

Clark Canyon Dam FERC No. 14677

Initial Consultation Document

Prepared for:
Clark Canyon Hydro, LLC

July 2015

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ACRONYMS AND ABBREVIATIONS

ac.....	acre
ac ft.....	acre-feet
Agreement.....	Memorandum of Understanding and Conservation Agreement
Applicant.....	Clark Canyon Hydro, LLC
BGEPA	Bald and Golden Eagle Protection Act
BLM.....	Bureau of Land Management
BOR	Bureau of Reclamation
cfs.....	cubic feet per second
CWA.....	Clean Water Act
dbA.....	a-weighted decibels
DO	dissolved oxygen
EA	Environmental Assessment
EDL.....	Environmental Dynamics International
ERI	Ecosystems Research Institute
ESA.....	Endangered Species Act
FERC	Federal Energy Regulatory Commission
ft.....	feet
g/L	grams nitrogen per liter
GSG	greater sage-grouse
GWh.....	gigawatt-hour
ICD	Initial Consultation Document
in.....	inch
kV	kilovolt
kW	kilowatt
kWh.....	kilowatt hour
m.....	meters
MBEWG.....	Montana Bald Eagle Working Group
MBTA.....	Migratory Bird Treaty Act
MDEQ.....	Montana Department of Environmental Quality
MFWP	Montana Department of Fish, Wildlife, and Parks
mg/L.....	milligrams per liter
mi.....	mile
MNHP.....	Montana Natural Heritage Program
MW.....	megawatt
NTU.....	nephelometric turbidity unit
NWI.....	National Wetlands Inventory
NWPS.....	Northwest Power Services
psi	pounds per square inch
PSOC.....	Potential Species of Concern
RM.....	river mile

ROW.....right-of-way
scfm.....standard cubic feet per minute
SHPOState Historic Preservation Office
SOCSpecies of Concern
sq ft.....square foot
TCP.....Traditional or Cultural Properties
TDG.....total dissolved gas
TMDL.....total maximum daily load
USACE.....United States Army Corps of Engineers
USFS.....United States Forest Service
USFWS.....United States Fish and Wildlife Service
V.....volt

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1. INTRODUCTION

Clark Canyon Hydro, LLC (Applicant), is the applicant for the Clark Canyon Dam Hydroelectric Project (Project) (Federal Energy Regulatory Commission [FERC] No. 14677). The proposed Project will provide 4.7 megawatts (MW) of renewable energy, producing on average 15,400,000 kilowatt hours (kWh) each year without producing air pollution or toxic by-products. In December 2004, the Applicant submitted a First Stage Consultation Document, (also referred to as the Initial Consultation Document [ICD], or 2004 ICD), prepared by Ecosystems Research Institute (ERI) and Northwest Power Services (NWPS) (ERI 2004). The 2004 ICD served to initiate the first stage consultation process for Project licensing and fulfilled the requirements of Section 16 of Subpart B of FERC's regulations for the filing and processing of an application for license. The 2004 ICD contained information describing the Project's physical features, location, and environmental setting, as well as the Applicant's proposals for operations and studies, as of 2004.

In April 2009, the FERC published an Environmental Assessment (EA) for the proposed Project (FERC 2009). The EA provided updated information for the Project, affected environment, and potential environmental consequences, as well as analysis provided by FERC staff regarding potential environmental impacts of the Project. The EA concluded that, "...licensing the project, with appropriate environmental protective measures, would not constitute a major federal action that would significantly affect the quality of the human environment." In August of 2009, FERC issued a 50-year Original License to the Applicant for the construction and operation of a new hydropower facility on the Bureau of Reclamation's Clark Canyon Dam in Dillon, Montana (FERC No. 12429).

In March of 2015, FERC terminated the Applicant's 50-year license in part due the inability to commence Project construction by the statutory deadline prescribed in the 50-year license. This document, the 2015 ICD is the first step in the process to develop a new license application for the Project. The FERC's order terminating the Applicant original license recognized the Applicant's efforts to develop the Project and encouraged the Applicant to continue these efforts. The FERC specifically stated that the Applicant could file a new license application, which the FERC could address on an expedited basis if the Applicant obtains concurrence from affected federal and state agencies and other interested stakeholders and makes a filing that includes all necessary information. The FERC further indicated that it did not anticipate the Applicant would need to perform much additional work to prepare a new application. The FERC indicated it expected FERC staff would work with the Applicant to determine what portions of the FERC licensing regulations could be waived and other steps taken to develop an expedited process (Clark Canyon Hydro 2015). The Applicant intends to finish development of the Project by applying for another original license with FERC. In order to ensure the Applicant's priority to the site vis-à-vis other potential developers, on April 21, 2015, the Applicant applied for a preliminary permit for the site. FERC has assigned the permit application proceeding Project No. 14677, and it is expected that any license application submitted by the Applicant will be assigned this docket number as well.

Table 1.1-1 shows the Applicant's proposed preliminary schedule for preparation of a new license application for the Project:

This ICD includes a comprehensive update of additional resource, design, and stakeholder information filed under FERC No. 12429 from the 2004 ICD through FERC's license termination in March of 2015. Definitions and terms used in this document as they relate to the description of the Project are given in the following list. All definitions are the same as in the 2004 ICD.

- **Project:** Refers to the Clark Canyon Dam Hydroelectric Project facilities within the identified Project boundary.
- **Project area:** The geographic zone of potential, reasonable direct impact. This normally extends, but is not limited, up to 100 ft out from the physical Project features and includes the forebay, power plant, Project tailrace, and the transmission facilities.
- **Project vicinity:** The area extending to approximately one mile out from Project features.

TABLE 2.1-1. PROPOSED PRELIMINARY SCHEDULE FOR NEW LICENSE APPLICATION PREPARATION

Preliminary Date:	Major Schedule Item:
July 22, 2015	<p>Stage 1 Consultation Document transmitted to the agencies and stakeholders</p> <p><i>This document contains Project descriptions including boundaries, feature dimensions/location, operation, stream flow & water regime information, environmental & anticipated effects of the proposed Project, and a detailed list of studies & methodologies that has been completed.</i></p> <p><i>On a typical project, this document would be more conceptual and preliminary. However, since this Project has gone through extensive licensing and engineering over the last 10 years this document will include information that has been developed over this time in consultation with the agencies and stakeholders.</i></p>
August 21, 2015 <i>preliminary date</i>	<p>Public Meeting in Dillon, Montana</p> <p><i>The meeting will be held in Dillon, Montana with an opportunity for a site visit. At least 15 days before the meeting, a letter will be provided to the agencies and stakeholders containing information on the time and location. This information will also be included the local newspaper at least 14 days prior to the meeting.</i></p>
September 5, 2015	<p>Comments on the Stage 1 Consultation Document Due</p> <p><i>Within 60 days, comments on the Stage 1 Consultation Document and associated studies are due.</i></p> <p><i>The Applicant would like to discuss with the agencies and stakeholders at the meeting whether it is feasible for this time period to be shortened to 45 days from the issuance of the Stage 1 Consultation Document.</i></p>
September 13, 2015	<p>Draft License Application transmitted to the agencies and stakeholders</p> <p><i>The draft license application includes the information in the Stage 1 Consultation Document and responds to any comments and recommendations made by any resource agency and Indian tribes. Also includes a discussion of the study results and any proposed protection, mitigation and enhancement measures.</i></p>

Preliminary Date:	Major Schedule Item:
October 13, 2015	Comments on the Draft License Application Due <i>Because of the last 10 years of licensing and engineering with consultation with resource agencies and stakeholder the Draft License Application will be the same as the Stage 1 Consultation with the addition of the comments and recommendations. Upon agreement with the agencies and stakeholder, The Applicant anticipates requesting a shortened 30-day comment period for the Draft License Application.</i>
October 28, 2015	License Application filed with the FERC with copies sent to the agencies and stakeholders
After the License Application has been filed with the FERC, FERC will begin the post-application process, during which it will solicit comments, terms and conditions, and recommendations from the agencies and/or stakeholders and issue an environmental document.	

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2. PROJECT DESCRIPTION

2.1. Description of Current Facilities

2.1.1. Existing Structures Description

The Flood Control Acts of 1944 and 1946 approved the construction of the Clark Canyon Dam and Reservoir as part of Bureau of Reclamation's (BOR) Pick-Sloan Missouri River Basin Program, East Bench Unit. The Clark Canyon Dam is situated on the Beaverhead River, near the town of Dillon in Beaverhead County, Montana. Authorized uses for water at the dam include irrigation, flood control, fish and wildlife, and municipal water. The dam is federally-owned, with operation and maintenance functions carried out by the East Bench Irrigation District.

The approximately 2,950 ft, zoned, earth-filled dam includes a concrete intake structure and conduit in the reservoir, shaft house at the crest of the dam, a 9 ft-diameter conduit that discharges water to a concrete stilling basin, a gate chamber with four high pressure gates, two of which act as emergency gates, and an uncontrolled concrete spillway. The reservoir has a capacity of 253,442 acre-feet (ac ft) and an active capacity of 126,117 ac-ft. Further specifications and capacities for the existing structure and facilities are shown in Table 2.1-1.

TABLE 2.1-1. CURRENT FACILITIES SPECIFICATIONS

Description	Detail
Drainage Area	2,315 square miles
Reservoir Capacity	253,442 acre-ft @ elev. 5,560.4 feet
Dam Type	Zoned, Earth-Filled
Length	2,950 ft at crest
Structural Height	147.50 ft
Hydraulic Height (Normal Operating Depth)	113.90 ft
Crest Width	36 ft at crest
Base Width	800 ft
Crest Elevation	5,578.00 ft
Intake Structure	1 intake
Regulating Gates	(2) 36" x 78" Rectangular Gates
Emergency Gates	(2) 36" x 78" Rectangular Gates
Existing Outlet Works Capacity	2,325 cfs at 5,547.00 feet 2,620 cfs at 5,571.90 feet
Existing Outlet Conduit	Approximately 9-ft-diameter, 360-ft-long, concrete
Spillway Capacity	9,520.00 cfs ¹ at 5,571.90 ft

¹cubic feet per second

2.2. Proposed Modifications and New Facilities

2.2.1. *Steel Liner*

The Applicant proposes to install a new 8 ft diameter steel penstock within the existing concrete conduit. The penstock will extend approximately 360 ft from the existing gate chamber to near the existing outlet works stilling basin. At the existing gate chamber, a steel transition piece from the two rectangular gates to the 8 ft diameter liner will be fabricated, installed, and grouted into place. At the river end of the liner, a trifurcation will separate the flows into two penstocks entering the powerhouse and a single steel pipe with a fixed cone valve at its terminus, which discharges into the existing outlet works stilling basin.

2.2.2. *Powerhouse Penstocks*

Two steel 8 ft diameter, 35 ft long penstocks will convey flows from the trifurcation to the turbines in the proposed powerhouse. Directly upstream of the powerhouse, each penstock will transition from 8-ft in diameter to 6-ft in diameter before entering the powerhouse.

2.2.3. *Outlet Stilling Basin Discharge*

The 8 ft diameter steel pipe leaving the trifurcation to the outlet stilling basin will be approximately 10 ft long. A 7 ft diameter fixed cone valve with a reducer will be installed at the terminus of the pipe for controlled discharge into the existing outlet works stilling basin. The fixed cone valve will be used to release flows when the powerhouse is offline or when the flow requirements are greater than the turbine capacity.

2.2.4. *Powerhouse*

The dimensions of the powerhouse will be approximately 46 ft by 65 ft. The powerhouse will contain two vertical Francis-type turbine/generator units with a combined generating capacity of 4.7 MW, and a combined discharge capacity of 700 cubic feet per second (cfs). The powerhouse will be a reinforced concrete substructure. Removable roof hatches will be provided for access to the equipment for maintenance. A crane will be provided for normal maintenance activities. Controls, switchgear, and other electro-mechanical equipment will be located inside the powerhouse building.

2.2.5. *Draft Tubes and Tailrace*

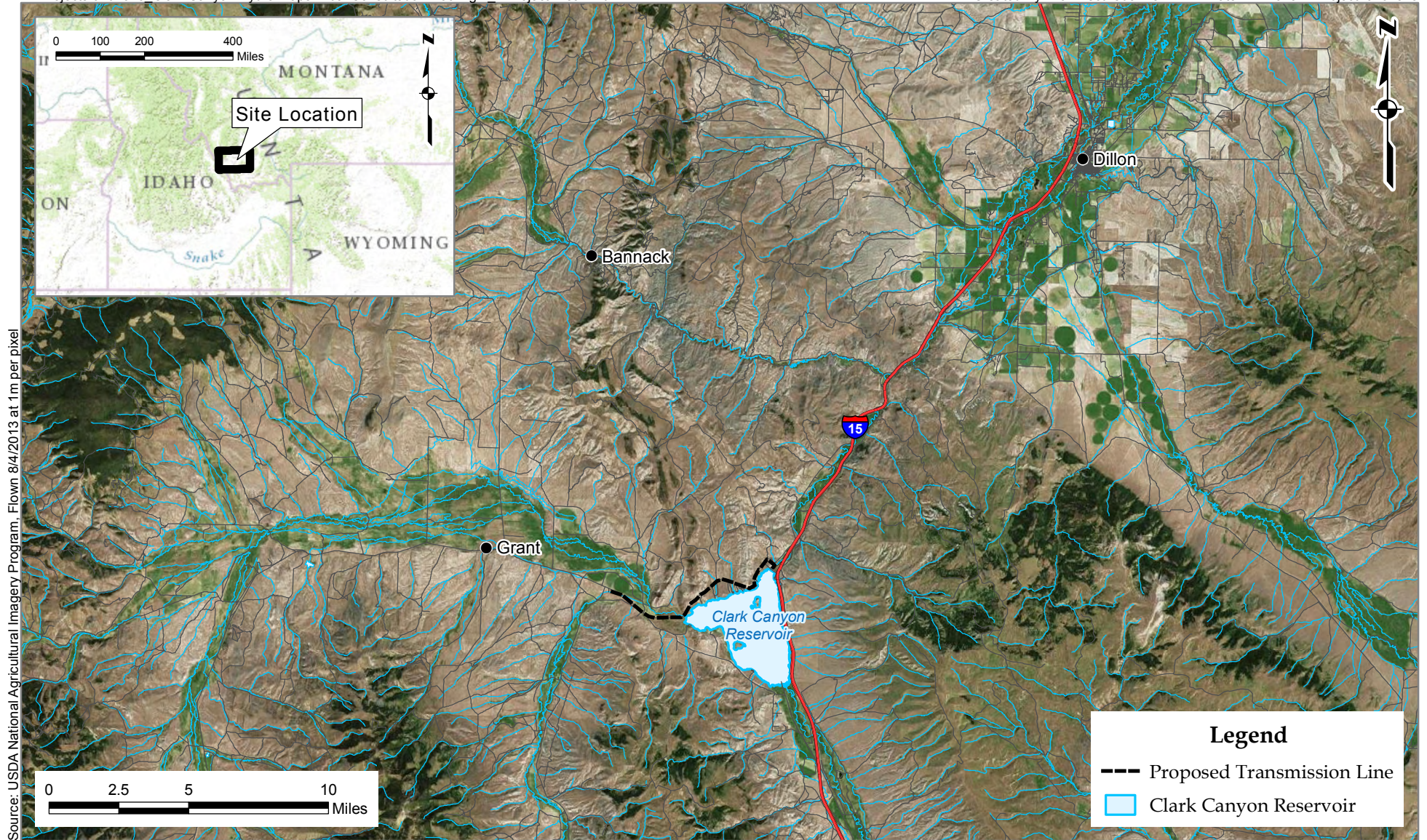
Water discharged from the turbines will pass through integral steel draft tubes (approximately 25 ft long) within the powerhouse. Each draft tube will transition into a concrete draft tube/tailrace section with integrated stop log channels outside the powerhouse. The channels will be approximately 15 ft wide by 17 ft long, and will discharge into the existing spillway stilling basin. Draft tube outlets inside the tailrace will be configured with stop log slots for removable bulkheads to allow for dewatering.

2.2.6. *Powerhouse Substation*

The powerhouse substation will be located northeast of the powerhouse, approximately 1,100 ft downstream. The substation will include a 4.16 kV to 69 kV step-up transformer with switchgear. The transformer will be on concrete pad foundations with containment and a grounding grid. Underground transmission lines will run between the powerhouse and the powerhouse substation.

2.2.7. *Transmission*

The new transmission line will run from the powerhouse substation approximately 7.9 mi to the Peterson Flat Substation as shown in Figure 2.2-1. The new line will consist of a single pole at a voltage of 69 kV with an average span distance of 428 ft, and 13 poles per mile on a proposed 80 ft corridor. The proposed transmission line will cross BOR and Montana state land, and run adjacent to private lands within the existing Highway 324 ROW.



Source: USDA National Agricultural Imagery Program, Flown 8/4/2013 at 1m per pixel

Figure 2.2-1
Project Area
Clark Canyon Hydroelectric Project
Beaverhead County, Montana

2.2.8. *Proposed Generation and Facilities*

The Project will have an installed generating capacity of 4.7 MW with two 2.35 MW Francis type turbine / generator units. At the selected size, the Project will use flows ranging from 87.5 cfs to 700 cfs (87.5 cfs to 350 cfs per unit), and will have a maximum static head of 110 ft and an average static head of 87 ft. On average, the Project will generate approximately 15.4 GWh per year.

2.2.9. *Aeration Basin*

The Applicant will install an aeration basin downstream of the powerhouse containing approximately 1,500 9-inch (in) disc aeration diffusers. The concrete aeration basin will be approximately 59 ft by 38 ft. The disc diffusers will be pressurized with air by two blowers (RBS 145 Tri-LOB or similar). Piping between the blower and the aeration basin will be 12 in stainless steel pipe. The blowers will be housed in a precast concrete blower enclosure located directly east of the powerhouse.

2.3. Operation of the Project

2.3.1. *Existing Operation*

Regulation of reservoir and corresponding water releases at Clark Canyon Dam are made in accordance with standard operating procedures developed by the BOR. The East Bench Irrigation District is responsible for operation of the dam and reservoir in close coordination with the BOR.

2.3.2. *Proposed Operation*

The proposed Project will function in a "run-of-river" mode with no daily storage for power generation. The fundamental criterion for Project development is to utilize only the regulated releases that occur under normal BOR guidelines as if no additional power generation facilities were constructed. It is anticipated that power generation will be seasonally dictated as flow regimens and reservoir levels are set forth by the BOR. Turbine/generator units were selected and sized to maximize electrical energy production from the proposed facility based on historical hydrology data.

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3. RESOURCES ANALYSIS

3.1. Environmental Setting

Clark Canyon Dam and Reservoir is located in Beaverhead County, Montana, on the Beaverhead River immediately below the junction of Red Rock River and Horse Prairie Creek. Benefits of the Dam and Reservoir are irrigation resources, flood control, fish and wildlife habitat, water supply, and recreation. The Dam and Reservoir are authorized under the authority of the Flood Control Act (1944). The Dam and Reservoir is administered by the BOR's East Bench Unit (East Bench Irrigation District) of the Pick-Sloan Missouri Basin Program and provides full irrigation service to 21,800 acres (ac) with supplemental irrigation service to 28,000 ac.

The reservoir surface area is 4,935 ac with 17 mi of shoreline when full (BOR website 2004). The reservoir has a total capacity of 257,152 ac ft including an active capacity of 126,117 ac ft, a joint use capacity of 50,436 ac ft, and an exclusive flood control capacity of 79,090 ac ft, as well as dead storage and inactive storage capacities. As of 1998, the reservoir's flood control capacity, including replacement storage capacity and surcharge capacity, provided a total flood control capacity of 150,917 ac ft that had reduced flood damages by approximately \$11.5 million (BOR website 2004).

Clark Canyon Reservoir provides water for the East Bench Irrigation Project east of Dillon, Montana. The Reservoir's stored water capacity provides irrigation benefits by an increase in net farm income. Beaverhead County's agriculture industry produces cattle, sheep, horses, hay, grain, seed potatoes, canola, and waxy barley. Cattle and livestock ranching is the region's predominant agricultural activity.

Beaverhead County has a population of 9,246 (2010 Census). Dillon is the county seat and largest community with about 4,000 residents. The county is sparsely populated, with a population density of 17 people per square mile (Beaverhead County 2012). The county's major industries are farming; construction; retail trade; real estate; professional and technical services; arts, entertainment, and recreation; accommodation and food service; and government employment (Beaverhead County 2012). The median household income in the county between 2009 and 2013 was \$41,614, with the per capita income at \$22,872 (United States Census Bureau 2015). As of May 2015, the county's unemployment rate was 2.9 percent (Montana Department of Labor and Industry 2015).

3.1.1. River Basin

The Beaverhead subbasin is part of the Red Rock Hydrologic Unit located on the eastern edge of the Continental Divide and exhibits the semi-arid climate indicative of continental basin- and-range type mountains and intermontane valleys. The subbasin encompasses 3,619 square miles, including portions of the Ruby, Blacktail, and Snowcrest mountain ranges, and the Tendoy Mountains, (Horse Prairie Creek's headwaters). In addition, it includes all of the Blacktail Deer Creek drainage and assorted small tributaries draining directly into the river.

Prior to construction of Clark Canyon Dam, the Beaverhead River originated at the confluence of Red Rock River and Horse Prairie Creek; it now begins at the outlet of Clark Canyon Reservoir. It travels 69 mi before it joins the Big Hole River at Twin Bridges, Montana, to form the Jefferson River. Above Dillon, the river is described as a tight channel that meanders through densely vegetated banks. Below Dillon, heavy irrigation use constrains the river to very slow flows through predominantly private land (Montana Department of Fish, Wildlife, and Parks [MFWP] 2004).

3.1.2. *Climate*

On average, the bulk of the region's precipitation, most of which is snow, occurs in March through July, and September. Precipitation is generated from the moist air masses of the west coast's mid-latitudes and driven by strong westerly to southwesterly winds over the mountainous Continental Divide (Caprio and Nielson 1992). The average seasonal snowfall is dependent upon elevation. At Dillon, the yearly average snowfall is about 35 in, but at just slightly higher elevations the annual average is 70 in. On average, about 50 days per year have at least 1 in of snow on the ground at Dillon, but higher elevations have snow for upwards of 100 days annually. The average annual precipitation in Dillon is 11.61 in.

January temperatures in Dillon average 32.2°F for the high temperature and 11°F for the low. The lowest temperature on record at the Dillon station was -40°F on February 9, 1933. July high temperatures average about 83°F at Dillon with lows around 49°F. The highest temperature ever recorded at Dillon was 100°F on August 12, 1940 (US Climate Data 2015).

Average annual total precipitation across the survey area is highly dependent on location and elevation. Driest areas are in the northern valley section north of Dillon where between 9 and 10 inches of precipitation falls in a typical year. The southeast part of the survey area, and the westernmost section at highest elevations, receive the most precipitation annually. Some areas receive up to 20 inches, with 15 to 18 inches common along the southern and southeast border. At Dillon, the average annual precipitation is 11.67 inches. Of this amount, about 5.3 inches, or 46 percent, usually falls in June through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record at Dillon was 1.94 inches at Dillon on May 28, 1982. Thunderstorms occur on about 25 days each year, mostly between June and August (NRCS 2004).

