Amended Application for New License
Major Project – Existing Dam

Exhibit C
Construction History and
Proposed Construction Schedule

Security Level: Public

Yuba River Development Project
FERC Project No. 2246

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June 2017

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None.

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None.

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EXHIBIT C

CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION SCHEDULE

1.0 Introduction

The Yuba County Water Agency (YCWA or Licensee) has prepared this Exhibit C, Construction History and Proposed Construction Schedule, as part of its Amended Application for a New License Major Project – Existing Dam (Amended FLA)[1] from the Federal Energy Regulatory Commission (FERC) for the Yuba River Development Project (Project), FERC Project Number 2246. This exhibit is prepared in conformance with Title 18 of the Code of Federal Regulations (C.F.R.), Subchapter B (Regulations under the Federal Power Act), Part 5 (Integrated Licensing Process). In particular, this exhibit conforms to the regulations in 18 C.F.R. Section (§) 5.18(a)(5)(iii), which require in part that the application include an Exhibit C, Construction History and Proposed Construction Schedule, in conformance with 18 C.F.R. Section 4.51(d). This Exhibit C describes, in detail, YCWA's proposed construction. As a reference, 18 C.F.R. Section 4.51(d) states:

> Exhibit C is a construction history and proposed construction schedule for the project. The construction history and schedules must contain:
>
> (1) If the application is for an initial license, a tabulated chronology of construction for the existing projects structures and facilities described under paragraph (b) of this section (Exhibit A), specifying for each structure or facility, to the extent possible, the actual or approximate dates (approximate dates must be identified as such) of:
>
> (i) Commencement and completion of construction or installation;
>
> (ii) Commencement of commercial operation, and
>
> (iii) Any additions or modifications other than routine maintenance; and
>
> (2) If any new development is proposed, a proposed schedule describing the necessary work and specifying the intervals following issuance of a license when the work would be commenced and completed.

Besides introductory material, this Exhibit includes two sections. Section 2.0 provides a history of Project construction. Section 3.0 describes YCWA's proposed construction schedule for proposed improvements to the Project under the new license.

See Exhibit A for a description of Project facilities and features, Exhibit B for a description of Project operations, Exhibit D for costs and financing information, and Exhibit E for a discussion of potential environmental effects and YCWA's proposed resource management measures. Project design drawings and maps are included in Exhibits F and G, respectively. Exhibit H

[1] YCWA filed with FERC an Application for a New License Major Project – Existing Dam – (Final License Application, or FLA) for the Project on April 27, 2014.

contains a detailed description of the need for the electricity provided by the Project, the availability of electrical energy alternatives, and other miscellaneous information.

2.0 Construction History of Existing Structures and Facilities

YCWA applies to FERC for a new license, not an initial license, for the Project. Therefore, the requirement of 18 C.F.R. Section 4.41(d)(1) regarding a tabulated chronology of construction of existing structures and facilities does not apply. However, Section 15.0, History of the Project, in Exhibit H provides a description of the construction history of the major structures and facilities that comprise the existing Project.

3.0 Construction Schedule for Proposed New Facilities

YCWA proposes seven general changes to existing Project facilities: 1) addition of a tailwater depression system (TDS) at New Colgate Powerhouse; 2) addition of a new aauxiliary flood control outlet at New Bullards Bar Reservoir; 3) modification to the Our House Diversion Dam fish release outlet; 4) modification to the Log Cabin Diversion Dam fish release outlet; 5) modification to the Lohman Ridge Diversion Tunnel Intake; 6) modifications to recreation facilities at New Bullards Bar Reservoir;[2] and 7) modifications to Project roads.

This Exhibit C describes YCWA's construction methods and schedule for the above changes, with the exception of recreation facilities and roads. The construction schedules for recreation facilities and for roads are described in YCWA's proposed Conditions RR1, *Implement Recreation Facilities Plan*, and LU1, *Implement Transportation System Management Plan*, which are included in Appendix E2 of Exhibit E.

3.1 Generation Developments

3.1.1 New Colgate Powerhouse Tailwater Depression System

YCWA proposes to add to the Project a new Tailwater Depression System (TDS) at New Colgate Powerhouse, as described in Section 5.1.1.1 of Exhibit A. The addition of the TDS would increase generation at the powerhouse. YCWA's conceptual level planning for construction of the new TDS is described below.

