

Site restoration began during the cleanup phase and was completed on September 8, 2007. Site restoration consisted of minor grading of the channel to approximate the presumed natural flow path of the river, placement of the large riprap, formerly in front of the dam, minor grading of the gravel bar, and restoration of the equipment access routes (Photographs 9-12). Specifically, the channel was graded to match the existing contour of the gravel bar and the presumed center of flow (thalweg) of the river upstream and downstream of the former dam.

The Calapooia River channel was graded to match the existing contour of the gravel bar and the presumed center of flow of the river.

The large riprap formerly lined up in front of the dam was placed in approximate natural patterns below the dam, but not in the center of the thalweg. Riprap and gravel were also placed in front of the abutments (i.e., on the sides adjacent to the river) to cover the areas exposed after removal of the dam.

[2] A limited number of smaller (<12 inches in length) pieces of concrete may have been overlooked or inadvertently buried in the gravel bar during construction activities.

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The excavations for the OSU sediment study were backfilled and the areas of active work on the gravel bar were smoothed to approximate natural conditions. The access areas on the north and south sides of the river were re-contoured, riprap was replaced and the ground was seeded and covered with straw. A native seed mix was used to revegetate the formerly blackberry-covered access areas:

59.28%	Blue Wildrye
28.54%	Meadow Barley
9.98%	California Brome
0.56%	Other Crop
1.64%	Inert Matter
0.00%	Weed Seeds
Noxious	None Found

5.0 CONCLUSIONS

The Brownsville Dam removal project was highly successful in meeting or exceeding project objectives:

- The entire dam was successfully removed.
- The project was completed in less time than originally anticipated: less than three weeks from mobilization to restoration and demobilization.
- The amount of dam debris and gravel fill recycled was 220 cubic yards less than originally estimated.
- Turbidity levels never exceeded the lowest action level.
- No significant problems were encountered.
- No injuries, accidents, spills or accidental releases into water occurred.
- Very little site disturbance (< 1 acre) occurred and those areas are restored to a very natural appearance.

Photographs 13 through 22 show the Site prior to and following the dam removal from the four established photopoints identified in Section 3.3. Sheets AB-1 and AB-2 show the approximate as-built topography and the approximate as-built center of river profile, respectively.

6.0 LIMITATIONS

The conclusions presented in this report are professional opinions based on data described in this report. They are intended only for the purpose, Site location, and project indicated. In addition, CES bases the conclusions presented in this report on the assumption that Site conditions do not deteriorate from those observed during the project and as described in this report. CES prepared this

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report for the CWC pursuant to an August 22, 2007, agreement and it is accurate to the best of CES' knowledge and belief.

7.0 REFERENCES

USGS, 1988. *United States Geological Survey 7.5 Minute Series Topographic Map, Brownsville, Oregon Quadrangle*. United States Geological Survey, Washington, D.C.

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SHEETS

Sheet AB-1. As-Built Topography
Sheet AB-2. As-Built Center of River Profile

APPENDICES

A. Photographs
B. Permits
C. Turbidity Log/Wood Remnants Drawing