The average frost-free period for Dillon is 99 days. Regionally, the growing season ranges from 45 to 100 days. Data from The Western Regional Climate Center at the Dillon City Airport indicate temperature variances from a December low of -37°F to an August/July high of about 100°F (WRCC 2004). The region's semi-arid conditions dictate low soil-moisture content that is insufficient for tree growth below timberline on some south and west landscape aspects and, as such, grasslands can extend from valley bottoms to the neighboring mountaintops.

The average relative humidity in mid-afternoon is about 30 percent in summer and about 70 percent in winter. Humidity is higher at night with the average at dawn at about 80 percent in most months. The sun shines about 72 percent of the time in summer and about 40 percent in winter. The prevailing wind is highly dependent on terrain, but generally follows the valleys,

with south winds for much of the year in the main valley, but also from the north a good percentage of the time. Average wind speed is highest, around 9 miles per hour, in April and May (NRCS 2004).

3.2. Soils and Geology

3.2.1. Existing Conditions

Clark Canyon Dam is situated at the confluence of the northwest-flowing Red Rock River and the east-flowing Horse Prairie Creek, at the origin of the Beaverhead River. These rivers are part of the Missouri River headwaters and within the Montana-Idaho Basin and Range Province (Bartholomew et al. 1999).

Between the Clark Canyon Dam and Barretts Diversion, the Beaverhead River flows through a very straight, deep and narrow valley canyon for the first twelve miles of its course, with an average gradient 0.244 percent. It then widens into a broad valley about eight miles south of Dillon, Montana. The steeper gradient within Beaverhead River Canyon may reflect, among other things, Quaternary tectonic controls on the adjacent valleys within this tectonically active region along the perimeter of the track of the so called Yellowstone hotspot (Bartholomew et al. 1999).

Data analyzed by Bartholomew et al. (1999) reveal that the course of the Beaverhead River across the Blacktail Range was established by the Late Pleistocene era. Earlier canyon incision of Eocene volcanic rocks presumably formed the bedrock along most of the river's future course. It is unknown when and how this course was established, but it is speculated that high volumes of Middle Pleistocene glacial runoff from the Continental Divide to the south and southwest influenced the general northeast-flow of the ancestral river across the Blacktail Range.

Additional evidence suggests that uplifting of the Blacktail Range relative to the Red Rock River valley, as well as the valley encompassing Dillon, must have been substantial in order to achieve the depth of incision across the Blacktail Range without a similar incision across the later Quaternary deposits found in these valleys.

These late Quaternary depositions along the Beaverhead River are believed to have occurred as the river cut through bedrock material, including: late Paleozoic rocks thrust over late Cretaceous Beaverhead Conglomerate located near Clark Canyon Dam; extensive Tertiary volcanic rocks north of Grasshopper Creek; and Mesozoic and Paleozoic strata exposed beneath the volcanic rocks locally near the river. The sharply dipping Beaverhead Conglomerate flattens abruptly near Henneberry Gulch to make up much of the bedrock near river level. Intrusive volcanic rocks also occur at river level and coarse gravels overlie volcanic rocks along the southeast-side of the river near the mouth of Clark Canyon (Bartholomew et al. 1999).

As the river enters the broad basin near Dillon, it is nearly perpendicular to the projected trace of the Blacktail fault. The Beaverhead River Canyon was incised across underlying Mesozoic-Cenozoic features after cutting through Eocene volcanic rocks. Stratigraphic, structural, and topographic changes at Barretts Diversion were noted to partially reflect Neogene movement on the west-northwest-trending Blacktail fault which flanks the Blacktail uplift. The frontal portion

the valley is filled with large, late Quaternary, coalescing fan complexes that may be influenced by late Quaternary movement along this active fault (Bartholomew et al. 1999).

Seismic activity in the southwestern region of Montana is significant and has been shown to have the highest degree of tectonic plate movement within the state (Bartholomew et al 1999). A portion of the region borders the highly active Yellowstone caldera in Wyoming. There may have been some correlations to major earthquakes, like the Quake Lake slide associated with the August 17, 1959 Hebgen Lake earthquake, and landslide activity in Beaverhead Canyon. Evidence of Late Quaternary landslides is frequent along the flanks of the lower canyon with larger landslides intruding upon the floodplain which, to a certain extent, deflect the river's course. In areas where the canyon sides have become unstable as a result of erosion or seismic activity, landslides occur and can block the path of flow of the Beaverhead River. The nearest faults to Clark Canyon Dam are known as Red Rock Fault and Blacktail Fault. Both run approximately southeast to northwest, perpendicular to the flow of the Beaverhead River downstream of the dam. Red Rock Fault is about 10 mi upstream along the Red Rock River, while the Blacktail Fault is about 12 mi downstream toward the town of Dillon. Blacktail Fault has been well-documented as an active fault (FERC 2009).

In regional terms, the lithology and stratigraphy composition is complex with Precambrian granitic, Paleozoic metamorphic, and Tertiary sedimentary and volcanic rocks. The region encompassing southwest contains the most extensive mineral resources of any area in Montana. Unique geologic structures and mineralogy of the region offer commercial grade to potentially commercially grade deposits of the following: precious metals such as gold and silver; industrial minerals including talc, chlorite, phosphate, limestone, zeolite, garnets, vermiculite, sand, gravel, building stone; the rare earth commodities of thorium and uranium; and energy mineral such as oil, gas, oil shale and coal.

Soils within the geologic province consist of frigid and cryic Ochrepts, Boralfs, and Borolls, with some Fluvents and Aquepts in alluvial valleys. Mountain soils are comparatively shallow to moderately deep with loamy to sandy textures and punctuated by rock fragments. Valley soils are moderately deep to deep with loamy to clayey textures (Bailey 1995).

In 2000, the BOR executed a study to calculate reservoir capacity lost due to sediment accumulation since 1964. The sediment accumulation may be associated with stream down-cutting. The sedimentation is generally believed to be contributed by the drainage area to the reservoir, although a minor amount is trapped upstream by the Lima reservoir. Loss of storage below the normal operating water surface level could also occur from shoreline erosion, although this has not been studied. Since the operation of the earthfill dam began in 1964, the reservoir has accumulated a sediment volume of 4,160 ac ft below 5,546.10 ft elevation which amounts to 2.3 percent loss in capacity and an average loss of 114.7 ac ft annually.

3.2.2. *Potential Project Effects on Soils and Geology*

3.2.2.1. Construction

The areas near the Clark Canyon Dam where construction of the proposed Project would occur were disturbed during construction of Clark Canyon Dam, which was completed in 1964. The valve house, powerhouse, parking area, and transformer pad would all be located on the toe of the downstream face of the dam, adjacent to the existing outlet portal and stilling basin, and the stilling basin for the overflow spillway. There would be no new penetrations through the dam structure. The Project would use the existing outlet tunnel downstream of the intake gates by installing a new steel liner in the tunnel with a new bifurcated diversion structure to allow for flows to the existing outlet stilling basin or to the proposed powerhouse.

The proposed transmission line would travel 8 mi across BOR, Montana State Land and run adjacent to private lands within the Beaverhead County Highway 324 ROW to connect at the Peterson Flat Substation.

Ground disturbance associated with construction of the Project could release sediment into nearby wetland areas and the Beaverhead River downstream of the dam. It could also adversely affect the structural stability or seepage characteristics of the existing dam. Turbidity could be increased by a change in flow patterns through the dam during construction.

Proposed construction work would disturb multiple areas on the downstream side of the dam, as well as inside the dam. Routing of the transmission line along the uphill side of the existing access road would limit the potential for sediment release from construction activities into wetlands and the Beaverhead River.

The temporary instream flow release pumping facilities, to maintain minimum flows during construction, would be located upstream of the dam near the overflow spillway crest. Little or no ground disturbance is anticipated in this area.

To minimize soil erosion and dust, protect water quality, and minimize turbidity in the Beaverhead River, a Soil Erosion Control and Revegetation Plan was developed to guide erosion control and revegetation activities during construction and operation of the proposed Project. The applicant proposes to use erosion control practices, such as silt fencing, straw bales, and a sedimentation basin, to capture eroded soil and sediment before it enters undisturbed areas or affects water quality. Approved and properly implemented erosion and sediment control measures would minimize sediment releases that could result from construction disturbance. Inspection and maintenance of the erosion and sediment control structures, especially around rainfall events and disturbance activities, would ensure compliance with the plan. Since the Soil Erosion and Revegetation Plan could be improved by site-specific information from the final Project design, it will be updated when final design is available. Components of the draft plan are discussed below.

A sedimentation basin would be located to capture runoff and pumped water from the areas of excavation near the outlet works so that sediment would settle out of the runoff before it flows into the Beaverhead River. Silt fencing would be used to filter runoff from construction covering

broader surface areas, such as access road improvements and the proposed buried transmission line corridor. Straw bale barriers would be used to filter runoff in concentrated flow areas, such as swales, berms, and channels that would encircle the spoil and staging areas. In addition, fuel may be stored in the staging area, so a liner would be placed in a separate portion of the area to prevent infiltration of a potential spill. This portion of the area would also be encircled by a berm large enough to contain at least the maximum amount of fuel that could be stored on top of the liner. All erosion and sediment control measures would be inspected after rainfall events and repaired, if necessary. The Project engineer would keep a log of all inspections and changes to the implementation of this plan.

Erosion and sedimentation control for the Project would include the application of seed and fertilizer to revegetate all disturbed areas at the completion of construction. Mulch would be applied and stabilized to prevent wind or other weather from removing the seed/fertilizer mix. Topsoil is proposed to be removed before construction starts, then stored and later replaced as part of revegetating the disturbed areas. Additionally, areas compacted by construction activity would be ripped before topsoil is replaced. Spoils, including material excavated from the powerhouse area, which is not expected to contain any rock material, would be stabilized in a similar fashion to other disturbed areas. For three years after stabilization, revegetated areas would be inspected annually to verify that rills or gullies have not formed, ground cover is sufficient, and native species dominate the restabilized areas. Portions of areas that require maintenance would be stabilized again, possibly with contingency measures such as additional irrigation.

Revegetation with native species, if stabilized before the structures are removed, would prevent revegetation material, such as seed, fertilizer, and mulch, from being released into wetlands or the river. Post-construction stabilization and effective site restoration with native plants, as discussed in section 3.5.3, would minimize long-term effects on environmental resources.

The applicant proposes to locate the spoil site near the east end of the downstream side of the dam. Material that is excavated from the location of the proposed powerhouse and appurtenant facilities would be placed and stabilized with native species as part of the soil erosion control and revegetation plan. This material would be graded and revegetated to blend in with the surrounding landscape and structures.

The proposed temporary pumping facility could adversely affect water quality in the Beaverhead River by taking in sediment through its intake in the reservoir, or by disturbing sediment during installation or removal of the intake. Adverse impacts to water quality would be minimized if the intake were located and removed in a manner that avoids disturbing the sediment in the reservoir, and avoids taking in sediment during operation of the pumping system. To monitor water quality in real-time, the applicant proposes to place data loggers immediately upstream and downstream of the construction site. Comparing water quality at the two locations would detect increases in turbidity over background levels. The water quality data loggers would be sufficient to monitor any turbidity change caused by sediment release downstream of dam, or sediment intake by the pumping system, by comparing water quality to baseline measurements in the reservoir. The upstream data loggers would need to be placed

away from the pump intake to ensure that any turbidity caused by the intake does not reach the water quality data logger. The applicant proposes to provide monitoring data to resource agencies and FERC to verify that the erosion and sediment controls are effective and that the temporary pumping facility is not creating additional turbidity.

Constructing facilities at an existing earthfill dam such as the Clark Canyon Dam has the potential to adversely affect the dam's structural ability to withstand a seismic or flood event by changing the seepage characteristics of the dam. The applicant proposes to construct the powerhouse and appurtenant facilities in a manner to avoid any effects on reservoir levels or dam stability. The proposed hydroelectric facilities would also be designed to withstand seismic and hydrostatic forces.

To ensure that the area is suitable for the foundation loading of the hydroelectric facilities, geotechnical borings would be drilled and the results reviewed and approved by FERC and BOR. Borings would be located and drilled after final design plans specify the exact location of the hydroelectric facilities. The results of the borings would show the composition of the subsurface geology and dam structures, including the location of bedrock, to confirm the suitability of the final design location of the powerhouse and foundation loading. To confirm that the proposed facilities would not adversely affect the stability of the existing structures, and to confirm that the proposed structures would be compatible with applicable seismic and hydrostatic load standards, the applicant would finalize design plans and drawings and submit FERC and BOR review and approval. The plans would include structural drawings, construction methods, and mitigation measures for potential impacts from construction of the powerhouse, steel conduit liner, shaft house, transmission line, and all appurtenant facilities.

3.2.2.2. Operation

Once in operation, the Project should have little or no effect on geology and soils. Proper implementation of the applicant's updated soil erosion control and revegetation plan would prevent excessive runoff that could possibly cause rills or gullies to form, thereby protecting water quality, wetlands, and soil resources. Intake and discharge of water for Project use would be confined to areas already established for those purposes.

3.2.3. Proposed Studies

No additional soils or geology studies are proposed.

3.3. Water Resources

3.3.1. Existing Conditions

3.3.1.1. Water Quantity

The Clark Canyon Reservoir is used for irrigation enhancement and flood control. The amount of water stored and discharged depends on its operations as a multiple use resource. Historical real-time water management data for the Clark Canyon Reservoir is available through the Hydromet data system operated by BOR (http://www.usbr.gov/gp-bin/arcweb_ccr.pl); data

was obtained for the operational time period from January 1, 1965 through December 31, 2014 for the assessment of water quantity in the Clark Canyon Reservoir.

The average daily discharge from the Clark Canyon Reservoir to the Beaverhead River from 1965 through 2014 is shown on Figure 3.3-1. Discharges for the period of record used in this analysis were found to range from a minimum flow of 23 cfs to a maximum flow of 2,200 cfs with an average of 344 cfs. A flow exceedance curve constructed from these data is shown in Figure 3.3-2. The data indicate that the 80 percent, 50 percent, and 20 percent exceedance flows are 50 cfs, 250 cfs, and 610 cfs, respectively.

Extended periods of low flows (less than 100 cfs) occurred in 1967, 1975, 1986, 1990-93, 2001-2009, and 2013-2014. The low flows in 2001-2004 reduced the reservoir storage to its lowest level since its construction. Conversely, there have also been extended periods of above average precipitation. These years (1971, 1976, 1984, 1996, 1998, and 1999) resulted in high discharges from the reservoir. In 1984, spring snowmelt flows from the outlet tunnel were at a maximum and the reservoir spilled for the first and only time. The cyclical pattern described above can best be visualized by inspecting the annual water yield from the reservoir, shown on Figure 3.3-3.

In order to define a typical annual hydrograph for flows leaving the Clark Canyon Reservoir, an annual hydrograph was developed for the average daily discharges. Figure 3.3-4 shows the daily average minimum, daily maximum and daily average observed flows from the reservoir between 1965 and 2014. The data indicate four distinct hydrologic time periods. Starting in April, water releases from the reservoir are increased, ramping to an average discharge of approximately 750 cfs. This corresponds to a reservoir filling period. The second period is a 45-day (approximately June 1 to July 15) period of stabilized flows of approximately 750 cfs. This corresponds to a near full pool in the reservoir. The third hydrologic period is from mid-July through the end of August and is represented by elevated and changing flow (reaching a maximum average daily discharge of 880 cfs). These flows correspond to a reduction in reservoir storage. Flows continue to drop until the end of September. The final hydrologic period is the low, stable flow from October to the following April. This period corresponds to the reduced reservoir storage.

The daily storage in Clark Canyon Reservoir from 1965 through 2014 is shown in Figure 3.3-5. The average daily storage for this 49-year period of record is observed to range from a minimum of 10,720 ac ft in 2003 and a maximum of 283,070 ac ft in 1984 with an average volume of 127,330 ac ft. In order to define a typical annual operational cycle, the average, minimum, and maximum daily storage volumes were calculated for the reservoir between 1965 through 2014. These data are shown for reservoir storage as well as reservoir elevation (Figures 3.3-6 and 3.3-7, respectively). The operation of Clark Canyon Reservoir can be defined by the adage “fill and spill,” demonstrated by Figures 3.3-6 and 3.3-7. The lowest reservoir elevations are generally observed at the end of September and correspond with the end of the irrigation season. The reservoir elevations and storage volumes steadily increase until maximums are attained. This generally occurs by the middle of May. The extreme conditions in reservoir storage and elevation (minimum and maximum curves) when graphed on an annual basis show

large variation (i.e., highest and lowest elevations for a given condition) compared to the annual average conditions. For example, the maximum daily elevation observed between 1965 and 2014 occurred on June 25th at 5,564.7 ft which is 25.5 ft higher than the average (5,539.2 ft) and 58.7 ft higher than the minimum (5,509 ft) elevations observed on that date.

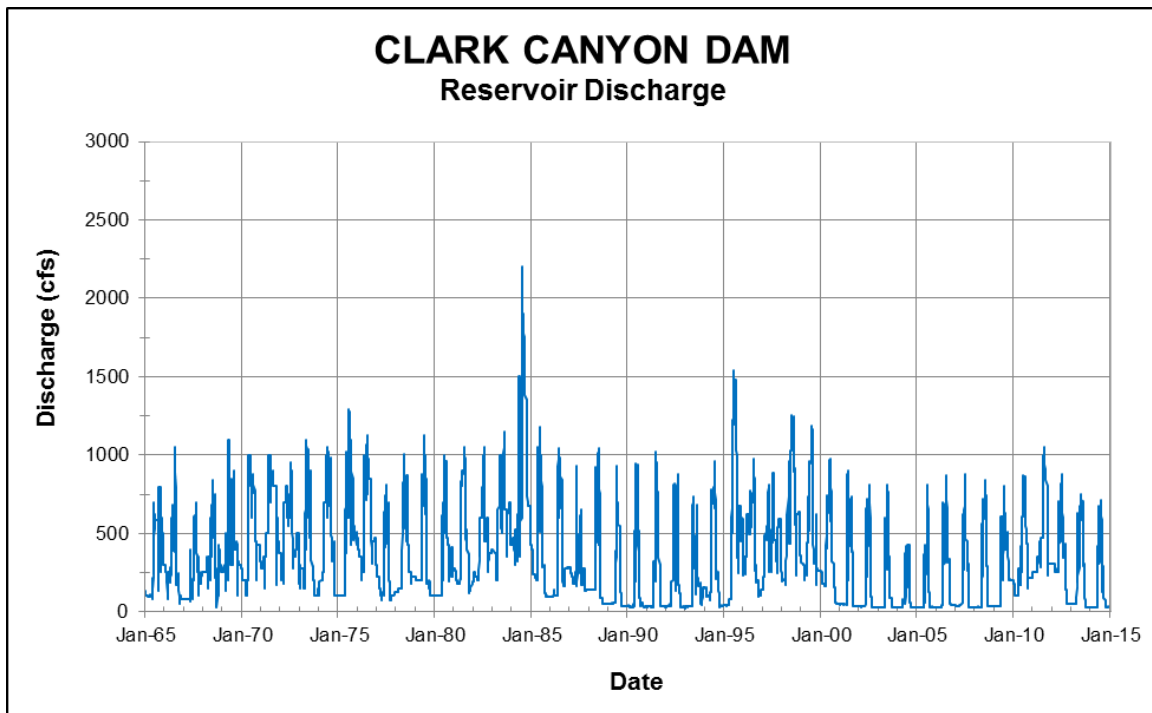


FIGURE 3.3-1. AVERAGE DAILY DISCHARGE FLOWS FOR THE BEAVERHEAD RIVER BELOW CLARK CANYON DAM.

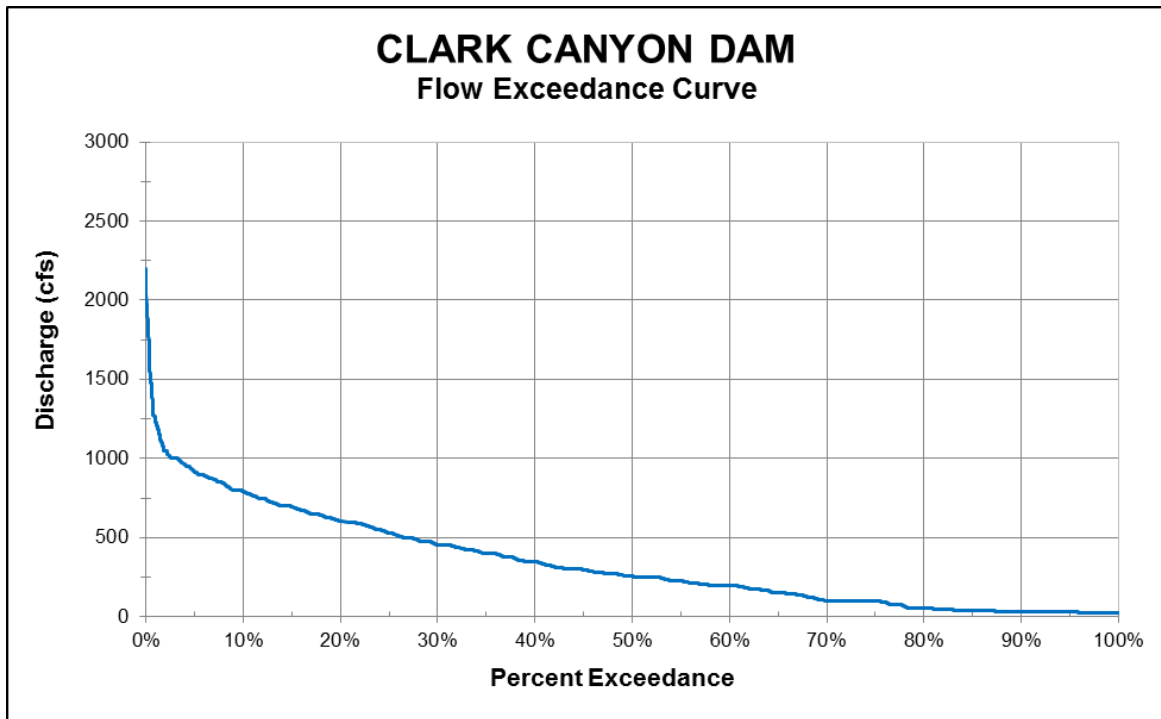


FIGURE 3.3-2. A FLOW EXCEEDANCE CURVE FOR THE BEAVERHEAD RIVER BELOW CLARK CANYON DAM.