[2] YCWA has completed all FERC-approved studies, and filed the results with FERC. However, YCWA's proposed Condition RR1, *Recreation Facilities Plan*, includes the construction and operation of a new Kelly Ridge Campground and a new recreation vehicle (RV) dump station. Since the facilities were agreed to very late in the relicensing and, as conceived at this time, would be located on approximately 57 ac of NFS lands outside the existing Project boundary, YCWA's relicensing studies did not include the area where the new Kelly Ridge Campground and the new RV dump station would be located, which are shown in the *Recreation Facilities Plan*. Therefore, YCWA will perform botanical and cultural studies (i.e., water and aquatic studies are not proposed because the area does not include and is not adjacent to any surface water) in these areas in 2017 and will file with FERC the results of the studies when they are available. The additional cultural studies may require that YCWA modify its previously filed *Historic Properties Management Plan* (HPMP). If so, YCWA anticipates the modified HPMP would be filed with FERC by the end of 2017.

3.1.1.1 Provisions for TDS during Project Initial Construction

Because of rising costs during the original construction of the Project in the early 1960s, some features of the Project were not completed. The TDS feature of the New Colgate Powerhouse was among those not completed even though installation of a TDS had been contemplated during the design of the powerhouse. Because of this, certain provisions were made for future installation of the TDS during initial construction. These provisions are described below:

- Each turbine unit has a 30-inch steel pipe vent from the turbine pedestal to the exterior of the plant's south wall. The vent pipes, which terminate below the plant deck, will be incorporated in the compressed air piping system and used to pressurize the runner pits.
- An air distribution manifold is embedded in each turbine pedestal, above the cupola of the runner pit's steel liner. From the manifold, four pipes convey vent air (and future compressed air) to open nozzles placed around the bearing housing, and discharge air above the runner.
- A shaft seal (also referred to as "rotary seal" or "running seal" in the Project documents) was planned to prevent leakage of compressed air along the turbine shaft. The shaft seal was never procured or installed. However, a one-inch service water line to provide 20 gallons per minute of cooling water to the future shaft seal was embedded in the turbine pedestal.
- Each runner pit was constructed to include (2) two-inch pipes, one near the bottom of the pit and the other above the runner. One end of each pipe is exposed to the inside pit ambient atmosphere, while the other end of each pipe is outside the turbine pedestal and has a blind flange. The original purpose of these pipes was for future installation of sight level gauges with magnetic switches that would initiate automatic air compressor operation.
- In the plant Tools and Storage Room, a 24-inch tailwater floatwell and gage were installed to measure and record tailwater levels.
- At the outlet of the tailrace conduit, a curtain wall was constructed to improve the recovery of air during compressed air operation.
- Hatch covers for hatches in the runner pit and tailrace were designed to resist the air pressure, and rubber seals were provided to seal the openings.
- A section of the deck was cantilevered beyond the plant wall at the plant deck and above the south wall. This cantilevered section was envisioned to be the area where the compressors would be installed.
- As described earlier, each unit penstock was furnished with a 12-inch blind-flanged nozzle, located upstream of the turbine shutoff valve. These nozzles were envisioned to be the source of water power to drive the air compressors. In addition, 16-inch-diameter wall and floor sleeves were placed to allow installation of the water line from the nozzle of Unit No. 2 to the plant deck.

3.1.1.2 TDS Construction

The anticipated total duration of the construction is 5 months, commencing after issuance of a new license from the FERC, detailed design, approval of detailed construction plans and acquisition of any additional required permits. It is anticipated that the work will not require a separate outage, but can be accomplished during planned outages. Key activities would include the following:

- Site preparation at powerhouse yard and deck, including construction of equipment foundations and relocation of the New Colgate Powerhouse pedestrian bypass
- Installation of blowers, pipe supports, roofing, air piping and valves
- Installation of power supply, including the tap of the 13.8-kilovolt isolated phase bus, transformer, switchgear and cables to the blowers
- Procurement and installation of turbine shaft seals
- Curtain wall modifications
- Installation of bulkhead shaft seal
- Installation of instrumentation and controls
- System testing and startup including construction and removal of temporary test barrier

All work will occur within the proposed FERC Project Boundary.

The construction labor force is estimated to average about 12 persons over the total construction period. Equipment will be transported to the powerhouse via Highway 20, Marysville Road, and Lake Francis Road, all of which are paved and suitable for the anticipated loads. It is anticipated that not more than 30 trailer ("low boy") truck roundtrips will be required to bring the blower skids, transformer, other electrical gear, pipe, structural steel and other heavy materials and equipment. About 15 to 20 truckloads of ready-mixed concrete may be needed for equipment pads, foundations and curbs. No changes in road conditions are anticipated as a result of the work.