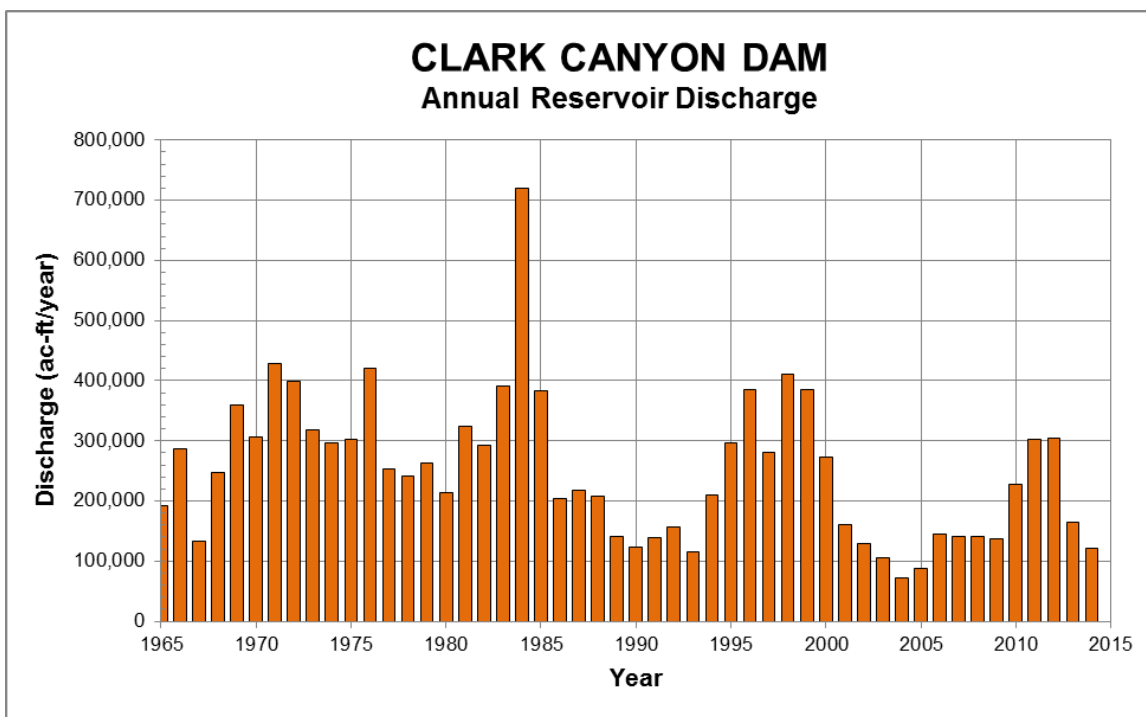


FIGURE 3.3-3. ANNUAL WATER YIELD OF CLARK CANYON RESERVOIR.

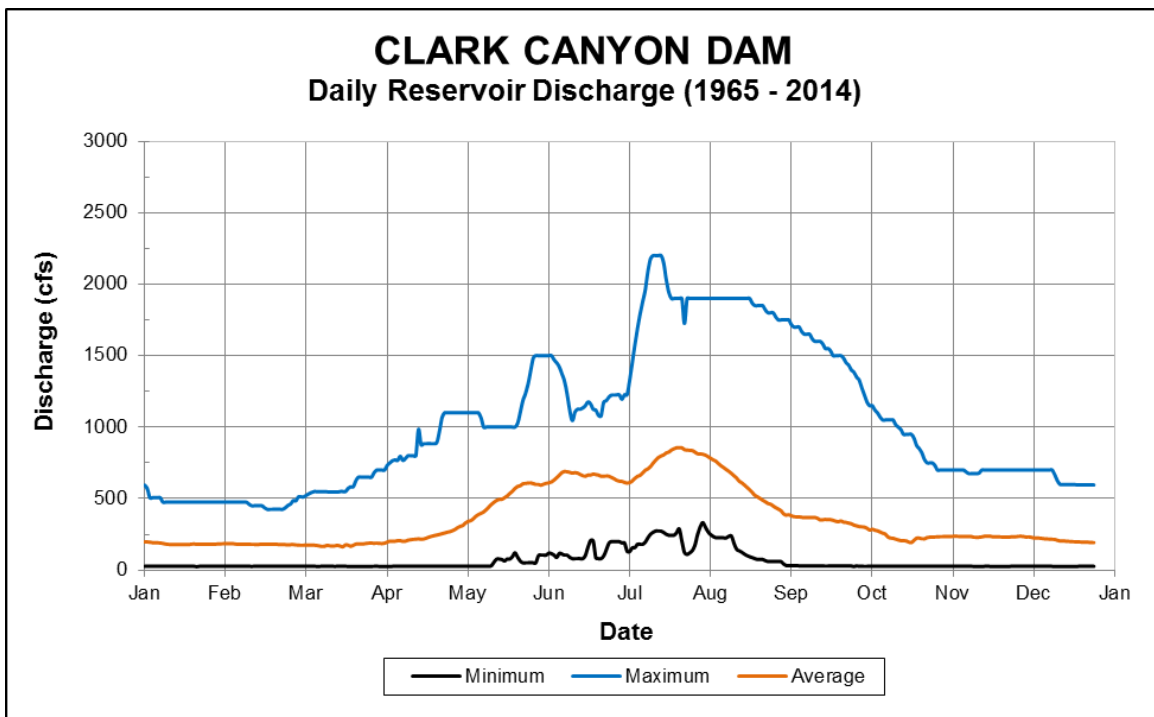


FIGURE 3.3-4. THE DAILY AVERAGE MINIMUM, MAXIMUM, AND AVERAGE OBSERVED FLOWS FROM THE RESERVOIR 1965 THROUGH 2014.

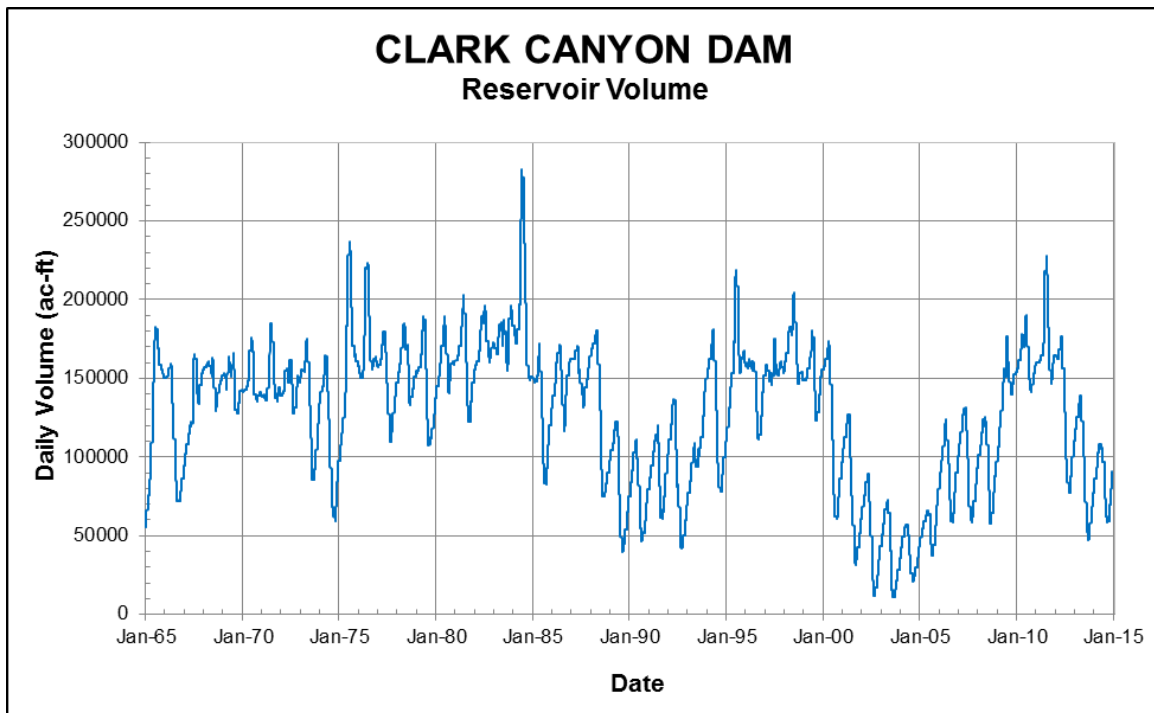


FIGURE 3.3-5. DAILY STORAGE IN ACRE-FEET FOR CLARK CANYON RESERVOIR.

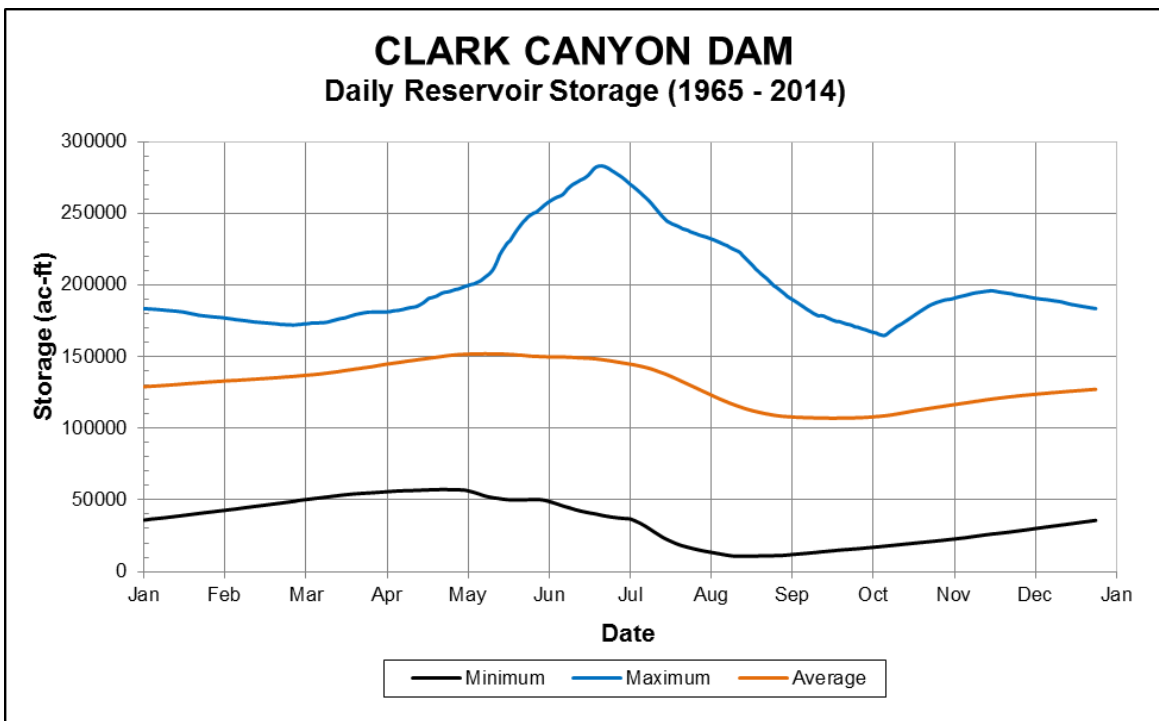


FIGURE 3.3-6. AVERAGE, MINIMUM AND MAXIMUM STORAGE FOR CLARK CANYON RESERVOIR.

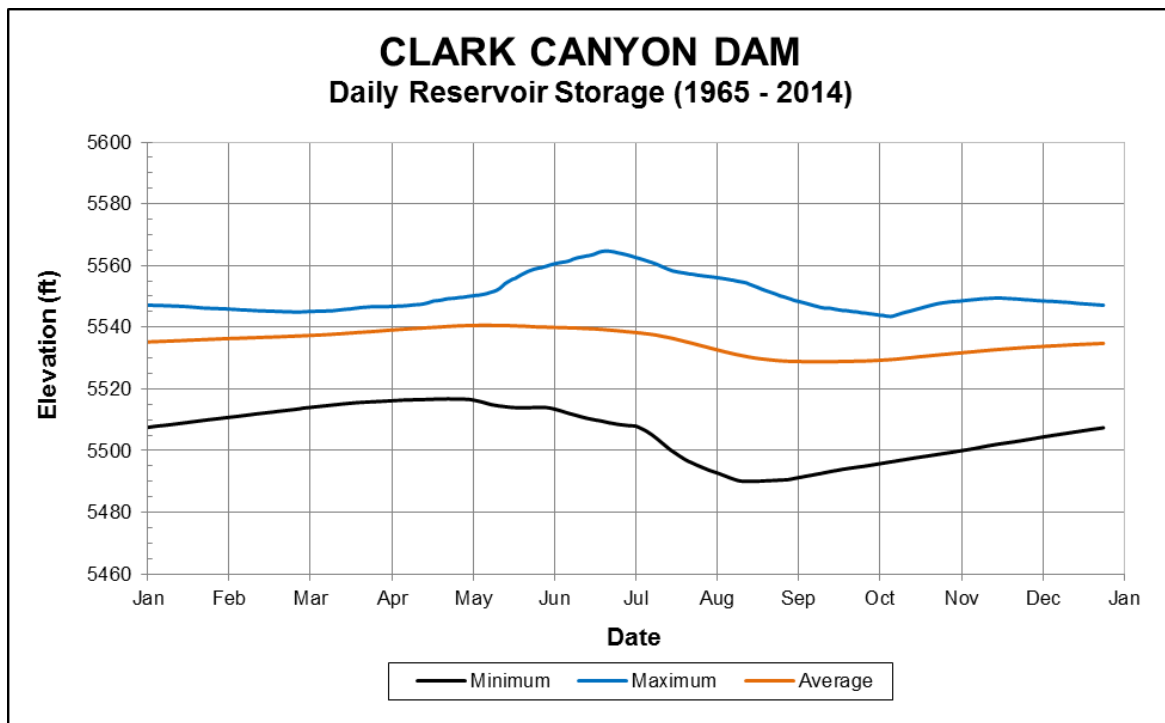


FIGURE 3.3-7. AVERAGE, MINIMUM AND MAXIMUM ELEVATION FOR CLARK CANYON RESERVOIR.

3.3.1.2. Water Quality

Existing water quality around Clark Canyon Reservoir and within the Beaverhead River, as well as the potential impacts to water quality by the proposed Project, are discussed in this section.

3.3.1.2.1. Water Quality Standards and Conditions

Water quality standards for Clark Canyon Reservoir and the Beaverhead River downstream of Clark Canyon Dam are prescribed by their use class of B-1. Use class B-1 means they are maintained in a condition suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply (Montana Department of Environmental Quality [MDEQ] 2012). Numeric water quality criteria for B-1 classified waters are presented in Table 3.3-1 below.

Red Rock River and Horse Prairie Creek (the primary tributaries to Clark Canyon Reservoir), as well as the Beaverhead River downstream from Grasshopper Creek (11.8 mi downstream from Clark Canyon Dam), are identified on the State of Montana's Clean Water Act (CWA) section 303(d) list as being water quality impaired with a total maximum daily loads (TMDL) required (MDEQ 2014). Details of these impairments of these streams are discussed below and shown in Table 3.3-2.

The Red Rock River from Lima Dam to Clark Canyon Reservoir is impaired due to habitat alteration, flow alteration, alteration in streamside vegetation, sediment, temperature, lead, and zinc. Horse Prairie Creek, from its headwaters to Clark Canyon Reservoir, is impaired due to flow alteration, arsenic, cadmium, copper, lead, mercury, and zinc. The Beaverhead River from Clark Canyon Dam to Grasshopper Creek is impaired due to flow streamside vegetation alteration, as well as lead. Downstream of Grasshopper Creek, the river is impaired by flow, streamside vegetation, substrate habitat alteration, sediment or siltation, and water temperature. MDEQ is currently working on defining acceptable TMDLs for the Red Rock River and Beaverhead River Basins (MDEQ 2014).

Clark Canyon Reservoir is included in MDEQ's 2014 Integrated Water Quality Report as impaired by a non-pollutant for alterations to flow regimes relating to drought impacts and irrigated crop production. These impacts cause impairments for the beneficial uses of primary contact recreation and aquatic life (MDEQ 2014). Since these impairments are not pollutants, a TMDL will not be completed.

Water quality data was collected at six sites in the Project vicinity between 2007 and 2009. The sites were chosen to provide baseline data for assessment of the potential effects of Project construction and operation on water quality of the Beaverhead River. Monitoring efforts documented dissolved oxygen (DO) and temperature profiles in the forebay area of Clark Canyon Reservoir. In addition, DO, temperature, TDG, and turbidity were monitored at five sites in the Beaverhead River downstream from the dam. The following sections discuss specific water quality background data for the two waterbodies that could be impacted by the Project: Clark Canyon Reservoir and the Beaverhead River.

TABLE 3.3-1. NUMERIC WATER QUALITY CRITERIA FOR B-1 CLASSIFIED WATERS IN MONTANA

Parameter	Background Condition	Numeric Criteria
Temperature	32°F to 66°F	1°F maximum increase above background
	66°F to 66.5°F	No discharge is allowed that will cause the water temperature to exceed 67°F.
	>66.5°F	The maximum allowable increase in water temperature is 0.5°F
Dissolved Oxygen	NA	4.0 mg/L from October through February; 8.0 mg/L during presence of early life stages of fish (likely March through September)
Total gas pressure	NA	110 percent saturation
Turbidity	NA	5 NTUs above background

Notes:

NA= not applicable

Mg/L=milligram per liter

NTU=nephelometric turbidity unit

TABLE 3.3-2. 303(D) LISTED STREAMS NEAR THE PROJECT

Impairment	Waterbody/Impairment Source			
	Red Rock River	Horse Prairie Creek	Medicine Lodge Creek	Beaverhead River
Lead	abandoned mine lands	abandoned mine lands	-	abandoned mine lands
Zinc	abandoned mine lands	abandoned mine lands	-	-
Copper	-	abandoned mine lands	-	-
Mercury	-	abandoned mine lands	-	-
Zinc	-	abandoned mine lands	-	-
Arsenic	-	abandoned mine lands	-	-
Phosphorus	-	-	Irrigated crop production, grazing in riparian or shoreline areas	-
Low flow alterations	Impacts from hydrostructure flow regulation/modification, irrigated crop production	Irrigated crop production	abandoned mine lands, grazing in riparian or shoreline areas	Agriculture, Irrigated crop production
Physical substrate habitat alterations	abandoned mine lands, grazing in riparian or shoreline areas	-	-	-

Impairment	Waterbody/Impairment Source			
	Red Rock River	Horse Prairie Creek	Medicine Lodge Creek	Beaverhead River
Stream-side or littoral vegetation	Grazing in riparian or shoreline areas, loss of riparian habitat	-	Grazing in riparian or shoreline areas, loss of riparian habitat	Agriculture, irrigated crop production, dam or impoundment
Sediment or siltation	Grazing in riparian or shoreline areas, loss of riparian habitat	-	Grazing in riparian or shoreline areas, loss of riparian habitat	-
Water temperature	Impacts from hydrostructure flow regulation/modification, Abandoned mine lands, irrigated crop production	-	Grazing in riparian or shoreline areas, loss of riparian habitat	-

Source: MDEQ 2014, “-” = no impairment

3.3.1.2.2. Clark Canyon Reservoir

During 1971-1972, Smith (1973) conducted limnological studies on the effects of Clark Canyon Reservoir on the water quality of the outflowing Beaverhead River. His data indicated that the reservoir has moderated the summer and winter temperatures of the Beaverhead River as compared to Red Rock River and Horse Prairie Creek. In addition, summer and winter diel (daily) temperature variations immediately below the reservoir were also found to be reduced. For example, Smith observed summer diel temperature variations upstream of the reservoir to range from 13°C to 21°C, while below the dam, the Beaverhead was a constant 15°C.

Water quality was evaluated in Clark Canyon Reservoir and the Beaverhead River between 2007 and 2009 (Symbiotics 2009, 2010). In 2007, reservoir surface elevations dropped about 15 ft during the sampling period from a high of about 5,535 ft during early May to a low of about 5,520 ft from August through October. The reservoir was cool but well stratified in May, with surface temperatures of approximately 14.5 °C, a thermocline depth of about 10 meters (m), and hypolimnion temperatures of approximately 10°C (Figure 3.3-8). Surface temperatures continued to warm through July, but began to cool in August and were down to 12.5°C by September. The maximum surface temperature observed was in early July when surface waters reached 22°C. The thermocline was relatively constant at about 10 m deep despite changes in reservoir elevations and reservoir temperatures. Stratification was strong from May through July, but lessened by mid-August and was completely absent by late September when the profile reflected complete mixing throughout the water column and a uniform temperature of approximately 12.5°C. Reservoir monitoring during stratification in July and August of 2007 indicated that DO levels varied from about 7 milligrams per liter (mg/L) within the upper 10 m to less than 4 mg/L near the bottom (Figure 3.3-9). By late

September, however, the reservoir became uniformly mixed and DO concentrations exceeded the standard of 8 mg/L. Reservoir profiles of DO were also performed in 2010. The 2010 reservoir profiles showed that fall turnover occurred during late September or early October. However, the lowest hypolimnion DO level was 1.3 mg/L in late July. This finding is similar to studies conducted in the reservoir several decades ago by Berg (1974), which found that DO concentrations in the hypolimnion fell to about 2 mg/L in July of both 1971 and 1972.

Current dam operations cause water to be vigorously aerated as highly pressurized flows exit the regulating outlet. As a result, the flow rate through the dam is highly correlated with total dissolved gas (TDG) saturation. The highest flows can lead to oversaturation and TDG levels above 115 percent saturation. The Montana standard for TDG saturation is 110 percent (MDEQ 2012).

Additional information about reservoir stratification patterns is available from temperature and DO profiles measured by the BOR in 2001, 2002, and 2003 (BOR 2005). In 2001, a substantial degree of stratification was evident in late June and in mid-August, with complete mixing (as reflected by uniform temperature and DO profiles) occurring by the next measurement on October 14th. In 2002, the reservoir exhibited substantial stratification in mid-June, was weakly stratified in mid-September, and reflected complete mixing by the next measurement on October 8th. In 2003, stratification was not evident in July, but no profiles were measured after July 28th in that year.

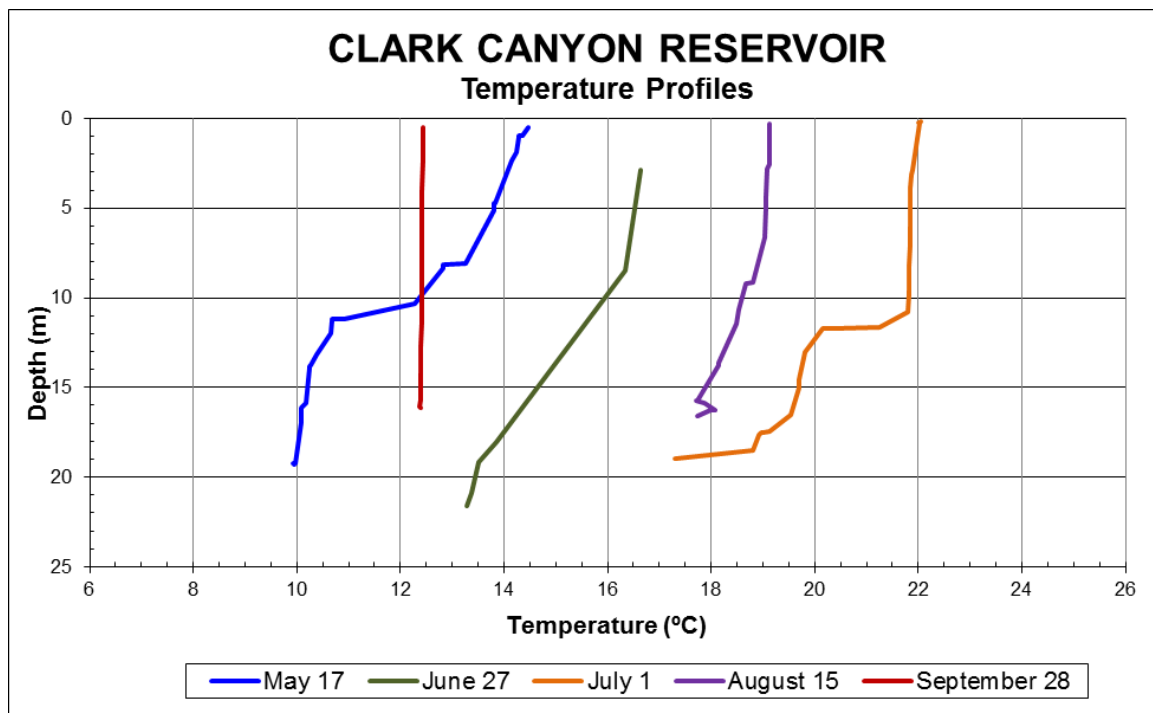


FIGURE 3.3-8. TEMPERATURE BY DEPTH IN CLARK CANYON RESERVOIR, SELECTED MONTHS 2007 (SOURCE: SYMBIOTICS, 2009).