At the site, typical heavy construction equipment will include an excavator (backhoe), an air compressor, one or two trucks, two truck-mounted cranes, pickup trucks, a construction office trailer and miscellaneous equipment. Smaller equipment will include hoists and platforms, concrete placing and drilling equipment, a welding machine, pipe fitting equipment, and other miscellaneous equipment customary to the electrical, mechanical and structural crafts.

No borrow areas are anticipated to be required because the work does not entail significant earthwork. It is expected that the available space within the fenced plant area will be sufficient for laydown and staging of materials and equipment. All work will be confined to the powerhouse, yard and immediate vicinity. No undisturbed areas are anticipated to be disturbed as a result of the work.

3.2 Non-Generating Facilities

3.2.1 New Bullards Bar Dam Auxiliary Flood Control Outlet

YCWA proposes to add to the Project a new auxiliary flood control outlet at New Bullards Bar Dam, as described in Section 5.1.2.1 of Exhibit A. The addition of the Auxiliary Flood Control Outlet would not directly result in added generation to the Project. YCWA's conceptual level planning for construction of the new Auxiliary Flood Control Outlet is described below.

3.2.1.1 General

Outlet construction would require excavation in the upper left abutment area of the dam site. To serve tunnel construction, a construction access road would be built from the left abutment area down to the outlet area. Tunnel construction would likely start from the downstream portal and would continue toward the upstream portal using conventional, staged, and drill-and-blast excavation methods. Temporary tunnel support would be installed during excavation as needed.

It is anticipated that excavation for the intake structure would be performed concurrently with access road construction and/or tunnel excavation. A natural cofferdam (i.e., *in situ* soil and rock) would be left in place in the inlet approach channel to protect the construction work and prevent uncontrolled release of reservoir water through the excavation area and tunnel. The natural cofferdam would likely need stabilization and buttressing measures to ensure the site is adequately protected from the reservoir.

After the concrete intake structure is completed, the over-excavated areas would be backfilled with structural fill, and riprap would be placed on the slopes that may be exposed to wave erosion.

The natural cofferdam would be left in place until the tunnel and intake structure are completed and the gates installed. Removal of the cofferdam and construction of the approach channel and inlet training walls would be performed during a low reservoir period (late summer/fall).

Work on all components of the Project including the approach channel, intake structure, tunnel, and outlet structure, would be completed with only temporary disruptions of normal traffic patterns along Marysville Road due to movement of heavy construction equipment (e.g., excavators, haul trucks, concrete trucks and cranes). Some short duration (i.e., 5- to 15-minute) road closures may be required when setting up or unloading large equipment.

YCWA has performed environmental studies within the work areas described below, most of which is within the proposed FERC Project Boundary. As described below, some areas are only potential work areas at this time. YCWA will request an adjustment of the FERC Project Boundary at the appropriate time.

3.2.1.2 Construction Laydown Areas

Laydown/staging areas are temporary facilities utilized during construction activities. Temporary construction facilities would likely include construction offices, worker and equipment parking, equipment maintenance yard, warehouse, fuel tank and fueling pad, aggregate processing plant, concrete batch plant including portable plant, bulk material silos (cement, fly ash), admixtures and aggregate piles, and temporary storage of other construction materials.

Potential laydown areas include: 1) east of visitor parking area adjacent to spillway on YCWA land (~4 acres on YCWA land); 2) flat area on north side of Marysville Road west of quarry on National Forest System (NFS) land (~15 acres on NFS land); 3) flat area on south side of Marysville Road south of quarry on private land (~20 acres on private land); 4) southeast of dam along dirt forest road on YCWA land (~16 acres on YCWA land); 5) alongside Marysville Road, east of quarry (~6 acres on YCWA and private land); 6) east side of Marysville Road, east of quarry (1.5 acres on YCWA and private land); and 7) west side of parking area on right abutment (~2 acres on YCWA land).

3.2.1.3 Construction Disposal Areas

Disposal areas will be required for the permanent placement of excess excavated materials obtained during construction activities. Material placed in the disposal areas would consist of soil and rock from required excavation, including tunnel muck. Woody debris may also be placed in disposal areas. Material not suited for onsite disposal (e.g., petroleum products, trash and waste) would be hauled to an approved offsite disposal facility.