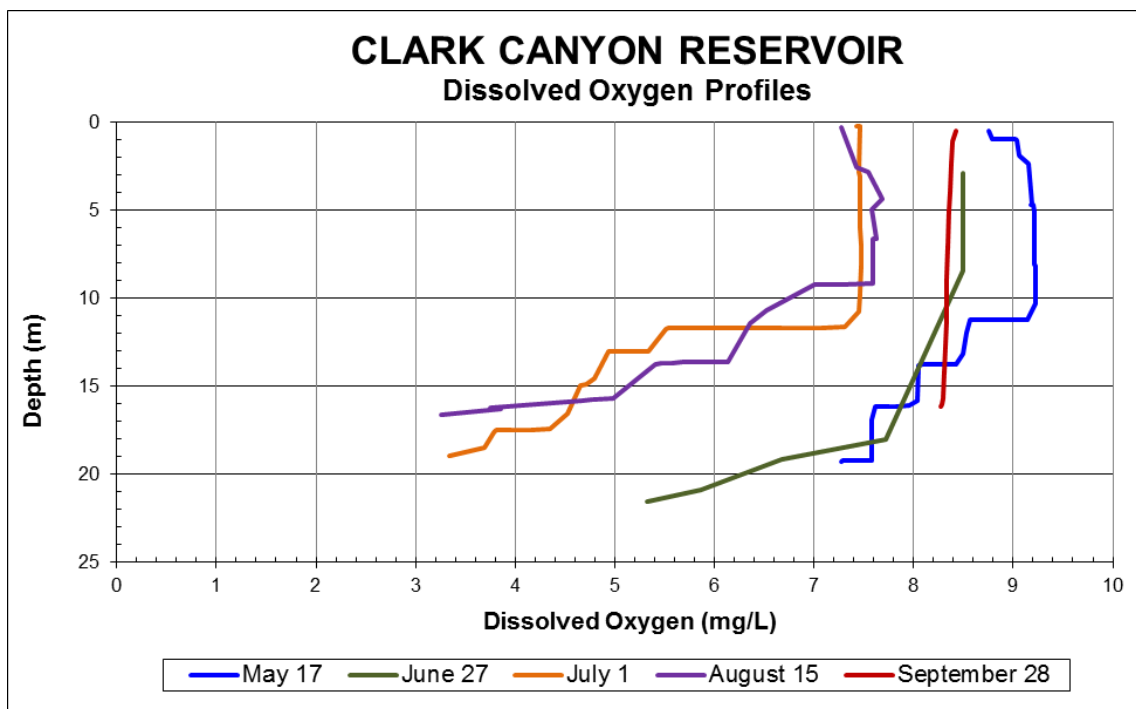


FIGURE 3.3-9. DISSOLVED OXYGEN BY DEPTH IN CLARK CANYON RESERVOIR, SELECTED MONTHS 2007 (SOURCE: SYMBIOTICS, 2009).

3.3.1.2.3. Beaverhead River

Monitoring sites in the Beaverhead River are located at RM 0 (BR-01), RM 0.9 (BR-02), RM 3.0 (BR-03), RM 5.7 (BR-04), and RM 10.7 (BR-05). Water temperature, DO, TDG, and turbidity were continuously monitored at site BR-01 in the Beaverhead River approximately 300 ft downstream of Clark Canyon Dam in June 2007 through 2009 (Symbiotics 2007, 2009). The 2009 monitoring effort included four additional sites, for a total of five monitoring sites at locations listed above, where continuous monitoring data were recorded (Symbiotics 2010). Water temperature, DO, TDG and turbidity were monitored for a minimum period of 48 hours in each month at all locations BR-01 through BR-05 in 2007 and at BR-01 in 2009. Grab samples were collected at monitoring site, BR-01 through BR-05, and analyzed for turbidity and total suspended solids in 2009. Water temperature, DO, and turbidity monitoring efforts were conducted in 2013 by Clark Canyon Hydro in the Beaverhead River at site BR-01.

3.3.1.2.3.1. Temperature

Water temperature was monitored in 2007, 2008, 2009, and 2013. Water temperatures measured in 2007 in the Beaverhead River 300 ft downstream from the dam gradually increased from 14.3°C in late June, peaked at just over 21°C on August 4th, and then gradually decreased to just over 16°C in early September. The range of daily variation decreased as the summer progressed, but averaged just less than 1°C. Water temperatures were highest around noon and lowest around midnight. Data collected in 2008 and 2009 showed similar patterns between years, with winter temperatures generally less than 5°C and summer temperatures reaching 16 to 17°C. Sites closest to the reservoir outlet were generally the coolest in the summer, due to the proximity to cool reservoir waters. The relatively higher water temperatures measured in 2007 can be attributed to the lower reservoir elevations that year resulting from drought conditions in the watershed (Symbiotics 2010).

Temperature observations in 2013 were consistent with historical monitoring, with winter temperatures generally less than 5°C and summer temperatures peaking at approximately 18°C.

3.3.1.2.3.2. Dissolved Oxygen

Minimum DO values measured at the five monitoring sites (BR-01 through BR-05) from 2007 through 2009 were generally above the 8 mg/L standard in most months and locations (Figure 3.3-10). Peak DO was reached typically during winter or spring and the lowest levels occurred in late summer. Overall, the lowest DO was recorded near the reservoir outlet, and higher values were recorded further downstream.

Some diel DO patterns, primarily during the spring and winter, were revealed by monitoring conducted near the reservoir outlet in 2008 and 2009. DO increased from morning to late afternoon, then declined. The greatest amplitudes were observed during the spring. This pattern reflects rates of photosynthesis in relation to the intensity of sunlight. During the summer months, there was little or no diel pattern. Greater discharges during those times likely reduced the opportunity for DO to be absorbed into solution.

DO observations in 2013 were consistent with historical monitoring, with concentrations peaking through winter and spring with seasonal lows occurring in late summer.

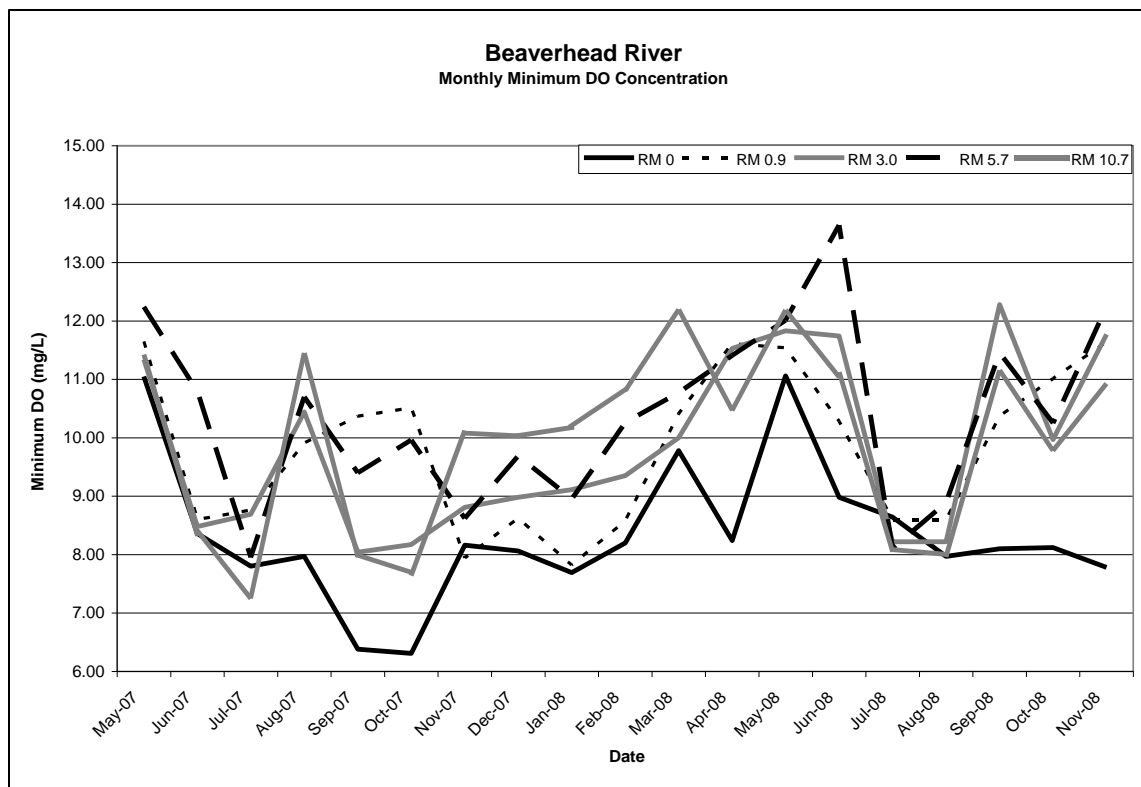


FIGURE 3.3-10. MINIMUM OXYGEN LEVELS MEASURED DURING MONTHLY 48-HOUR CONTINUOUS SAMPLING PERIODS AT FIVE SITES IN THE LOWER BEAVERHEAD RIVER BETWEEN MAY 2007 AND NOVEMBER 2008 DOWNSTREAM FROM THE CLARK CANYON DAM1 (SOURCE: SYMBIOTICS, 2009, AS MODIFIED BY FERC STAFF).

¹ The heavy dashed line applies to data collected at RM 5.7.

3.3.1.2.3.3. *Total Dissolved Gas*

During 1983, gas bubble disease was observed for the first time in trout in the Beaverhead River below Clark Canyon Dam. This corresponded to a time when the reservoir was at its maximum capacity and under both outlet and spill conditions. Data showed that 8.8 percent of the brown trout and 3 percent of the rainbow trout sampled immediately below the dam exhibited disease symptoms (Oswald 1985). The reservoir spilling for the first (and only) time since its construction was believed to be the cause of the supersaturation. However, data collected by Falter and Bennett (1987) during a non-spill period also found elevated levels of gases in the water. The highest levels observed for the non-spill time period was 126 percent compared to 127 percent during spilling. Lowest levels were always above 100 percent of saturation. Using all available data, a flow/gas saturation envelope curve has been constructed for the outflow water at Clark Canyon Dam. The data would indicate that a strong linear relationship between flow and total gas pressure exists between 0 and 1,000 cfs. This is the normal annual range of outflowing water from the reservoir. This analysis supports the conclusions drawn by Falter and Bennett, which was that the design of the outlet structure is the cause of gas supersaturation problems observed in the river below Clark Canyon Reservoir. The development of a hydroelectric Project on the outlet structure may reduce or eliminate this problem by reducing the turbulent mixing in the tailwater pool.

Although no spill occurred over Clark Canyon Dam during the 2007 monitoring period, saturation levels exceeded the state standard of 110 percent saturation during high flow periods in 2007, 2008, and 2009. Statistically, the 110 percent saturation rate was exceeded when flows were greater than about 360 cfs (Symbiotics 2010). Previous data collected by Falter and Bennett (1987) also indicated a strong and very similar linear relationship for flows up to about 1,000 cfs. This relationship was weakened slightly for flows above approximately 1,500 cfs, with or without spilling. Overall, TDG levels appeared to track discharge from Clark Canyon Dam and frequently exceeded state standards between June and September. Peak TDG levels exceeded 115 to 120 percent saturation during mid-summer in all years, when flows were in the range of 600 to 900 cfs. Measurements taken at downstream sites indicated that saturation levels were reduced as water moved downstream. However, at times TDG levels remained above the 110 percent standard at the next three measurement sites, extending 5.7 mi downstream from Clark Canyon Dam.

Monthly 48-hour TDG monitoring conducted in 2008 and 2009 showed diel changes in TDG in spring and winter, with levels stable at other times of the year as shown on Figure 3.3-11. Increasing TDG during daylight hours was assumed to be associated with increases in photosynthesis. TDG levels peaked typically at about 3:00 PM.

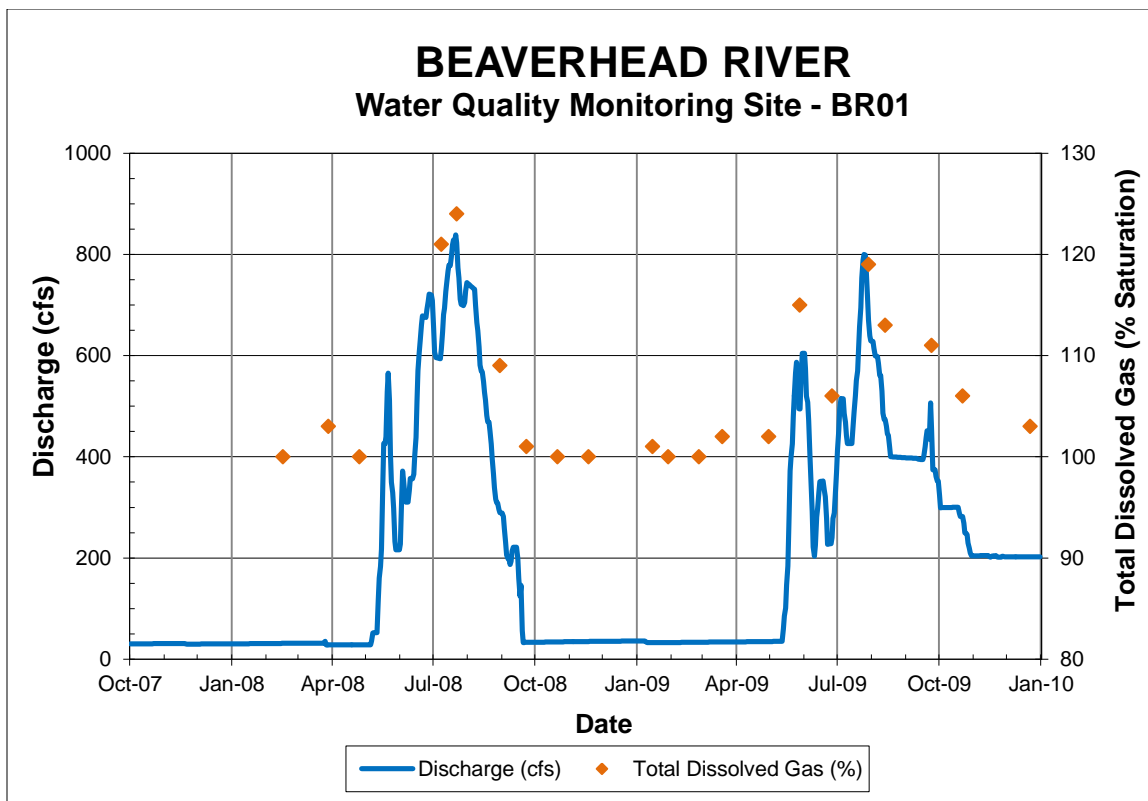


FIGURE 3.3-11. DISCHARGE AND TOTAL DISSOLVED GAS CONCENTRATIONS IN THE BEAVERHEAD RIVER DOWNSTREAM OF CLARK CANYON DAM DURING PERIODIC SAMPLING, 2008 THROUGH 2009.

3.3.1.2.3.4. *Turbidity*

Turbidity measurements indicate that turbidity levels are generally low, but do show some seasonal variation (Symbiotics 2009, 2010). Average turbidity values were generally below 5 nephelometric turbidity unit (NTU) per 48-hour sampling event. For example, turbidity observations in 2007 at site BR-01 ranged from a low of 0.02 NTUs in July to a high of 4.7 NTUs in September. Overall, turbidity levels measured at the site nearest the dam outlet were highest in the fall when reservoir levels were low. This may be attributable to re-suspension of sediment deposits due to wave action as the elevation of the reservoir was lowered over the irrigation season. Elevated turbidity levels at the downstream sites were most likely caused by suspended sediment contributed from tributary inflows. For example, during May 2009, a measurement of about 20 NTU was recorded at monitoring site BR-05. This site (BR-05) occurs below several tributaries and irrigation returns, which can raise turbidity. Turbidity observations in 2013 were generally consistent with historical monitoring with seasonal lows and highs observed in spring and late fall, respectively.

3.3.1.2.3.5. *Nutrients*

Nutrient data collected immediately below the reservoir indicated total inorganic nitrogen (ammonia+nitrate+nitrite) concentrations ranged between 20 and 300 g/L (grams per liter), with an average of 150 g/L. During the same time period (summer 1972), orthophosphate ranged between 40 and 180 g/L, with an average of 110 g/L. These nutrient data indicate that there are soluble nutrients being exported from the reservoir and that these nutrients are available for algal growth downstream from the reservoir. Using the nitrogen/phosphorus ratio, the data indicates that nitrogen will limit primary production downstream from the dam.

3.3.2. *Potential Project Effects to Water Resources*

3.3.2.1. *Construction*

Potential Project effect is the temporary increase of turbidity and sediments during the construction phase of the Project. Potential sediment impacts will be minimized through appropriate erosion control measures. Project construction activities are not anticipated to affect temperature, TDG, or DO measurements in the reservoir or river.

3.3.2.2. *Operations*

The Montana standard for TDG saturation is 110 percent. When the proposed Project is operating, aeration would be less vigorous because water exiting through the hydroelectric facility would be substantially less turbulent. Although this would be beneficial to the fishery by reducing TDG to within acceptable levels, DO standards anticipated to be prescribed by the MDEQ for the Project's CWA Section 401 Water Quality Certification may be compromised at certain times.

DO levels in Clark Canyon Reservoir's hypolimnion decline to as low as 1.3 mg/L, possibly less, during the summer. The state standard for minimum daily DO in the Beaverhead River is 8 mg/L from September through May and 7.5 mg/L from June through August. Summer

sampling in 2008 through 2010 indicated that this standard was met in the river below the outlet for most of the summer. This reinforces the idea that substantial aeration occurs as water exits the outlet. To maintain these concentrations in the river, the Project must provide at least that level of aeration, which can require augmenting DO concentrations by at least 7 mg/L. This plan is intended to outline the measures necessary to meet that standard during Project operation.

The approach to address DO levels is consistent with the strategy proposed in the Project's revised DO Enhancement Plan, filed with FERC on July 16, 2012. The Applicant proposes the deployment of submerged tailrace diffusers within an aeration basin. The diffuser system will feature two mechanical blowers, an electronic control system, and ducted aeration diffuser disks to inject fine bubbles of air into the water column. The aeration basin will be 59 ft long and 45 ft wide, and will allow water to be aerated as it leaves the powerhouse prior to re-entering the Beaverhead River. When the Project is operating, flows into the aeration basin will range from 87.5 to 700 cfs. Detailed drawings and specifications are available in Appendix A. The proposed aeration basin will not impact public access below Clark Canyon Dam. If sufficient aeration within this basin cannot be provided for any reason, water passing through the powerhouse will be diverted to the cone valve to maintain standards for DO as required by the Project's anticipated CWA Section 401 Water Quality Certification.

Based on studies of DO concentrations at the bottom of Clark Canyon Reservoir, DO levels may need to be supplemented by as much as 7 mg/L. To ensure that MDEQ targets are met, the diffuser system will have the capability to add 7.5 mg/L of DO. To achieve this level of aeration, approximately 2,040 diffuser units will be used. Each diffuser will have an active surface area of 59 square inches. Estimations for the number of diffusers were completed by using Environmental Dynamics International (EDI) calculations for the Flex Air Diffuser proposed for this project (Appendix B). Some minor design adjustments in the number and size of diffusers may be necessary, but the overall system will maintain the capability to add 7.5 mg/L of DO to water in the aeration basin. Diffusers will be mounted on pipes located at a depth of 25 ft in the aeration basin. Diffusers will rise approximately 1 ft above their mounting pipes, placing them at a depth of approximately 24 ft. Air injected into the diffuser array will be filtered to reduce or eliminate airborne particles within the aeration system. Filtering generally eliminates the need for cleaning or other maintenance within the inside of the diffuser array. Biological fouling on the outside of diffuser heads has a minimal effect on oxygen transfer. To confirm that diffusers are operational, the array would be operated intermittently according to the recommendations of the manufacturer.

Two roots-type blower units would supply air to the diffuser array and be capable of handling 5,600 standard cubic feet per minute (scfm) at 11.8 pounds per square inch (psi). Each blower would be rated at 5,900 scfm at 15 psi and will have the capacity necessary for Project specifications. The blowers will require two 3-phase, 460-volt (V) power connections, each consuming a maximum of 315 kilowatts (kW) to operate. Noise from the proposed blower system is estimated at 78 a-weighted decibels (dB(A)) at 3 ft from the building according to the manufacturer's specifications. The noise abatement measures proposed include placing the blower in a concrete vault type structure or building as shown in Appendix A. This noise

abatement measure will help keep sound levels below 80 dbA at a distance of 3 ft from the blower housing, at or below background levels of the existing dam outlet. Measurements taken in March 2012 near the fisherman's access recorded background noise levels from the outlet tunnel of 67 dbA, with a maximum reading of 73 dbA at a flow rate of 265 cfs. Flows, and by extension noise, will be considerably higher when stratification occurs and summer irrigation water is released from the reservoir.

The blower will include sensors to monitor flow rates and can be adjusted by the operator using controls located both remotely and in the powerhouse. The volume of air supplied by the blower will be based on the level of oxygen augmentation that is required for a given volume of water and will take into account empirically observed oxygen transfer rates. In addition to the sizing necessary for aeration targets, redundancy will be incorporated into the blower system to avoid any aeration system outages. If the blower is not operational during the June 1st to September 15th oxygenation period, or at any other time when oxygenation may be necessary, all flows will be diverted to the existing outlet works until the blower can be repaired or replaced. If blower function is unreliable for any reason, a backup blower will be purchased and connected to the diffuser array in the aeration basin.

Blower controls will be selected that include blower temperature monitoring, finite blower adjustments, automatic operation, and automatic or emergency shutdown criteria. Blower controls will include a bypass that will allow full flows to be routed through the existing cone valves in the event of an emergency shutdown, or when DO criteria cannot be met. In a shutdown scenario when DO falls below MDEQ standards, the plant would automatically trip offline, triggering the closing of the wicket gates on the turbines and simultaneously opening the cone valve, thus transferring flows through the cone valve. Whenever blowers are not operational and necessary for Project operation, the Project will be offline. If the blowers cease operation during Project operation, flows will automatically be diverted to the cone valves.