The estimated total quantity of excavated material, including an appropriate bulking factor, is approximately 300,000 cubic yards. The materials obtained from required excavations would primarily consist of soil and metavolcanic rock. Materials from excavation may, in part, be suitable for utilization as backfill, road and yard surfacing, concrete aggregate and riprap. Some sorting, stockpiling and processing of excavated materials will be required to make them suitable for various intended uses. Excess materials, as well as materials that are unsuitable for reuse in construction, will be placed in the disposal areas.

Potential disposal areas include: 1) east of visitor parking area adjacent to spillway on YCWA land (~4 acres with a capacity of ~80,000 cubic yards); 2) old quarry on NFS land and private land (~8 acres and 100,000 cubic yards); 3) flat area on north side of Marysville Road, west of quarry on NFS land (~15 acres and 100,000 cubic yards); 4) flat area on south side of Marysville Road, south of quarry on private land (~20 acres and 100,000 cubic yards); and 5) southeast of dam along dirt forest road on YCWA land (~16 acres and 100,000 cubic yards).

3.2.1.4 Construction Traffic Considerations

The construction labor force is estimated to average about 30 to 40 persons over an assumed two-year construction period. Peak manpower could be close to double this number depending

on the contractor's schedule. Personnel and equipment would reach the site via Highway 20 or 49 and Marysville Road, which are paved and suitable for the anticipated loads.

3.2.1.5 Schedule

A possible construction sequence, involving an approximately 5-year construction period is summarized below. The primary long-lead items are the fabricated steel roller gates together with the hydraulic cylinder operators and hydraulic power units. Construction would not begin until after a new FERC license is issued, final designs and construction plans are approved and all necessary permits obtained. Schedule highlights are as follows:

- At this time, it is anticipated that environmental compliance and permitting will take a total of three years, and the design will occur concurrently with permitting. Therefore, the total time for these two activities is three years. Actual field construction will take no more than two years.
- Mobilization would include the setup of construction offices, an aggregate crushing plant and a concrete batch plant; the development of disposal and laydown areas; and the construction of the access road to the outlet. It is anticipated that these activities may take about three months.
- The schedule assumes that YCWA would bid the roller gate package separately from the construction package to expedite the gate procurement. However, the construction contractor could be assigned the procurement contract upon award of the construction contract. The gate procurement cycle, from prime contract award to gate delivery at the site, is expected to take 14 months.
- Tunnel excavation would begin after completion of the access road, working from the downstream portal towards the inlet. Rock from tunnel excavation would be hauled to the disposal area, or to a stockpile in a laydown area for later use as concrete aggregate. It is expected that tunnel excavation may take about four months.
- Intake structure excavation would be conducted concurrently with construction of the access road and tunnel excavation. The intake excavation is expected to take about 2 to 3 months.
- After tunnel excavation, the reinforced-concrete tunnel lining would be constructed working from the inlet area towards the downstream portal. Once the upstream portion of the tunnel is lined, construction of the intake structure could begin and could be constructed concurrently with the rest of the tunnel lining. It is anticipated that the tunnel lining and construction of the transition/intake structure would take about 4 to 5 months and five to six months, respectively.
- The reinforced-concrete outlet channel and flip bucket structure would be constructed after the tunnel lining is completed. This activity is anticipated to take about 3 to 4 months.

- The roller gates would be installed after completion of the intake structure construction. Gate installation is anticipated to take about 2 to 3 months to complete.
- Excavation of the approach channel would be performed once the intake structure is in an advanced stage of completion and the reservoir level is sufficiently low. After the approach channel is excavated, the reinforced concrete training walls and slope protection would be constructed. These activities would take about 4 months to complete.

The above summary schedule assumes that the financing plan for the project is in place before award of the construction contract. Also, seasonal schedule constraints that may be imposed by environmental mitigation requirements are not reflected in the summary above.

Figure 3.2-1 is a conceptual-level map of the construction area, as anticipated at this time.

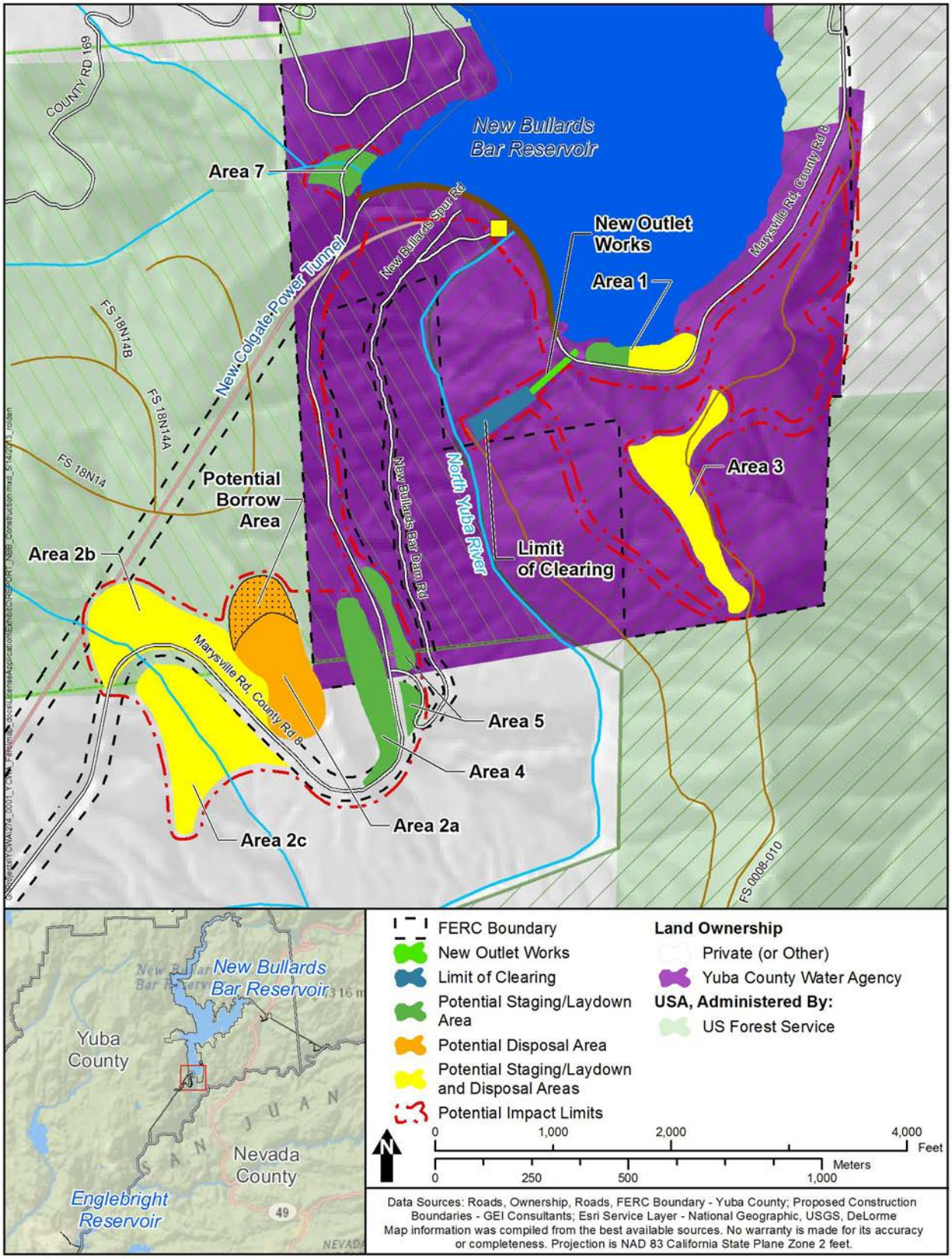

Figure 3.2-1. New Bullards Bar proposed new Auxiliary Flood Control Outlet construction area.

3.2.2 Modifications to Lohman Ridge Diversion Tunnel Intake

YCWA proposes to modify the Lohman Ridge Diversion Tunnel intake, as described in Section 5.1.2.2 of Exhibit A. The modifications would not result in added generation to the Project. YCWA's conceptual level planning for construction of the modifications is described below.

All work will occur within the proposed FERC Project Boundary, where temporary facilities and laydown locations are available adjacent to the site. The work would occur in late summer when the minimum flow releases are low and equal to inflow into the impoundment. YCWA would open the low level outlet to allow the water surface elevation in the impoundment to drop below the intake to the diversion tunnel. A crane would be brought on-site and used to install temporary construction platforms and needed formwork for concrete modifications and installation of the new civil work. A new inlet control gate and debris rake would be installed. Penetrations through the existing tunnel inlet deck for the new gate and debris rack would be developed using concrete drilling and cutting tools. Mechanical and electrical control devices will be installed on the tunnel inlet deck.