Compliance with water quality standards is of special concern when the Clark Canyon Reservoir is stratified and DO levels in the reservoir's hypolimnion are low. Based on data discussed above, low DO levels generally occur between mid-June and mid-September. To ensure compliance with state water quality standards during this critical period, a second DO probe will be deployed in the Beaverhead River at Site 3 for the first year of operation and thereafter beginning on June 1st, subject to MDEQ approval. This redundant probe will provide a double check of the permanent probe to ensure compliance with state water quality standards. Whenever both probes register DO levels that fall below compliance levels, the Project will automatically shut down, and all water will be diverted through the cone valves. With the exception of the first year of operation, this particular feedback loop utilizing a redundant probe will remain in place from June 1st to September 15th, or until the DO criterion is met for 14 consecutive days without supplemental aeration, whichever date is later. The MDEQ or MFWP can request an extended or shortened deployment of the redundant probe based on changing conditions in the reservoir.

In addition to the emergency shutdown procedure outlined above, compliance with water quality standards will be overseen by a powerhouse operator. The powerhouse operator will

visit the powerhouse at least once daily during all phases of operation. Whenever water quality standards in the Beaverhead River approach MDEQ thresholds, the Project operator will determine the ability of the aeration basin to provide sufficient aeration. Whenever the operator is not at the powerhouse, a series of automated alarms will dispatch an on-call operator to the powerhouse whenever water quality standards may have been exceeded. The dispatched operator will be required to arrive at the powerhouse within 30 minutes to evaluate causes of any noncompliance reading. The amount of time available for the operator to reach the powerhouse may be adjusted in response to seasonal reservoir DO levels, or reliability of equipment and procedures, subject to MDEQ approval. This procedure was designed in consultation with the MFPW and MDEQ to assure compliance with water quality standards.

It is important to note that some additional aeration will occur in the Beaverhead River over the short distance between where the Project outflows enter the river and the compliance monitoring station. Because the Clark Canyon Dam stores irrigation water, peak releases typically occur during mid-summer to meet demand. These irrigation water releases occur when DO concentrations in the reservoir hypolimnion are potentially at their lowest levels. Thus, when flows in excess of the Project capacity (700 cfs) occur, the potential exists for additional aeration from the cone valve in the existing outlet works. This scenario would occur during average to above average water years. Thus, powerhouse operations will often take into account the total aeration provided by both the tailrace diffusers and releases through the cone valve.

3.3.2.2.1. Water Quality Monitoring Operations

Monitoring will begin when online testing of the powerhouse starts. Monitoring will include continuous measurements of temperature, DO, TDG, and streamflow (Table 3.3-3). Although parameters will be monitored continuously, hourly data will be logged and stored for the purpose of reporting. The primary goal is to confirm that Project operation complies with Montana water quality standards. Monitoring in the Beaverhead River will allow evaluation of water quality relative to baseline monitoring conducted during the preconstruction phase. Monitoring will continue for a period of at least five years once the Project is online, but may continue beyond this time period at the discretion of the MDEQ following review of the five-year study results.

The Applicant proposes to monitor temperature and DO levels continuously at three locations during Project operation.

Water quality in the reservoir bottom (Site 1) will be evaluated by diverting small amounts of water from the Project penstock upstream of the turbines. That water would enter a small pressurized chamber containing a monitoring probe. Measurements taken here will be used to evaluate the quality of water in the reservoir's hypolimnion prior to any potential Project effects.

Site 2 would be in the aeration basin, where a probe would also be deployed to estimate the amount of supplemental aeration being supplied.

The third probe will be located about 300 ft downstream from the Project (Site 3), across the river from the fisherman's access. This probe will evaluate water quality in the Beaverhead River after mixing of Project flows and discharge from the existing outlet has occurred and will also be the compliance point for the Project where MDEQ standards must be met.

Project operation would be expected to reduce the TDG concentrations in discharged water due to the reduced speed and turbulence of water passing through the turbine in comparison with the existing outlet structure. However, measures intended to increase oxygen concentrations may also increase TDG levels. To quantify this effect, TDG will be monitored during the first five years of Project operation at sites 2 and 3. Past monthly monitoring over the May to September time period has been sufficient to document a strong positive relationship between TDG and flow (Symbiotics 2010).

TABLE 3.3-3. SUMMARY OF OPERATIONS MONITORING.

Parameter	Sites	Frequency	Duration	Method
Temperature (C)	1,2,3	Continuous	Minimum of first five years of Project operation	Campbell Scientific 107-L or similar
DO (mg/L and percent saturation)	1,2,3			In-Situ RDO PRO or similar
TDG (percent saturation)	2,3			In-Situ TDG sensor or similar

3.3.2.2.2. Reporting

Any violations of water quality standards or the Project's 401 Water Quality Certification will be reported to the MDEQ, BOR, and MFWP within 24 hours.

Annual water quality reports will be submitted to the MDEQ, BOR, and MFWP within 60 days following each calendar year. Each report will include an analysis of the required monitoring data, including tabular and graphical representation of daily average temperature measurements and daily minimum oxygen concentrations. The report will include an analysis of the TDG monitoring, including tabular and graphical representation of daily maximum TDG measurements versus flow and any aeration measures implemented during the monitoring periods. A graphical display of continuous TDG values will also be reported. These reports will provide comparisons with preconstruction monitoring data.

3.3.2.2.3. Evaluation of Water Quality Enhancement Effectiveness

The corrective measures outlined above are most relevant to a five month period from May through September of each year. During these summer months, oxygen levels at the penstock intake in the reservoir should decline gradually toward an annual minimum and then rise sharply after the reservoir is drained and water in the reservoir has become mixed. The air diffuser system would be tested across a range of flow levels over that time period.

DO and TDG monitoring at sites 2 and 3 will provide the Project operator with real-time water quality information. This will allow immediate implementation of the corrective measures outlined above. In early summer, as DO levels decline, the air diffusers will be gradually brought online to maintain DO concentrations downstream. If DO declines to such levels that the diffusers are insufficient to meet DO criteria, then water will be aerated by the cone valve within the existing outlet works. The shift of partial flows to the cone valve can function to both aerate water using the existing outlet works and increase DO enhancement within the aeration basin.

The compliance point at Site 3 is necessary for two reasons. First, Site 2 does not measure the quality of water discharged from the cone valve. The possibility exists that water exiting the aeration basin could have moderate DO levels at the same time that water from the cone valve is supersaturated with gasses. Under this condition, monitoring at Site 2 would underestimate the true DO concentrations that are critical to protecting downstream biota. In addition, Site 3 will allow additional contact time between the introduced bubbles and the water that exits the aeration basin. The efficiency of oxygen transfer increases as contact time increases, and monitoring at Site 2 may not capture the oxygen transfer achieved by the diffuser system, especially during high flow conditions.

Data collected between May and September will be most critical for evaluating the effectiveness of DO enhancement because it is during this interval that the reservoir stratifies and oxygen declines to its lowest levels, particularly in the hypolimnion where releases will originate. Furthermore, Project operations are anticipated to be at or near capacity over the summer period when the peak flows are typically released to satisfy irrigation water rights downstream. During the remainder of the year, following autumn turnover and just after spring turnover, oxygen levels are generally much higher in the reservoir's hypolimnion. Monitoring for compliance would continue, and the 8 mg/L DO criterion would be more easily achievable due to higher oxygen levels at the reservoir's deepest stratum. Throughout the year, the effectiveness of corrective measures employed during the critical May to September period will be reviewed. If necessary, alternatives for increasing oxygen levels to meet criteria can be evaluated, and changes to this plan could be developed and implemented following consultation with the MDEQ and other agencies.

TDG will be monitored concurrently with DO during Project operation (Table 3.3-2). It was anticipated in the initial Section 401 Water Quality Application that supersaturation of gases would decrease during Project operation due to reduced gas entrainment into the enclosed penstock relative to the regulating outlet gates. However, use of the proposed aeration features to increase oxygen concentrations may maintain TDG at or near existing levels. TDG will be monitored during operation and annual reports issued to the MDEQ, BOR, MFWP, and other resource agencies that request the report. Options to ensure compliance can be developed and implemented in consultation with the MDEQ. Any implemented measures would be evaluated on a continual basis to determine effectiveness in alleviating TDG violations. If judged ineffective, alternative measures would be proposed, and implemented upon review.

In summary, this monitoring program will employ an adaptive management approach using best management practices both to ensure compliance under a range of operating conditions and prescribe operational and engineering remedies, if necessary, to maintain ongoing compliance. The program would continue and be reevaluated annually over a period of at least five years until it could be amply demonstrated that the Project consistently met the MDEQ's water quality standards.

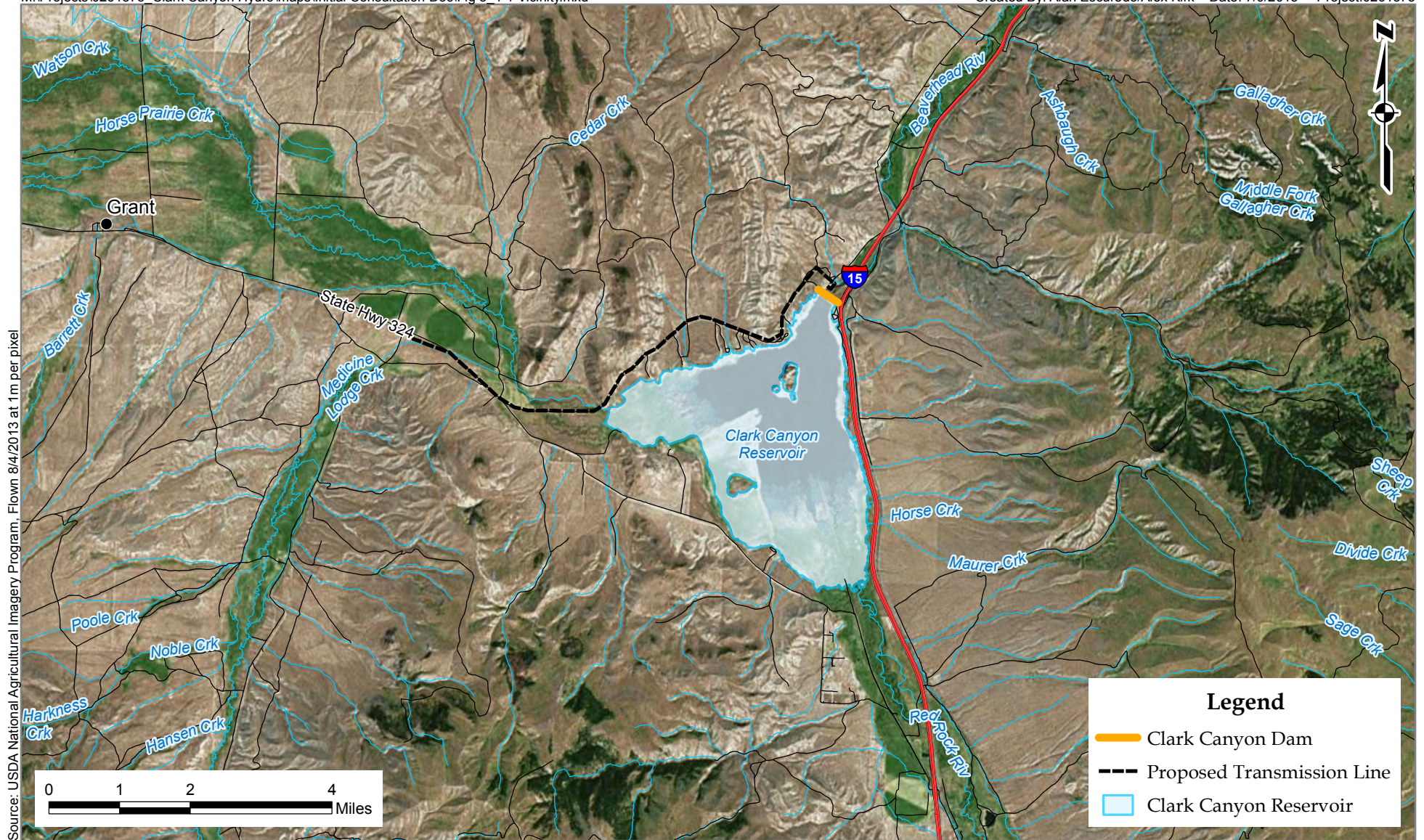
3.3.3. *Proposed Studies*

No additional water resources studies are proposed.

3.4. Fish and Aquatic Resources

3.4.1. *Existing Conditions*

This section describes fisheries and aquatic invertebrates within the Project vicinity (approximately 10 mi from Project features) including Clark Canyon Reservoir, the Beaverhead River from Clark Canyon Dam (river mile [RM] 74.9) downstream to Grasshopper Creek (RM 63.1), and other major tributaries to the Beaverhead within that area (Figure 3.4-1).



Source: USDA National Agricultural Imagery Program, Flown 8/4/2013 at 1m per pixel

Figure 3.4-1
Project Vicinity
Clark Canyon Hydroelectric Project
Beaverhead County, Montana

3.4.1.1. Fish Community

Native fish species found in the Project vicinity include westslope cutthroat trout (*Oncorhynchus clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), longnose dace (*Rhynchichthys cataractai*), mottled sculpin (*Cottus bairdi*), mountain sucker (*Catostomus platyrhynchus*), longnose sucker (*Catostomus catostomus*), and white sucker (*Catostomus commersoni*). Introduced species include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and common carp (*Cyprinus carpio*) (MFWP 2004a).

3.4.1.2. Threatened, Endangered, and Special Status Species

No endangered or threatened fish species are known to occur in the Project vicinity. Special status species that may occur in the Project vicinity include the westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and Montana Arctic grayling (*Thymallus arcticus montanus*).

3.4.1.2.1. Westslope Cutthroat Trout

The westslope cutthroat trout is a subspecies that occurred historically throughout the Northern Rocky Mountain states, including the Beaverhead River Basin. It is distinguished from other subspecies of cutthroat trout by a pattern of irregularly shaped black spots on the body which are concentrated near the tail, but are relatively sparse on the anterior region of the fish below the lateral line. It also possesses some unique genetic and chromosomal traits (Behnke 1992). Pure and nearly pure strains have been documented in portions of the Beaverhead River (Shepard et al. 2003) and some individuals may occur in the Project vicinity.

Abundance of westslope cutthroat trout in Montana has declined most dramatically in the Missouri River drainage, where genetically pure populations currently occupy less than five percent of their historic range. Factors contributing to this decline include over-harvest, competition, and hybridization with stocked nonnative trout, in-stream barriers, and other land and water use practices (Sloat 2001). The U.S Fish and Wildlife Service (USFWS) concluded that there was insufficient justification to list the westslope cutthroat as threatened (USFWS 2003).

Both the USFS and Bureau of Land Management (BLM) categorize westslope cutthroat trout as Sensitive. It is currently listed by MFWP as a S2 species, meaning that it is “at risk because of very limited and potentially declining numbers extent, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state” (Montana Natural Heritage Program [MNHP] 2015).

Current management actions for the westslope cutthroat trout by federal and state agencies include the identification and protection of remaining populations; the evaluation of areas that provide suitable habitat for range expansion; and the expansion of the distribution of genetically pure strains (Sloat 2001). MFWP and sister state agencies have signed a Memorandum of Understanding and Conservation Agreement that is part of a as part of coordinated multi-state, range wide effort to conserve westslope cutthroat trout (MFWP 2007a). Genetically pure strains persist in some of the headwaters of unobstructed tributaries within their former range where reduced temperatures appear to provide them with a competitive advantage over introduced trout species (Sloat 2001).

3.4.1.2.2. Fluvial Arctic Grayling

The fluvial Arctic Grayling (*Thymallus arcticus*) has been petitioned for listing several times since 1991 (MFWP 2014), however USFWS determined in 2014 it was not warranted for listing under the ESA (USFWS 2014). The USFS and BLM both list fluvial Arctic grayling as Sensitive, indicating there is a concern for population viability within the state due to a significant current or predicted downward trend in populations or habitat. MFWP lists it as S1, indicating it is “at high risk because of extremely limited and potentially declining numbers, extent, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state” (MNHP 2015a and 2015b).

Populations of fluvial Arctic grayling in Montana have declined drastically during this century from historic numbers. In contrast to adfluvial/lacustrine populations, fluvial Arctic Grayling occupy riverine habitat throughout the year. Presently, they are found only in the upper Big Hole River. Ongoing threats to populations of fluvial Arctic grayling include water quality and quantity depletion, competition with introduced species, predation, habitat degradation, and angling pressure. Water quantity issues include drought and recruitment limitation due to sudden runoff events. The Fluvial Arctic Grayling Workgroup was established in 1995 to direct recovery efforts for this species. These efforts include development of a broodstock for re-introductions, identification of suitable streams for range expansion, implementation of catch-and-release only regulations, and protection of minimum in-stream flows (Byorth 1996).

Montana Arctic grayling occurred historically in the Missouri River Basin above Great Falls and were first documented in the Beaverhead River Basin by Lewis and Clark in 1805 (USFWS 2004). Like fluvial Arctic grayling, they are characterized by a large, sail-like dorsal fin and black spots concentrated on the anterior portion of the body. Grayling spawn in the spring by broadcasting their eggs over gravel. Arctic Grayling were stocked into the Beaverhead downstream of Dillon, Montana (Table 3.4-1), in an attempt to re-establish the species between 1999 and 2002 (MFWP 2004b). However, low flows and increased water temperatures associated with a prolonged drought have contributed to reduced success with these attempts and stockings were discontinued in 2002 (MFWP 2004c). Montana Arctic grayling have not been recorded in MFWP fish collection records on the Beaverhead since 2002 (MFWP MFISH database [MFWP 2015a).

TABLE 3.4-1. STOCKING RECORD FOR MONTANA ARCTIC GRAYLING IN THE BEAVERHEAD RIVER BELOW DILLON, MONTANA.

Date	Number of Fish	Length (in)	Hatchery Source
7/29/1999	6,344	8.3	Big Springs Trout Hatchery
8/3/1999	6,148	8	Big Springs Trout Hatchery
8/17/1999	5,760	8.5	Big Springs Trout Hatchery
6/22/2000	14,528	6.1	Big Springs Trout Hatchery
7/25/2000	484	6.9	Big Springs Trout Hatchery
6/19/2001	6,231	7.1	Big Springs Trout Hatchery

Date	Number of Fish	Length (in)	Hatchery Source
6/19/2001	6,237	7.6	Big Springs Trout Hatchery
5/7/2002	5,065	4.3	Murray Springs Trout Hatchery
6/10/2002	6,020	8.2	Bluewater Springs Trout Hatchery
6/10/2002	6,063	8.4	Bluewater Springs Trout Hatchery
6/12/2002	5,955	8.4	Bluewater Springs Trout Hatchery
6/12/2002	6,351	8.4	Bluewater Springs Trout Hatchery
6/17/2002	2,552	8.4	Bluewater Springs Trout Hatchery
6/17/2002	5,105	8.4	Bluewater Springs Trout Hatchery

3.4.1.3. Beaverhead River

The Beaverhead River between Clark Canyon Dam and Barrett's Diversion Dam is a productive tailwater fishery. The dominant fish species in the Beaverhead River are brown trout and rainbow trout. While neither of these species is native to the river, their populations are considered to be wild and self-sustaining.

Surveys to determine the abundance of Age 1+ rainbow and brown trout have been conducted by MWFP within the Project vicinity annually since 1986. Survey data collected by between RM 74.9 to RM 73.3 in the Beaverhead River below the Clark Canyon Dam between 1991 and 2013 are shown on Figure 3.4-2. Brown trout abundance was observed to range from 473 fish per mile to 2,619 fish per mile and averaged 1,369 fish per mile between 1991 and 2013. Rainbow trout abundance was observed to range from 99 fish per mile to 680 fish per mile and averaged 305 fish per mile between 1991 and 2013. Trout abundance in the survey area of the Beaverhead River has been observed to fluctuate with discharge flows which are generally attributable to regional weather conditions. Periods of drought may have particularly serious implications for the trout fishery, which is highly valued in this portion of the Beaverhead River.

Oswald (2003) reports that rainbow trout in the reach downstream of Clark Canyon Dam have declined as the population of brown trout has expanded. Populations of both species appear to be adversely affected in dry water years, when the minimum flow released from Clark Canyon Dam may be reduced substantially during the winter (non-irrigation) season. Oswald (2006) reported that the number of brown trout greater than 18 in long in the Beaverhead River exceeded 600 fish per mile from 1998 to 2000, after a series of wet water years when the mean winter flow releases were over 200 cfs. Dry water years from 2001 through 2006 resulted in winter flow releases of less than 50 cfs, and the estimated number of brown trout greater than 18 in long subsequently declined to about 400 fish per mile by 2002, to 300 fish per mile by 2004, and to 100 fish per mile by 2006.

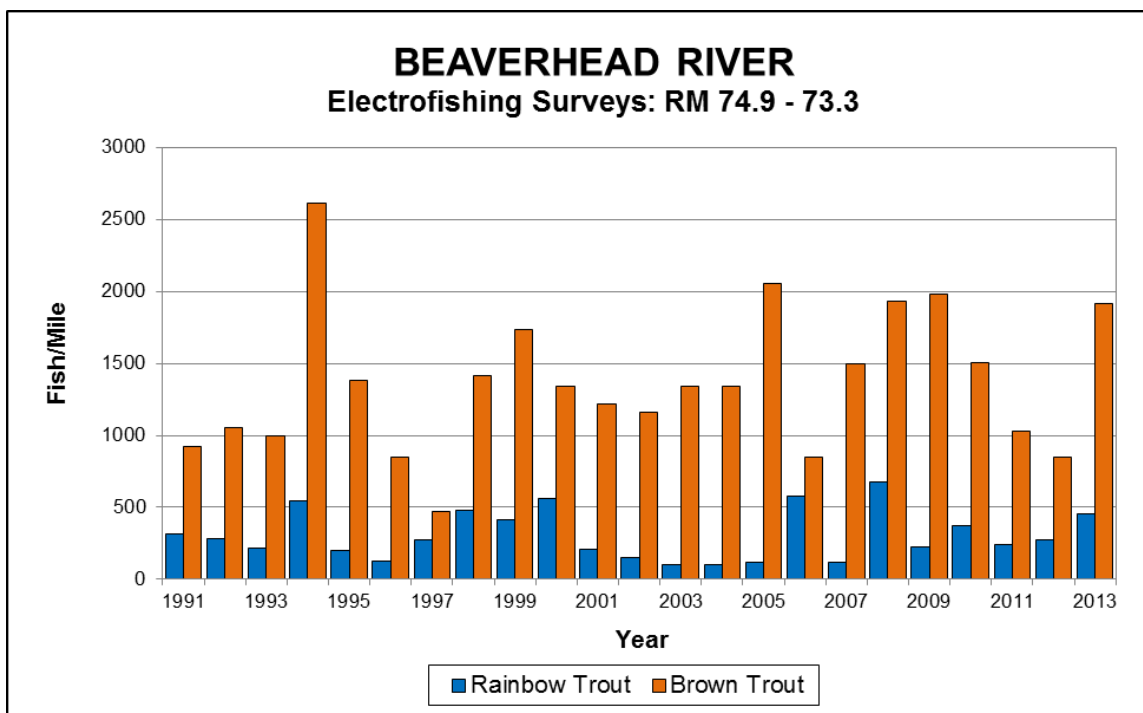


FIGURE 3.4-2. RELATIVE ABUNDANCE (FISH/MILE) OF AGE-1+ RAINBOW AND BROWN TROUT IN THE HILDRETH SECTION (RM 74.9 TO 73.3) OF THE BEAVERHEAD RIVER BELOW CLARK CANYON DAM SINCE 1991.

3.4.1.4. Clark Canyon Reservoir

Clark Canyon Reservoir supports a popular fishery for rainbow trout. Other common or abundant fish species include white sucker, reidside shiner, brown trout, and burbot. Less common species present in the reservoir include brook trout, mountain whitefish, carp, and westslope cutthroat trout (MFWP 2004g).

To augment the existing rainbow trout population in Clark Canyon Reservoir, MFWP collects and spawns broodstock from Red Rock River. Fertilized eggs from these fish are incubated and reared in hatcheries and then are released into the reservoir as fingerlings or yearlings. Between 100,000 and 300,000 fingerling trout are stocked into the reservoir in most years, and approximately 70,000 additional yearling fish have been released in most years since 2002. Broodstock collection has not been undertaken in some drought years, when flows in the Red Rock River were too low to support a spawning migration of rainbow trout (BOR 2006).

A list of stocking records for rainbow trout in Clark Canyon Reservoir from 2009 through 2014 is shown in Table 3.4-2. A complete list of stocking records in Clark Canyon Reservoir since 1990 is contained in Appendix D. In 2003, stocking of 200,000 catchable rainbow trout was aborted due to poor projected survival imposed by reduced reservoir levels. The cause for the decision was severe conditions brought on by prolonged drought (MFWP 2004e).

Relative abundance of rainbow and brown trout in Clark Canyon Reservoir is has been documented since 1980 by gill netting. Results from spring and fall floating gill net surveys

conducted in the reservoir are shown on Figure 3.4-3 and Figure 3.4-4, respectively. Rainbow trout abundance in fall surveys conducted between 1989 and 2011 was observed to range from 1.2 fish per net to 50 fish per net in 2004 and 2006, respectively. Rainbow trout abundance in spring surveys conducted between 1980 and 2006 was observed to range from 2.9 fish per net to 18.7 fish per net in 1991 and 2006, respectively. Brown trout abundance in spring and fall surveys has remained fairly low and stable; generally ranging between 1 fish per net and 10 fish per net.

Fluctuations in trout species appear to be related reservoir levels associated with regional weather conditions. MFWP manages the possession limit on rainbow and brown trout according to observations of fish abundance in the reservoir. The current possession limit for Clark Canyon Reservoir is three combined trout daily in possession.

**TABLE 3.4-2. STOCKING RECORD FOR RAINBOW TROUT IN CLARK CANYON RESERVOIR
2009 - 2014**

Date	Number of Fish	Length (in)	Hatchery Source
6/1/2009	48,031	4	Bluewater Springs Trout Hatchery
6/1/2009	48,544	4	Bluewater Springs Trout Hatchery
6/10/2009	37,173	4	Bluewater Springs Trout Hatchery
6/10/2009	43,202	4	Bluewater Springs Trout Hatchery
6/15/2009	18,280	4	Bluewater Springs Trout Hatchery
6/15/2009	38,612	4	Bluewater Springs Trout Hatchery
6/15/2009	39,874	4	Bluewater Springs Trout Hatchery
6/7/2010	48,007	4.18	Bluewater Springs Trout Hatchery
6/9/2010	40,128	3.96	Bluewater Springs Trout Hatchery
6/9/2010	53,127	4.15	Bluewater Springs Trout Hatchery
6/14/2010	26,719	3.88	Bluewater Springs Trout Hatchery
6/14/2010	30,080	4.05	Bluewater Springs Trout Hatchery
6/14/2010	55,378	3.9	Bluewater Springs Trout Hatchery
6/13/2011	50,827	4.02	Bluewater Springs Trout Hatchery
6/13/2011	51,041	4.05	Bluewater Springs Trout Hatchery
6/15/2011	50,136	4.15	Bluewater Springs Trout Hatchery
6/27/2011	39,508	4.46	Bluewater Springs Trout Hatchery
6/29/2011	13,500	4.37	Bluewater Springs Trout Hatchery
6/29/2011	36,040	3.89	Bluewater Springs Trout Hatchery
6/29/2011	36,523	3.91	Bluewater Springs Trout Hatchery
7/2/2012	57,358	3.91	Bluewater Springs Trout Hatchery
7/2/2012	59,798	3.93	Bluewater Springs Trout Hatchery
7/5/2012	39,571	4.07	Bluewater Springs Trout Hatchery
7/26/2012	109,477	2.12	Bluewater Springs Trout Hatchery
7/15/2013	34,819	4.26	Bluewater Springs Trout Hatchery

Date	Number of Fish	Length (in)	Hatchery Source
7/15/2013	36,179	4.24	Bluewater Springs Trout Hatchery
8/12/2013	68,529	2.89	Bluewater Springs Trout Hatchery
7/14/2014	48,899	4.16	Bluewater Springs Trout Hatchery
7/14/2014	54,560	4.18	Bluewater Springs Trout Hatchery
8/18/2014	69,095	3.02	Bluewater Springs Trout Hatchery
8/18/2014	99,897	2.97	Bluewater Springs Trout Hatchery

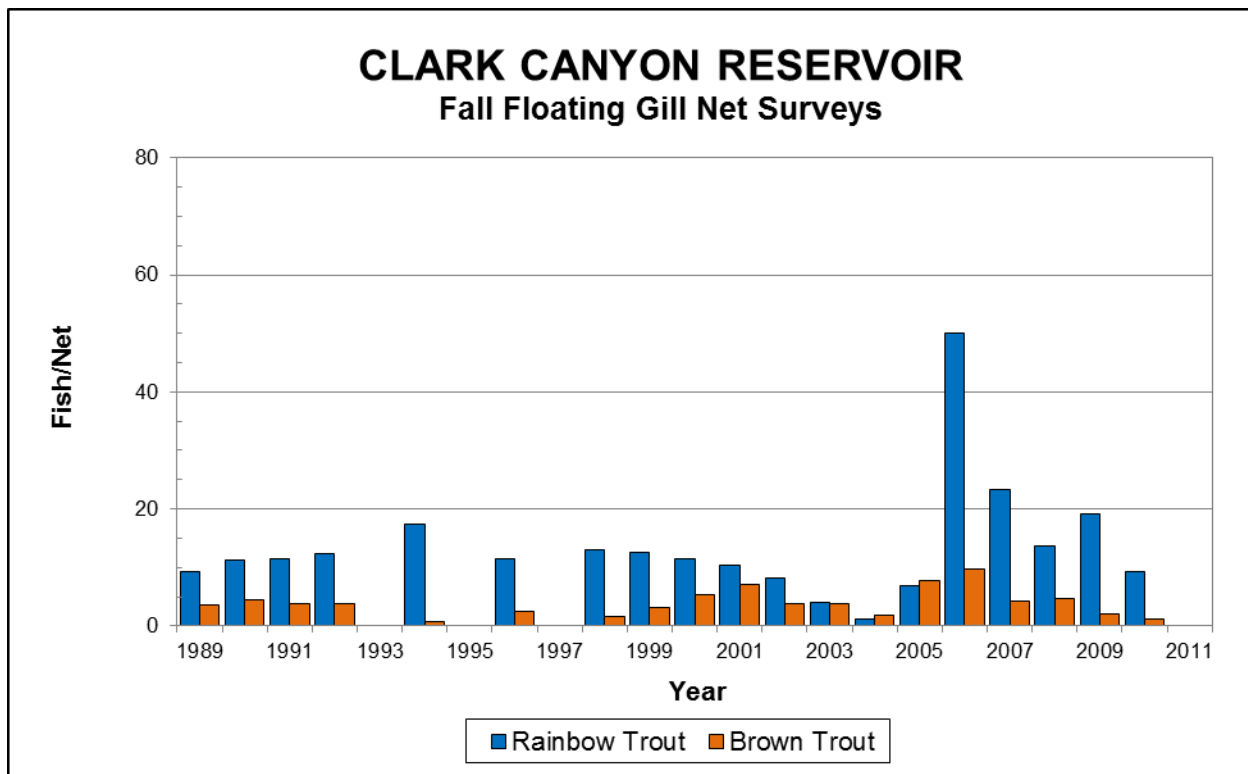


FIGURE 3.4-3. RELATIVE ABUNDANCE (FISH/NET) OF RAINBOW AND BROWN TROUT IN CLARK CANYON RESERVOIR FROM 1989 TO 2011. NO DATA WERE AVAILABLE FOR 1993, 1995, AND 1997.

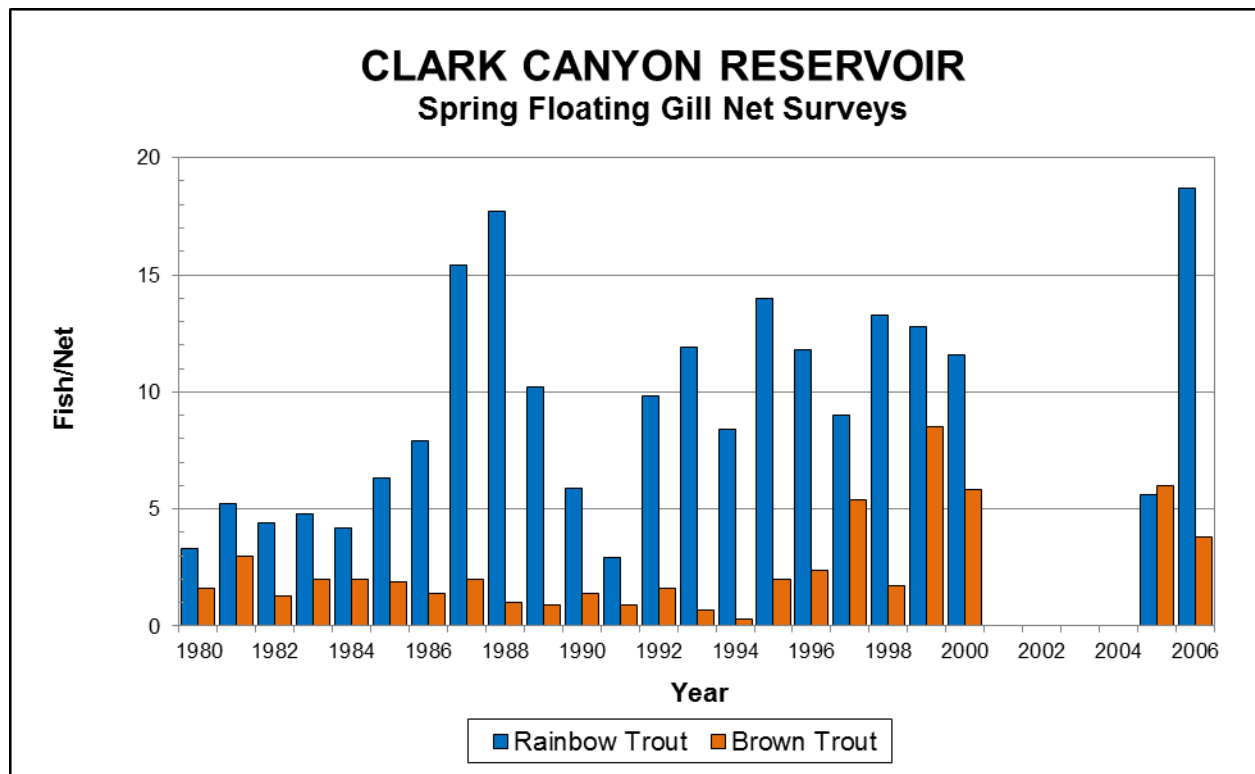


FIGURE 3.4-4. RELATIVE ABUNDANCE (FISH/NET) OF RAINBOW AND BROWN TROUT IN CLARK CANYON RESERVOIR FROM 1980 TO 2006 NO DATA WERE AVAILABLE FOR 2001 THROUGH 2004.

3.5. Botanical and Wildlife Resources

3.5.1. Existing Conditions

The documents submitted as part of the 2012 Application for a Non-capacity Amendment of Original License for Clark Canyon Hydroelectric Project (2012 license amendment) for the new transmission line corridor (Symbiotics 2012a) contain the most up to date information on the botanical and wildlife resources within the Project area. The 2012 license amendment includes information pertaining to vegetation, wildlife habitat, wetlands, invasive plant species, and sensitive wildlife and plant species.

The following documents were reviewed for information relevant to botanical and wildlife resources:

- *Wildlife Habitat Evaluation Report* (Balance Environmental, 2011a). This report describes the vegetation types and wildlife habitat within the Project area. Presented as Attachment C of the 2012 license amendment (Symbiotics 2012a).
- *Ute Ladies' Tresses (*Spiranthes diluvialis*) Survey Report for the Clark Canyon Transmission Corridor* (Balance Environmental 2011b). Describes the Ute ladies' tresses survey completed within the proposed transmission line corridor in 2011, which included the proposed Project facilities below the dam. Presented as Attachment E of the Biological Evaluation (Symbiotics 2012c).
- *Wetland Delineation Report* (Symbiotics 2012b). Presented as Attachment D of the 2012 license amendment (Symbiotics 2012a).
- *Biological Assessment for the Non-Capacity License Amendment* (Symbiotics 2012c). This report describes the evaluation of the sensitive plant and animal species potentially present, or documented as present, within the Project area. Presented as Attachment F of the 2012 license amendment (Symbiotics 2012a).
- *Revegetation Plan* (Symbiotics 2012d). This report serves as the weed management plan for the Project, and discusses revegetation measures that will occur associated with Project construction. Presented as Attachment G of the 2012 license amendment (Symbiotics 2012a).

3.5.1.1. Botanical Resources

3.5.1.1.1. General Vegetation

The Wildlife Habitat Evaluation Report (referred to as the 2011 habitat evaluation; [Balance Environmental, 2011a]) evaluated the vegetation types within the Project area, within 656 ft of the proposed transmission line corridor, which includes all proposed Project infrastructure at the dam area. Acreage and descriptions of vegetated habitat types are presented in Table 3.5-1. Plant associations and alliances are described in detail in the 2011 habitat evaluation; detailed maps of the vegetation types documented within the Project area are presented in Appendix B of the 2011 habitat evaluation (Balance Environmental 2011a).

The Project is located within the Beaverhead Mountains Ecoregion, which extends from the Centennial Mountains south of Red Rock Lakes National Wildlife Refuge in southwestern Montana, west to the Continental Divide along the Beaverhead Mountains, and includes the headwaters for the Beaverhead, Madison, and Clarks Fork rivers (Lesica 2003).

Shrub steppe is the prevalent native vegetation in the Clark Canyon Reservoir area. Big sagebrush (*Artemisia tridentata*) and green rabbitbrush (*Chrysothamnus viscidiflorus*) are common shrubs. Rocky areas support the growth of mountain mahogany (*Cercocarpus ledifolius*) and broom snakeweed (*Gutierrezia sarothrae*). Perennial bunchgrasses such as bluebunch wheatgrass (*Agropyron spicatum*), fescue (*Festuca* sp.), and Indian ricegrass (*Oryzopsis hymenoides*) occupy the understory alongside drought adapted forbs.

The Beaverhead River supports a narrow riparian corridor and diversity of wetland plants along the river bottom. Common species within the river bottom near Clark Canyon Dam include Baltic rush (*Juncus balticus*), smooth scouring rush (*Equisetum laevigatum*), and clustered field sedge (*Carex praegracilis*). There is also extensive coverage of agricultural and urban lands with ranching recognized as the dominant land use. The proposed powerhouse site, at the base of Clark Canyon Dam, is characterized by low to mid-height grasses and forbs.

The proposed transmission corridor is primarily basin big sage/bluebunch wheatgrass shrub herbaceous vegetation. Other vegetation types found along the corridor are predominantly Rocky Mountain juniper/bluebunch wheatgrass woodland, quackgrass herbaceous vegetation, and wetland areas along the two small creeks west of the reservoir. Hayfields occur at the western end of the proposed transmission line corridor (Balance Environmental 2011a).

TABLE 3.5-1. VEGETATION TYPES WITHIN THE PROJECT AREA. (SOURCE: BALANCE ENVIRONMENTAL [2011A])

Project code	Association	Alliance	Acres
Grasslands			
G-1	Ruderal Plant Herbaceous Vegetation	Undesignated alliance	3.56
G-2	Pseudoroegneria spicata - Achnatherum hymenoides Herbaceous Vegetation	Pseudoroegneria spicata herbaceous	10.3
G-3	Pseudoroegneria spicata - Cushion Plants Herbaceous Vegetation	Pseudoroegneria spicata herbaceous	151.71
G-4	Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation	Pseudoroegneria spicata herbaceous	27.3
G-5	Hayfield	Undesignated alliance	265.79
G-6	Hesperostipa comata - Poa secunda Herbaceous Vegetation	Hesperostipa comata bunch herbaceous	89.91
G-7	Pasture	Undesignated alliance	92.21
Other			
Borrow pit	Borrow pit/ Gravel pit	Undesignated alliance	6.77
Concrete	Concrete	Undesignated alliance	0.85
Dam	Dam Surface	Undesignated alliance	3.95
Landscape d	Landscaped Area	Undesignated alliance	68.09
Open water	Open Water	Undesignated alliance	7.07
Paved road	Paved Road/ Parking Lot	Undesignated alliance	90.82
Sparsely vegetated	Sparsely vegetated	Undesignated alliance	33.84
Unpaved road	Unpaved Road	Undesignated alliance	23.57
Rockland			
Rock	Rock Outcrop Limestone/ Conglomerate Sparse Vegetation	Rock Outcrop Sparsely Vegetated	1.84
Sagebrush			
S-1	Artemisia tridentata (ssp. tridentata, ssp. xericensis) / Pseudoroegneria spicata Shrub Herbaceous Vegetation	Artemisia tridentata (ssp. Tridentata, ssp. Xericensis) shrub herbaceous	1379.38

Project code	Association	Alliance	Acres
S-2	Artemisia tridentata ssp. tridentata / Pascopyrum smithii - (Elymus lanceolatus) Shrubland	Artemisia tridentata (ssp. Tridentata, ssp. Xericensis) shrub herbaceous	385.49
S-3	Artemisia tridentata ssp. wyomingensis / Pseudoroegneria spicata Shrub Herbaceous Vegetation	Artemisia tridentata ssp. Wyomingensis shrub herbaceous	4.47
Wetland Shrublands			
WS-1	Salix exigua Temporarily Flooded Shrubland	Salix (exigua, interior) temporarily flooded shrubland	80.81
WS-2	Salix exigua / Mesic Graminoids Shrubland	Salix (exigua, interior) temporarily flooded shrubland	19.39
WS-3	Salix boothii / Mesic Graminoids Shrubland	Salix boothii temporarily flooded shrubland	0.002
Wetlands			
W-1	Elymus repens Herbaceous Vegetation	Elymus repens herbaceous	654.63
W-2	Poa pratensis Seasonally Flooded Herbaceous Vegetation	Poa pratensis semi-natural seasonally flooded herbaceous	40.06
W-3	Poa pratensis Semi-natural Herbaceous Vegetation	Poa pratensis semi-natural herbaceous	21.88
W-4	Juncus balticus Herbaceous Vegetation	Juncus balticus seasonally flooded herbaceous	62.22
W-5	Agrostis gigantea Herbaceous Vegetation	Agrostis stolonifera seasonally flooded herbaceous	21.13
W-6	Schoenoplectus acutus Herbaceous Vegetation	Schoenoplectus acutus - (schoenoplectus tabernaemontani) semipermanently flooded herbaceous	7.27
Woodland			
WD-1	Juniperus scopulorum / Pseudoroegneria spicata Woodland	Juniperus scopulorum Woodland	102.8
Grand Total			3657.1

3.5.1.1.2. Plant Species of Concern

A GIS geodatabase of plant Species of Concern (SOC) was obtained from Montana Natural Heritage Program (MNHP) in June 2015 (MNHP 2015a). The MNHP SOC geodatabase is a compilation of several lists of threatened, endangered, sensitive species, and species of concern, including species listed by USFWS, USFS, BLM, and MT FWP. Table 3.5-2 lists the descriptions for the various state and federal designations and ranking for SOC within Montana (MNHP 2015b). As of June 2015, MNHP lists 93 plant SOC or Potential Species of Concern (PSOC) within Beaverhead County (Table 3.5-3; MNHP 2015a). Eleven of the SOC are listed as BLM sensitive species. Table 3.5-3 also lists the habitat for each PSOC or SOC.

One plant species is protected under the federal Endangered Species Act: the threatened Ute ladies'-tresses (Table 3.5-3), which is known to occur in the Beaverhead River drainage. Surveys for Ute ladies'-tresses were conducted in the Project area in 2011, and no plants were found (Balance Environmental 2011).

Five SOC or PSOC plant species have been recorded within the vicinity of the proposed Project corridor (MNHP 2015a): chicken-sage (*Sphaeromeria argentea*), Bitterroot milkvetch (*Astragalus scaphoides*), hoary phacelia (*Phacelia incana*), scalloped-leaf lousewort (*Pedicularis crenulata*), and limestone larkspur (*Delphinium bicolor ssp. calcicola*) (Table 3.5-3; Figure 3.5-1).

The 2015 MNHP geodatabase confirms that no new SOC species, or new observations of previously recorded species, have been documented since 2012. As such, the 2011 habitat evaluation (Balance Environmental 2011a), and the 2012 Biological Assessment (Symbiotics 2012c) provide the most up to date information on sensitive plant species within the Project area. A summary of sensitive plant species evaluated is included below, including where the species were documented in the Project vicinity, a species description, and description of habitat.

Ute Ladies' Tresses

The Ute ladies' tresses is a federally listed threatened species under the Endangered Species Act, and is state ranked as S1S2 (MNHP 2015a and b). Ute ladies' tresses is a terrestrial orchid, and is generally associated with wetland habitats and areas with major river drainages and is thought to require a dynamic disturbance regime. Its habitats typically include alkaline wetlands, swales, and old meander channels often on the edge of the wetland or in areas that are dry by mid-summer (MNHP 2015b). Within Montana, there are only a few known occurrences of Ute ladies' tresses, occurring in the Missouri, Jefferson, Ruby, Madison, and Beaverhead River drainages, one of which is northeast of the Project area.

Two portions of the Project area were found to have potential Ute ladies' tresses habitat: (1) the region where Medicine Lodge Creek and Horse Prairie Creek come together near Clark Canyon Reservoir and the associated wetlands nearby; and (2) some of the wetlands near Beaverhead Creek below the dam. Both of these areas were intensively surveyed in 2011; no Ute ladies' tresses were found (Balance Environmental 2011b).