3.2.2.1 Lohman Ridge Diversion Tunnel Intake Construction

The construction labor force is estimated to average about eight persons over the total construction period. Equipment will be transported to the diversion tunnel via Highway 20, Marysville Road, and Highway 49, all of which are paved and suitable for the anticipated loads. It is anticipated that not more than 10 trailer ("low boy") truck roundtrips would be required to bring the mechanical, electrical and other heavy materials and equipment to the project site. No more than five truckloads of ready-mixed concrete may be needed for equipment pads and foundations. No changes in road conditions are anticipated as a result of the work.

At the site, typical heavy construction equipment will include an excavator (backhoe), an air compressor, a heavy-duty truck, a truck-mounted crane and miscellaneous equipment. Smaller equipment will include hoists and platforms, concrete placing and drilling equipment, a welding machine, and other miscellaneous equipment customary to the electrical, mechanical and structural crafts.

No borrow areas are anticipated to be required because the work does not entail significant earthwork. It is expected that the available space within the tunnel intake area will be sufficient for laydown and staging of materials and equipment. All work will be confined to the tunnel intake and immediate vicinity. No undisturbed areas are anticipated to be disturbed as a result of the work.

3.2.3 Modifications to Our House Diversion Dam and Log Cabin Diversion Dam Fish Release Outlets

YCWA proposes to modify Our House Diversion Dam and Log Cabin Diversion Dam fish release outlets, as described in Section 5.1.2.3 of Exhibit A. The modifications would not result

in added generation to the Project. YCWA's conceptual level planning for construction of the modifications as envisioned at this time is described below.

All work will occur within the proposed FERC Project Boundary, where temporary facilities and laydown locations are available adjacent to each site. The work would occur in late summer when the minimum flow release from each dam is generally low and equal to inflow into the impoundment. YCWA would open the low level outlet to allow the water surface elevation in the impoundment to drop below the intake to the fish release outlet. A crane would be brought on-site and used to install temporary construction platforms and needed formwork for concrete modifications and installation of the new civil work. A new upsized fish release pipe and associated valve system would be installed at each facility, with the centerline of the new pipe at the same centerline elevation as the existing fish release outlet (i.e., no disturbance to the existing fish release outlet). The concrete facilities needed at the inlet and outlet of the new fish release outlets would be similar to those for the existing fish release outlets, upsized for the larger pipes accordingly. The penetration through the dams for the new fish release outlets would be achieved by coring multiple small diameter overlapping bores through the dam to form a circular opening large enough to accommodate the new outlet pipe and associated localized structural reinforcement rebar and plating. At the new fish release inlets, conical transition and stop-log slots would be installed; at the outlets, valve support platforms and valve stem guides would be constructed.

At this time, it is anticipated that environmental compliance and permitting will take a total of six months for each diversion dam and the design will occur concurrently with permitting. Actual field construction will take no more than six months. While each site can be modified concurrently, the total time for these two activities is estimated to be two years.

3.2.3.1 Construction at Log Cabin Dam and Our House Dam

The construction labor force is estimated to average about 10 persons over the total construction period. Equipment will be transported to the diversion tunnel via Highway 20, Marysville Road, and Highway 49, all of which are paved and suitable for the anticipated loads. It is anticipated that not more than 10 trailer ("low boy") truck roundtrips will be required to bring the mechanical, electrical and other heavy materials and equipment to the project site. No more than 20 truckloads of ready-mixed concrete may be needed for equipment supports and foundations. No changes in road conditions are anticipated as a result of the work.

At the sites, typical heavy construction equipment will include a crane, a concrete coring machine, air compressors, dump trucks, heavy-duty trucks, a floating barge, and miscellaneous equipment. Smaller equipment will include hoists and platforms, scaffolding, concrete placing and drilling equipment, a welding machine, and other miscellaneous equipment customary to the electrical, mechanical and structural crafts.

No borrow areas are anticipated to be required because the work does not entail significant earthwork. For construction at the Log Cabin Dam, it is expected that the available space on the

access roads to the dam areas will be sufficient for laydown and staging of materials and equipment. For construction at the Our House Dam, it is expected that the available space to the north east, adjacent to the river-right abutment to the dam will be sufficient for laydown and staging of materials and equipment. For both sites, all work will be confined to the dam outlet area and immediate vicinity. No undisturbed areas are anticipated to be disturbed as a result of the work at either sites.

4.0 Literature Cited

None.