Chicken-Sage

Chicken-sage is state ranked as S3, and is a BLM sensitive species. The species is known to occur in arid, alkaline sagebrush-steppe habitats with sparse vegetation in the valley and foothill zones. Scattered and sparse populations exist in east-central Idaho and adjacent Beaverhead County, with disjunct populations in Nevada, southwest Wyoming, and adjacent Colorado. There are nearly 20 known locations south of Dillon in Beaverhead County, including one within 1 mi of the proposed transmission ROW along Highway 324 (MNHP 2015a). That population is scattered across a 4 ac area and was known to be extant as recently as 2008. Other populations are known from the nearby Grasshopper, Sage Creek, and Big Sheep Creek drainages. No individuals are known to occur within the Project area, but there may be suitable habitat.

Bitterroot Milkvetch

Bitterroot milkvetch is state ranked as S3, and is a BLM sensitive species. This herbaceous perennial is endemic to Lemhi County, Idaho, and Beaverhead County, Montana. The species occurs in sagebrush grassland, generally on silty soils with dense cover of sagebrush, though other shrubs are sometimes dominant. Populations are often found along drainage ways in the ecotonal area between rocky, steep upper slopes and nearly level benches, and appear to be most frequent on warmer, south- and southwest-facing slopes. The MNHP has records of two smaller populations within 2 mi of the proposed Project (MNHP 2015a). A population north of the proposed powerhouse area was first identified in 1995 and consists of approximately 50 individuals over 8 ac. Another, larger population is known from approximately 2 mi west. This population occurs over a 35 ac area. No individuals are known to occur within the proposed Project area.

Hoary Phacelia

Hoary phacelia is state ranked as S3, and is found in foothills of Utah, Idaho, Montana, Wyoming, and Colorado on stony, limestone-derived soils on talus slopes. Associated vegetation includes mountain mahogany and sparse forb cover. Only 10 populations are known in Montana, all of which are in Beaverhead County. The nearest occurrence of hoary phacelia was documented in 1995. It is less than a mile west of Clark Canyon Dam and approximately 0.5 mi north of the proposed Project (MNHP 2015b).

Railroad Canyon Wild Buckwheat

Railroad canyon buckwheat is state ranked as S3, and is known to be extant in two locations, one in southern Beaverhead County and another in adjacent Lemhi County, Idaho. The Montana population occurs in the Rape Creek drainage, south of the proposed transmission ROW, in sparse sagebrush on clay soils. Herbarium specimens also exist in about 10 other localities in southwest Montana. The MNHP documents one known occurrence within a mile of the proposed transmission Project (MNHP 2015a). In 1984, a 75 ac patch containing railroad canyon wild buckwheat and Limestone larkspur (*Delphinium bicolor* ssp. *calicicola*) was delineated approximately 0.5 mi west of Clark Canyon Reservoir, outside of the Project area.

Scallop-Leaf Lousewort

Scallop-leaf lousewort is state ranked as S1 that is considered at high risk of extirpation by the MFWP and MNHP (MNHP 2015a). The species is found primarily in southern Wyoming, Colorado, and adjacent Nebraska. Two populations of scallop-leaf lousewort were discovered in 2003 along the Beaverhead River. These populations are over 300 mi northwest of the nearest known populations in Wyoming (Lesica 2003). One of the two populations was documented in a 77 ac area immediately downstream of the Clark Canyon Dam, within the Project area (MNHP 2015a), however Project-specific surveys have not been completed.

Limestone Larkspur

Limestone larkspur, a subspecies of *Delphinium bicolor*, is a state PSOC with a state rank of S3S4 (an intermediary ranking between S3 and S4). It is endemic to Montana and 44 populations have been observed across southwestern, western, and southcentral Montana, the nearest of which is about 0.5 mi from the Project area.

TABLE 3.5-2. DESCRIPTION OF SPECIES DESIGNATION AND RANKINGS FOR PLANT AND ANIMAL SPECIES OF CONCERN (MNHP 2015B)

Title	Code	Description
Species of Concern	SOC	Native taxa at-risk due to declining population trends, threats to their habitats, restricted distribution, and/or other factors. Designation as a MT SOC or PSOC is based on the MT Status Rank, and is not a statutory or regulatory classification. Designations provide information that helps resource managers make proactive decisions regarding species conservation and data collection priorities.
Potential Species of Concern	PSOC	Native taxa for which current, often limited, information suggests potential vulnerability. Also included are animal species which additional data are needed before an accurate status assessment can be made.
Special status species	SSC	Species that have some legal protections in place, but are otherwise not Montana Species of Concern. Bald Eagle is a SSC because, although it is no longer protected under the ESA and is also no longer a MT SOC, it is still protected under the BGEPA
State rank 1	S1	At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
State rank 2	S2	At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to global extinction or extirpation in the state.
State rank 3	S3	Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas.
State rank 4	S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.
State rank historic	SH	Possibly extinct or extirpated - Species is known only from historical records, but may nevertheless still be extant; additional surveys are needed.

Title	Code	Description
State rank-unrankable	SU	Unrankable - Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
USFS Sensitive	(USFS) Sensitive	Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: 1) Significant current or predicted downward trends in population numbers or density; 2) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
BLM Sensitive	(BLM) Sensitive	Native species found on BLM land that is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range. The species depends on ecological refugia or specialized or unique habitats on BLM lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk. All federally designated candidate species, proposed species, and delisted species in the 5 years following their delisting.
USFWS ESA Candidate	C	Taxa for which sufficient information on biological status and threats exists to propose to list them as threatened or endangered. None of the substantive or procedural provisions of the Act apply to candidate species.
USFWS ESA Listed Threatened	LT	Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

TABLE 3.5-3. SPECIAL STATUS PLANT SPECIES KNOWN FROM BEAVERHEAD COUNTY (MNHP 2015A)

Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Rhizoplaca haydenii</i>	A Lichen		S1S2	SOC			
<i>Solorina bispora</i>	Chocolate Chip Lichen		S1S2	SOC			
<i>Agastache cusickii</i>	Cusick's Horsemint		S2S3	SOC	Sensitive		Rock/Talus
<i>Allium parvum</i>	Small Onion		S3	SOC			Dry Forest-Grassland
<i>Allotropa virgata</i>	Candystick		S3S4	PSOC			
<i>Aquilegia formosa</i>	Sitka Columbine		S3	SOC			Forest (Mesic)
<i>Astragalus ceramicus</i> var. <i>apus</i>	Painted Milkvetch		S1S2	SOC	Sensitive		Sandy sites
<i>Astragalus convallarius</i>	Lesser Rushy Milkvetch		S3				Grasslands (Intermountain)
<i>Astragalus scaphoides</i>	Bitterroot Milkvetch	X	S3	SOC	Sensitive		Sagebrush-grassland
<i>Astragalus terminalis</i>	Railhead Milkvetch		S2S3	SOC	Sensitive		Sagebrush steppe
<i>Atriplex truncata</i>	Wedge-leaf Saltbush		S3	SOC			Wetland/Riparian
<i>Balsamorhiza hookeri</i>	Hooker's Balsamroot		S3	SOC			Sagebrush-grassland
<i>Balsamorhiza macrophylla</i>	Large-leaved Balsamroot		S3S4	PSOC			Sagebrush-grassland
<i>Boechera fecunda</i>	Sapphire Rockcress		S2	SOC	Sensitive		Rocky, calcareous, montane slopes
<i>Braya humilis</i>	Low Braya		S2	SOC			Alpine
<i>Brickellia oblongifolia</i>	Mojave Brickellbush		S1S2	SOC			Rock/Talus
<i>Calochortus bruneauensis</i>	Bruneau Mariposa Lily		S1S3	SOC			Grasslands (Intermountain)
<i>Carex idahoensis</i>	Idaho Sedge		S3	SOC	Sensitive		Wetland/Riparian

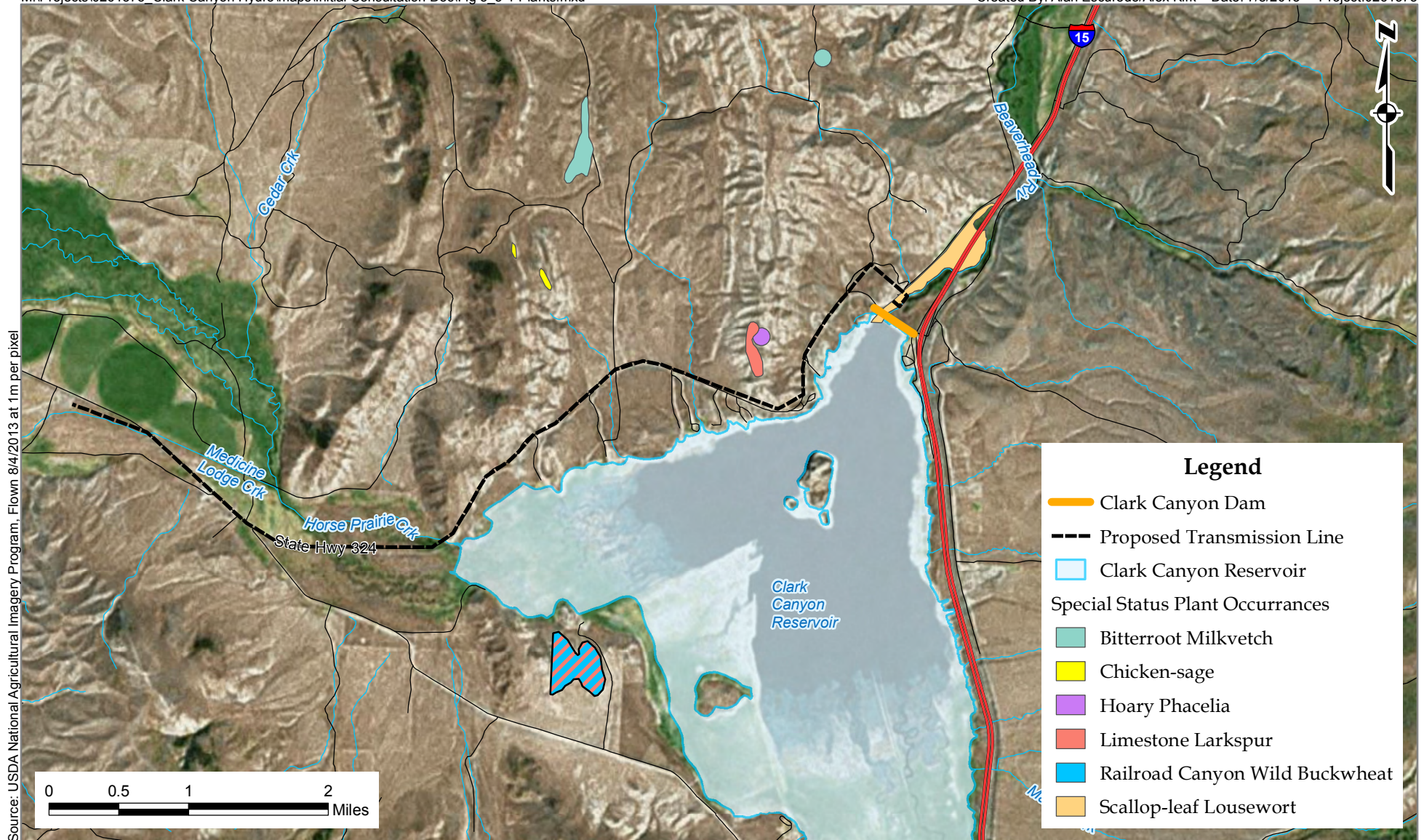
Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Carex multcostata</i>	Many-ribbed Sedge		S2S3	SOC			Grasslands (Montane)
<i>Carex occidentalis</i>	Western Sedge		SH	SOC			Dry, montane to alpine
<i>Carex stevenii</i>	Steven's Scandinavian Sedge		S2?	SOC			Wetland/Riparian (Subalpine)
<i>Castilleja covilleana</i>	Coville Indian Paintbrush		S3	SOC			Subalpine slopes
<i>Castilleja exilis</i>	Annual Indian Paintbrush		S2	SOC			Wetland/Riparian
<i>Castilleja nivea</i>	Snow Indian Paintbrush		S3	SOC			Alpine
<i>Cryptantha fendleri</i>	Fendler Cat's-eye		S2	SOC	Sensitive		Sandy sites
<i>Cryptantha humilis</i>	Round-headed Cryptantha		SH	SOC			Sagebrush Steppe (low-elevation)
<i>Delphinium bicolor ssp. calcicola</i>	Limestone Larkspur	X	S3S4	PSOC			
<i>Delphinium burkei</i>	Meadow Larkspur		S1S2	SOC			Meadows (Moist, low-elevation)
<i>Delphinium glaucescens</i>	Electric Peak Larkspur		S3S4	PSOC			
<i>Downingia laeta</i>	Great Basin Downingia		S2S3	SOC			Wetland/Riparian (Shallow water ponds, lakes)
<i>Draba crassa</i>	Thick-leaf Whitlow-grass		S3	SOC			Alpine
<i>Draba densifolia</i>	Dense-leaf Draba		S2	SOC			Alpine
<i>Draba globosa</i>	Round-fruited Draba		S2S3	SOC			Alpine
<i>Draba ventosa</i>	Wind River Draba		S2S3	SOC			Alpine
<i>Drosera anglica</i>	English Sundew		S3	SOC			Fens
<i>Eleocharis rostellata</i>	Beaked Spikerush		S3	SOC			Wetlands (Alkaline)
<i>Elodea bifoliata</i>	Long-sheath Waterweed		S2?	SOC			Wetland/Riparian (Shallow water)
<i>Elymus flavescens</i>	Sand Wildrye		S1S2	SOC	Sensitive		Sandy sites

Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Ericameria discoidea</i> var. <i>discoidea</i>	Whitestem Goldenbush		S2	SOC			Rock/Talus
<i>Ericameria parryi</i> var. <i>montana</i>	Parry's Mountain Rabbitbrush		S2	SOC			Grasslands (subalpine)
<i>Erigeron asperugineus</i>	Idaho Fleabane		S2	SOC			Alpine
<i>Erigeron leiomerus</i>	Smooth Fleabane		S2	SOC			Alpine
<i>Erigeron linearis</i>	Linear-leaf Fleabane		S2	SOC			Sagebrush/Grasslands (Foothills to Montane)
<i>Erigeron parryi</i>	Parry's Fleabane		S2S3	SOC			Slopes and ridges (Open, Montane)
<i>Erigeron tener</i>	Slender Fleabane		S2?	SOC			Slopes (Open, limestone, montane)
<i>Eriogonum caespitosum</i>	Mat Buckwheat		S2S3	SOC			Sagebrush steppe (Montane)
<i>Eriogonum crosbyae</i>	Crosby's Buckwheat		S3	SOC			Alpine
<i>Eriogonum soliceps</i>	Railroad Canyon Wild Buckwheat		S3	SOC			Ridges/slopes (Open, Montane)
<i>Gentianopsis simplex</i>	Hiker's Gentian		S2	SOC			Fens, wet meadows, seeps
<i>Gymnosteris parvula</i>	Small-flower Gymnosteris		S2	SOC			Grasslands/Sagebrush steppe
<i>Hornungia procumbens</i>	Hutchinsia		S2	SOC			Sagebrush Steppe
<i>Ipomopsis congesta</i> ssp. <i>crebrifolia</i>	Ballhead Ipomopsis		S2S3	SOC			Sagebrush Steppe
<i>Kobresia simpliciuscula</i>	Simple Kobresia		S3	SOC			Alpine
<i>Kochia americana</i>	Red Sage		S2	SOC			Saline/Alkaline Sites

Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Lomatium attenuatum</i>	Taper-tip Desert-parsley		S3	SOC			Slopes and Scree (Dry)
<i>Lomatogonium rotatum</i>	Marsh Felwort		S1S2	SOC			Wetland/Riparian
<i>Micranthes apetala</i>	Tiny Swamp Saxifrage		S2?	SOC			Alpine
<i>Micranthes tempestiva</i>	Storm Saxifrage		S2S3	SOC			Alpine
<i>Mimulus primuloides</i>	Primrose Monkeyflower		S3	SOC			Fens and wet meadows
<i>Mimulus suksdorfii</i>	Suksdorf Monkeyflower		S3S4	PSOC			
<i>Noccaea parviflora</i>	Small-flowered Pennycress		S3	SOC			Meadows (Moist, Montane to alpine)
<i>Oenothera pallida</i> ssp. <i>pallida</i>	Pale Evening-primrose		S1	SOC			Sandy sites
<i>Oxytropis deflexa</i> var. <i>foliolosa</i>	Nodding Locoweed		S2S3	SOC			Alpine
<i>Oxytropis parryi</i>	Parry's Locoweed		S2S3	SOC			Alpine
<i>Pedicularis contorta</i> var. <i>ctenophora</i>	Pink Coil-beaked Lousewort		S2S3	SOC			Slopes (Montane/Subalpine)
<i>Pedicularis crenulata</i>	Scallop-leaf Lousewort	X	S1	SOC			Wetland/Riparian
<i>Penstemon humilis</i>	Low Beardtongue		S1S3	SOC			Sagebrush steppe (Montane)
<i>Penstemon lemhiensis</i>	Lemhi Beardtongue		S3	SOC			Sagebrush-grasslands
<i>Penstemon whippleanus</i>	Whipple's Beardtongue		S2	SOC			Open areas (subalpine and alpine)
<i>Phacelia incana</i>	Hoary Phacelia	X	S3	SOC			Rocky slopes (foothills)
<i>Phacelia scopulina</i>	Dwarf Phacelia		SH	PSOC			Alkaline sites

Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Physaria carinata</i>	Keeled Bladderpod		S1S2	SOC			Grassland slopes (low-elevation)
<i>Physaria pulchella</i>	Beautiful Bladderpod		S3	SOC	Sensitive		Open slopes (Calcaeous soils, foothills to alpine)
<i>Physaria saximontana</i> var. <i>dentata</i>	Rocky Mountain Twinpod		S3	SOC			Gravelly slopes/talus (Montane/subalpine)
<i>Plagiobothrys leptocladus</i>	Slender-branched Popcorn-flower		S2S3	SOC			Wetland/Riparian (low-elevation)
<i>Potentilla plattensis</i>	Platte Cinquefoil		S3	SOC			Grasslands/Sagebrush (Mesic)
<i>Primula alcalina</i>	Alkali Primrose		S2	SOC	Sensitive		Wetland/Riparian
<i>Primula incana</i>	Mealy Primrose		S3	SOC			Wetland/Riparian
<i>Puccinellia lemmonii</i>	Lemmon's Alkaligrass		S1S2	SOC			Wetland/Riparian
<i>Ranunculus hyperboreus</i>	High Northern Buttercup		S3S4	PSOC			Wetland/Riparian (Montane)
<i>Selaginella selaginoides</i>	Northern Spikemoss		S2S3	SOC			Wet, mossy soil (montane/subalpine)
<i>Sphaeralcea munroana</i>	White-stemmed globemallow		S3S4	PSOC			Sagebrush-Grasslands (low-elevation)
<i>Sphaeromeria argentea</i>	Chicken-sage	X	S3	SOC	Sensitive		Sagebrush steppe (low-elevation)
<i>Spiranthes diluvialis</i>	Ute Lady's-tresses		S1S2	SOC		LT	Wetland/Riparian
<i>Stellaria crassifolia</i>	Fleshy Stitchwort		S2	SOC			Wetland/Riparian
<i>Stipa lettermanii</i>	Letterman's Needlegrass		S1S3	SOC			Talus and Grasslands (low-elevation)
<i>Thalictrum alpinum</i>	Alpine Meadowrue		S2	SOC			Wetland/Riparian
<i>Thelypodium paniculatum</i>	Northwestern Thelypody		SH	SOC			Wetland/Riparian
<i>Thelypodium sagittatum</i>	Slender Thelypody		S2	SOC			Alkaline meadows (Valleys and Montane)

Scientific Name	Common Name	Recorded in Project vicinity	State Rank	State Designation	BLM Rank	ESA Listing	Habitat
<i>Townsendia florifer</i>	Showy Townsend-daisy		S2	SOC			Grasslands and Sagebrush
<i>Townsendia spathulata</i>	Sword Townsend-daisy		S3S4	PSOC			
<i>Trichophorum cespitosum</i>	Tufted Club-rush		S2	SOC			Fens and wet meadows
<i>Viguiera multiflora</i>	Many-flowered Viguiera		S2S3	SOC			Aspen woodlands



Notes:
Montana Natural Heritage Program
(MNHP) data from 5/8/2014

Figure 3.5-1
Special Status Plant Occurrences (MNHP 2015)
Clark Canyon Hydroelectric Project
Beaverhead County, Montana



Environmental Resources Management
191 Jewel Basin Ct, Suite 1A
Bigfork, Montana 59911

3.5.1.1.3. Invasive Plants

The Montana Department of Agriculture manages the list of state noxious weeds, which was last updated in 2013 (MT DOA 2013). Noxious weed species are categorized by their management priority. Priority 1A species are not present or have a very limited presence in Montana; Priority 1B species have limited presence in Montana. Management criteria for Priority 1A and 1B species will require eradication or containment and education. Priority 2A species are common in isolated areas of Montana. Priority 2B species are abundant in Montana and widespread in many counties. Management criteria for Priority 2A and 2B species will require eradication or containment where less abundant, and will be prioritized by local weed districts.

Fourteen noxious weed species are known to exist either at the base of the Clark Canyon Dam or along the transmission line route (FERC 2009). Six of these species are categorized as Montana priority 2B noxious weeds (MT DOA 2013): quackgrass (*Elymus repens*), spotted knapweed (*Centaurea stoebe*), black henbane (*Hyoscyamus niger*), Canada thistle (*Cirsium arvense*), hounds tongue (*Cynoglossum officinale*), and whitetop (*Cardaria draba*). Cheatgrass (*Bromus tectorum*), a priority 3 species, is also present. Field surveys conducted for the transmission line route in 2011, as part of the 2011 habitat evaluation (Balance Environmental 2011a) found a total of five weed species: black henbane, Canada thistle, houndstongue, spotted knapweed, and whitetop.

3.5.1.2. Wetlands

Wetlands are transitional land areas between terrestrial and aquatic systems where the water table is usually at or near the land surface or the land is covered by shallow water. There are three areas of wetlands within the Project area: along the Beaverhead River at the base of Clark Canyon Dam, Horse Prairie Creek, and Medicine Lodge Creek near the Peterson Flat Substation at the western end of the proposed transmission line corridor.

Two wetland assessments have been completed for the Project, to cover the entire Project area: 1) A wetland assessment was completed for the original Project area below the dam; and 2) in 2011 a wetland delineation was completed exclusively in the section of the proposed transmission line corridor that runs along highway 324 (outside of the Project area below the dam) (Symbiotics 2012b). Wetlands for these two areas are described separately below.

3.5.1.2.1. Dam Area

A narrow riparian corridor with a diversity of wetland plants borders the Beaverhead River downstream of the dam. The Beaverhead River at the base of the dam consists of a mix of open water and emergent and shrub-scrub wetland habitats. Coyote willow (*Salix exugia*), Booth's willow (*Salix boothii*), hardstem bulrush (*Schoenoplectus acutus*), cattail (*Typha latifolia*) and baltic rush (*Juncus balticus*) are the dominant facultative or obligate wetland species. The transmission line will span the Beaverhead River below the dam, but will not displace these wetland habitats. Hydrology for the area is driven by releases from the dam into the Beaverhead River. Additional hydrology is suspected from hydrostatic pressure from the impoundment, expressed as seeps and springs in the general area.

3.5.1.2.2. Transmission Line Corridor Along Highway 324

The 2011 wetland delineation included the area within an 80 ft wide corridor along the proposed transmission line corridor (40 ft either side of the proposed centerline), outside of the area below the dam, as reported in the Wetland Delineation Report (Symbiotics 2012b). Wetlands were assessed using a preliminary desktop evaluation, as well as with a formal field wetland delineation using standard U.S. Army Corps of Engineers (USACE) methods. This delineation identified 14.11 ac of wetlands with 2.49 ac classified as palustrine shrub-scrub wetlands, and 11.62 ac classified as palustrine emergent wetlands. Wetlands were associated with Horse Prairie Creek and Medicine Lodge Creek (see index maps 1 through 5 in the Wetland Delineation Report [Symbiotics 2012b]). No wetlands were identified along the proposed transmission line corridor between Horse Prairie Creek and the Beaverhead River below the dam (see index maps 6 through 10 in the Wetland Delineation Report [Symbiotics 2012b]). No spring features were identified along the proposed transmission line corridor (Symbiotics 2012b).

3.5.1.3. Wildlife Resources

3.5.1.3.1. Wildlife Habitat

The 2011 habitat evaluation (Balance Environmental, 2011a) evaluated the wildlife habitat within the Project area as part of the vegetation assessment, within 656 feet (200 m) of the proposed transmission line corridor, which includes all proposed Project infrastructure at the dam area. Acreage and descriptions of wildlife habitat types are presented in Table 3.5-1, as vegetation types, or other unvegetated habitat types. Wildlife habitat was assessed by compiling all available literature and spatial data on habitat types for wildlife species of concern that have the potential to occur in the Project vicinity, including aerial imagery, NWI mapping, and USFS and BLM cover type data. Potentially suitable habitat was mapped in a GIS, and these maps were groundtruthed and refined in the field in 2011. Using groundtruthed mapping, the appropriate National Vegetation Classification System (NVCS) type was assigned to characterize the plant community for each habitat type. Results of the habitat mapping are presented in the 2011 habitat evaluation (Balance Environmental 2011a), and are summarized here.

The 2011 habitat evaluation habitat report (Balance Environmental, 2011a) identified four broad habitat types, which were divided further into finer scale vegetation types, as presented in Table 3.5-1 above: grasslands, sagebrush, wetland shrubland, herbaceous wetlands, and woodland. They also identified two non-vegetated land cover types: other non-vegetated, and rock outcrops. Appendix B of the 2011 habitat evaluation (Balance Environmental, 2011a) presents detailed maps of the vegetation types documented within the Project area.

3.5.1.3.2. General Wildlife

The Project area is located in the Beaverhead/Red Rock migratory bird flyway, and the riparian wetland habitats are important areas for migratory birds and other wildlife. Immediately downstream of the tailrace, springs create a marsh wetland adjacent to the Beaverhead River.

This wetland provides feeding and limited nesting habitat for gulls (*Larus spp.*), cormorant (*Phalacrocorax auritus*), sandhill cranes (*Grus canadensis*), and other waterfowl. Open water provides feeding areas for waterfowl, bald eagle (*Haliaeetus leucocephalus*), and osprey (*Pandion haliaetus*), and breeding habitat for amphibians. Other general bird species of note within the Project area are trumpeter swan (*Cygnus buccinator*), Barrow's goldeneye (*Bucephala islandica*), Swainson's hawk (*Buteo swainsoni*), greater sage grouse (GSG; *Centrocercus urophasianus*), sandhill crane (*Grus canadensis*), American dipper (*Cinclus mexicanus*), Townsend's solitaire (*Myadestes townsendi*), and Brewer's sparrow (*Spizella breweri*).

Potential habitat exists for several game wildlife species (big game, upland birds, and furbearers) within the Project area, as presented in Table 3.5-4. Mule deer (*Odocoileus hemionus*), white tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), pronghorn (*Antilocapra americana*), and elk (*Cervus elaphus*) can be found in riparian meadows and sage steppe habitats. Small mammals such as mink (*Mustella vison*), muskrat (*Ondatra zibethicus*), and voles (*Microtus sp.*) may den along creek and river banks, and frequent meadow habitats. Upland steppe provides feeding, breeding, and nesting habitat for game birds, such as GSG, songbirds, and raptors, such as ferruginous hawk (*Buteo regalis*).

TABLE 3.5-4. GAME SPECIES WITH POTENTIAL SUITABLE HABITAT IN THE PROJECT AREA (MNHP 2015B).

	Common Name	Scientific Name
Big Game	black bear	<i>Ursus americanus</i>
	elk	<i>Cervus elaphus</i>
	moose	<i>Alces alces</i>
	mule deer	<i>Odocoileus hemionus</i>
	pronghorn antelope	<i>Antilocapra americana</i>
	white tailed deer	<i>Odocoileus virginianus</i>
Upland Birds	Hungarian partridge	<i>Perdix perdix</i>
	pheasant	<i>Phasianus colchicus</i>
	sage grouse	<i>Centrocercus urophasianus</i>
	sharp-tail grouse	<i>Tympanuchus phasianellus</i>
Furbearing Mammals	badger	<i>Taxidea taxus</i>
	beaver	<i>Castor canadensis</i>
	bobcat	<i>Felis rufus</i>
	coyote	<i>Canis latrans</i>
	mink	<i>Mustella vison</i>
	muskrat	<i>Ondatra zibethicus</i>
	raccoon	<i>Procyon lotor</i>
	red fox	<i>Vulpes vulpes</i>
	river otter	<i>Lutra canadensis</i>
	skunk	<i>Mephitis mephitis</i>
	weasel	<i>Mustela frenata</i>

3.5.1.3.3. Wildlife Species of Concern

A GIS geodatabase of wildlife SOC documented breeding areas was obtained from MNHP in June 2015 (MNHP 2015a). The list of species was further refined based on comments received from the USFWS, BOR, and MFWP, in addition to MNHP occurrence and observation records for the immediate Project vicinity. Species detailed below include those for which known occurrences and/or potential habitat exist in the vicinity of the proposed transmission corridor. Table 3.5-2 lists the descriptions for the various state and federal designations and ranking for SOC's within Montana (MNHP 2015b).

As of June 2015, MNHP lists 48 wildlife SOC within Beaverhead County that have been documented with breeding, nesting, or otherwise occupied territory (Table 3.5-5; MNHP 2015a). This list does not include incidental observations of species that are passing through the area. Table 3.5-5 also lists the habitat type for each SOC. Twelve of the species are considered likely to occur in the Project area based on MNHP occurrence data (MNHP 2015a) and potential suitable habitat within the Project area. These species and are described below, separately for bird species and small mammals.

TABLE 3.5-5. SPECIAL STATUS WILDLIFE OCCURENCES IN BEAVERHEAD COUNTY, MONTANA (MNHP 2015A).

Scientific Name	Common name	Assessed in ICD1	State Rank	State Designation	BLM Rank	ESA Rank/Regulatory	MFWP Tier	Habitat
Amphibians								
<i>Anaxyrus boreas</i>	Western Toad		S2	SOC	Sensitive		1	Wetlands, floodplain pools
Birds								
<i>Accipiter gentilis</i>	Northern Goshawk		S3	SOC	Sensitive		2	Mixed conifer forests
<i>Aquila chrysaetos</i>	Golden Eagle	X	S3	SOC	Sensitive	BGEPA; MBTA; BCC	2	Grasslands
<i>Ardea herodias</i>	Great Blue Heron	X	S3	SOC			3	Riparian forest
<i>Artemisiospiza nevadensis</i>	Sagebrush Sparrow	X	S3B	SOC	Sensitive		3	Sagebrush
<i>Athene cunicularia</i>	Burrowing Owl		S3B	SOC	Sensitive		1	Grasslands
<i>Buteo regalis</i>	Ferruginous Hawk	X	S3B	SOC	Sensitive		2	Sagebrush grassland
<i>Catharus fuscescens</i>	Veery		S3B	SOC			2	Riparian forest
<i>Centrocercus urophasianus</i>	Greater Sage-Grouse	X	S2	SOC	Sensitive	C	1	Sagebrush
<i>Certhia americana</i>	Brown Creeper		S3	SOC			2	Moist conifer forests
<i>Coccothraustes vespertinus</i>	Evening Grosbeak		S3	SOC			3	Conifer forest
<i>Cygnus buccinator</i>	Trumpeter Swan	X	S3	SOC	Sensitive		1	Lakes, ponds, reservoirs
<i>Dolichonyx oryzivorus</i>	Bobolink		S3B	SOC	Sensitive		3	Moist grasslands
<i>Dryocopus pileatus</i>	Pileated Woodpecker		S3	SOC			2	Moist conifer forests
<i>Falco peregrinus</i>	Peregrine Falcon		S3	SOC	Sensitive	DM	2	Cliffs / canyons
<i>Haemorhous cassinii</i>	Cassin's Finch		S3	SOC			3	Drier conifer forest
<i>Haliaeetus leucocephalus</i>	Bald Eagle	X	S4	SSS	Sensitive	DM; BGEPA; MBTA; BCC	1	Riparian forest

Scientific Name	Common name	Assessed in ICD1	State Rank	State Designation	BLM Rank	ESA Rank/Regulatory	MFWP Tier	Habitat
<i>Ixoreus naevius</i>	Varied Thrush		S3B	SOC			3	Moist conifer forests
<i>Lanius ludovicianus</i>	Loggerhead Shrike		S3B	SOC	Sensitive		2	Shrubland
<i>Leucophaeus pipixcan</i>	Franklin's Gull		S3B	SOC	Sensitive		2	Wetlands
<i>Leucosticte atrata</i>	Black Rosy-Finch		S2	SOC			2	Alpine
<i>Nucifraga columbiana</i>	Clark's Nutcracker		S3	SOC			3	Conifer forest
<i>Numerius americanus</i>	Long-billed Curlew		S3B	SOC	Sensitive		1	Grasslands
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron		S3B	SOC	Sensitive		2	Wetlands
<i>Oreoscoptes montanus</i>	Sage Thrasher		S3B	SOC	Sensitive		3	Sagebrush
<i>Pipilo chlorurus</i>	Green-tailed Towhee		S3B	SOC			2	Shrub woodland
<i>Plegadis chihi</i>	White-faced Ibis		S3B	SOC	Sensitive		2	Wetlands
<i>Psiloscops flammeolus</i>	Flammulated Owl		S3B	SOC	Sensitive		1	Dry conifer forest
<i>Rhynchophanes mccownii</i>	McCown's Longspur		S3B	SOC	Sensitive		2	Grasslands
<i>Spizella breweri</i>	Brewer's Sparrow		S3B	SOC	Sensitive		2	Sagebrush
<i>Sterna forsteri</i>	Forster's Tern		S3B	SOC			2	Wetlands
<i>Strix nebulosa</i>	Great Gray Owl		S3	SOC	Sensitive		2	Conifer forest near open meadows
<i>Troglodytes pacificus</i>	Pacific Wren		S3	SOC			2	Moist conifer forests
Mammals								
<i>Brachylagus idahoensis</i>	Pygmy Rabbit	X	S3	SOC	Sensitive		1	Sagebrush
<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat		S3	SOC	Sensitive		1	Caves in forested habitats
<i>Euderma maculatum</i>	Spotted Bat		S3	SOC	Sensitive		1	Cliffs with rock crevices
<i>Gulo gulo</i>	Wolverine		S3	SOC	Sensitive		2	Boreal Forest and Alpine Habitats
<i>Lasiurus cinereus</i>	Hoary Bat		S3	SOC			2	Riparian and forest

Scientific Name	Common name	Assessed in ICD1	State Rank	State Designation	BLM Rank	ESA Rank/Regulatory	MFWP Tier	Habitat
<i>Martes pennanti</i>	Fisher		S3	SOC	Sensitive		2	Mixed conifer forests
<i>Myotis lucifugus</i>	Little Brown Myotis		S3	SOC			3	Generalist
<i>Myotis thysanodes</i>	Fringed Myotis		S3	SOC	Sensitive		2	Riparian and dry mixed conifer forests
<i>Perognathus parvus</i>	Great Basin Pocket Mouse	X	S3	SOC	Sensitive		1	Sagebrush / grassland
<i>Sorex hoyi</i>	Pygmy Shrew		S3	SOC			2	Open conifer forest, grasslands, and shrublands, often near water
<i>Sorex merriami</i>	Merriam's Shrew	X	S3	SOC			2	Sagebrush grassland
<i>Sorex nanus</i>	Dwarf Shrew	X	S2S3	SOC			2	Rocky habitat
<i>Sorex preblei</i>	Preble's Shrew	X	S3	SOC			2	Sagebrush grassland
<i>Synaptomys borealis</i>	Northern Bog Lemming		S2	SOC			1	Conifer forest wetland
<i>Ursus arctos</i>	Grizzly Bear		S2S3	SOC	Sensitive	LT,XN	1	Conifer forest

Notes:

1: Assessed as part of this updated ICD based on one or more of the following: presence of potential suitable habitat, documented presence in Project area, listing by federal or state agency, or agency comments

3.5.1.3.3.1. Bird Species of Concern

Several bird SOC have potential breeding habitat within the Project area. Based on MNHP breeding occurrence data and potential suitable habitat, the following bird species were evaluated as part of this ICD: bald eagle (a special status species rather than a SOC; Table 3.5-2), golden eagle, ferruginous hawk, GSG, sagebrush sparrow, trumpeter swan, and great blue heron. Bird species were assessed within a 0.5 mi buffer of the proposed Project area, and only recent (year 2000 or more recent) occurrence records were included in this assessment. To date, no field-based bird surveys have been conducted by the Project.

Bald eagle

The bald eagle was removed from the federal ESA list in 2007. Therefore, there are no current recovery plans or critical habitat designations. They are a MFWP Tier 1 species (MNHP 2015b). Bald eagles continue to be protected at the federal level under the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act (MBTA). The State of Montana also has regulations that protect bald eagles. The 1994 Montana Bald Eagle Management Plan developed by the Montana Bald Eagle Working Group (MBEWG), and their addendum, the 2010 Bald Eagle Management Guidelines, detail restrictions on human activities near known nest sites (MBEWG 2010).

Bald eagles are found primarily near coastlines, rivers, reservoirs, and lakes. Eagles principally eat fish, but also feed on carrion, waterfowl, and small mammals. They use large trees as nest sites and hunting perches. Eagles winter throughout much of the United States; both wintering and nesting eagles can be found in the Project vicinity.

Since 2000, the MNHP has one record of occurrence of bald eagle nesting within 0.5 mi of the Project. The nest observation was recorded in 2011 just north of the proposed transmission line corridor in the Horse Prairie Creek drainage, west of the reservoir (MNHP 2015a). In addition, MFWP biologists have monitored this nest site since 2008. Subsequent to the 2011 MNHP occurrence record, the bald eagle pair was observed by MFWP at this nest tree in February 2012 and the territory is assumed to be occupied yearly. In addition, bald eagle nests have been observed downstream of the dam outside of the 0.5 mi Project area buffer, one of which was last documented in 2014. Figure 3.5-2 presents the locations of the single post-2000 MNHP bald eagle nesting territory record within the 0.5 mi buffer, represented as a point location. For raptors, these points represent the location where a nesting bird was observed, indicating an area of active breeding territory at the time of the observation.

Bald eagles also utilize the Clark Canyon Reservoir area in winter and during migration. As of 2004, mid-winter eagle counts in the reservoir vicinity averaged five to 10 birds per visit (Jim Roscoe, wildlife biologist, BLM, personal communication on August 2, 2004).

Golden eagle

The golden eagle is a BLM sensitive species, a MFWP Tier 2 species, and a USFWS Bird of Conservation Concern that is protected under the federal Bald and Golden Eagle Protection Act.

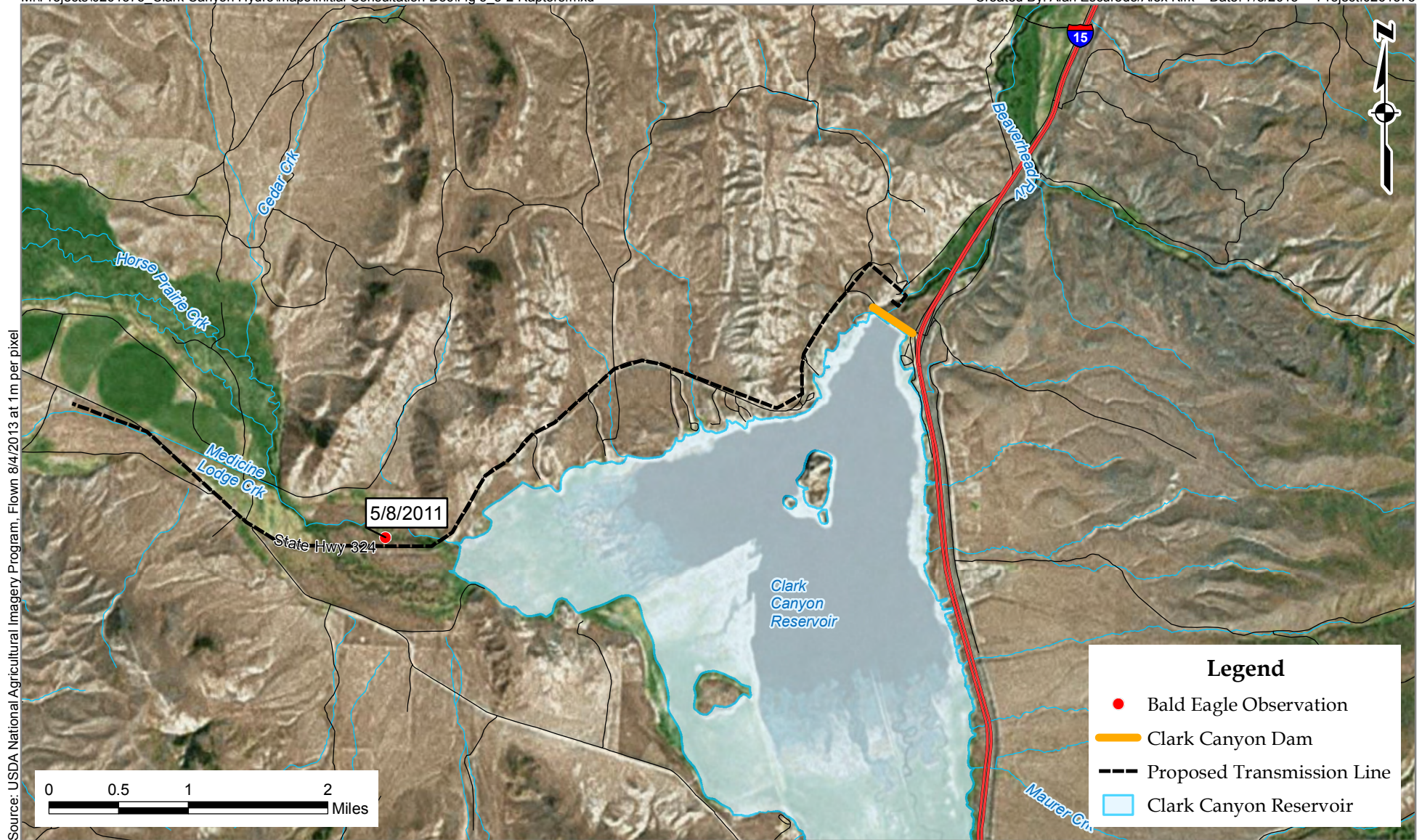
They are common year round in open rangelands and mountainous habitats throughout Montana.

Golden eagles prey primarily on small mammals, particularly rabbits and ground squirrels, but are also known to eat a wide variety of prey, including birds, snakes, insects, and carrion. They usually nest in large trees or on cliffs. Since the year 2000, there are no records of active breeding territories for golden eagles within 0.5 mi of the proposed Project (MNHP 2015a). However, the Clark Canyon Reservoir area does provide suitable nesting and wintering habitat, and golden eagles may be present at any time of year.

Ferruginous hawk

The ferruginous hawk is a BLM special status species, a MFWP Tier 2 species, and is considered at risk for extirpation from Montana by MNHP. In Montana, ferruginous hawks breed in the shortgrass foothills and steppe-habitat east of the Rocky Mountains. These hawks commonly migrate south in the fall. Ferruginous hawks are found on semi-arid plains and in arid steppe habitats and prefer relatively unbroken terrain (DeGraaf et al. 1991; Link et al. 2001). In Montana they inhabit shrub steppe and shortgrass prairie. Ferruginous hawks prefer tall trees for nesting, but will use a variety of structures including mounds, short cliffs, cutbacks, low hills, haystacks, and human structures (DeGraaf et al. 1991). Ferruginous hawks feed on ground squirrels, rabbits, pocket gophers, kangaroo rats, mice, voles, lizards, and snakes. Populations can be adversely influenced by agricultural activities (Link et al. 2001).

The MNHP has records of 14 nest locations in the Project vicinity of the proposed transmission corridor (MNHP 2015a), however, no breeding birds have been documented by the MNHP database within the 0.5 mile Project buffer since 2000 (MNHP 2015a), and are therefore not presented in Figure 3.5-2. Nonetheless, there is suitable nesting habitat in the Project vicinity, and breeding pairs may use the area for foraging.



Notes:
 Montana Natural Heritage Program
 (MNHP) data from 5/8/2014
 Includes only records after the year 2000, and
 within half a mile of the proposed transmission line

Figure 3.5-2
Raptor Nest Observations
 Clark Canyon Hydroelectric Project
 Beaverhead County, Montana



Environmental Resources Management
 191 Jewel Basin Ct, Suite 1A
 Bigfork, Montana 59911

Greater sage grouse

The GSG is a candidate species for federal listing and protection under the ESA. In 2010, the USFWS determined that the species warrants protection, but that listing under the act is precluded by the need to address other listing actions of a higher priority. The GSG is also a MFWP Tier I species of concern and a BLM sensitive species. It is the largest grouse species in North America and a sagebrush-obligate, depending on sagebrush communities for breeding, nesting, brood-rearing, and winter habitat (Dahlgren 2006). Seasonal habitat characteristics vary considerably and GSG frequently move over large areas annually to meet their seasonal needs. Populations are found scattered throughout Montana, excluding the northwest and extreme northeast portions of the state.

GSG leks generally occur in open areas with sparse shrub cover, while nests are usually located under sagebrush. Brood-rearing habitat tends to have higher cover of herbaceous vegetation and abundant insects, which are an important food resource for juveniles (Connelly et al. 2000; Dahlgren 2006). GSG move to more mesic habitats as herbaceous vegetation dries out and late summer brood-rearing habitats become more variable. In winter, GSG feed almost exclusively on sagebrush, which they also rely on for thermal and escape cover. Winter habitat is often in areas with moderate cover of tall sagebrush that emerges at least 10 to 12 in from snow cover (Connelly et al. 2004).

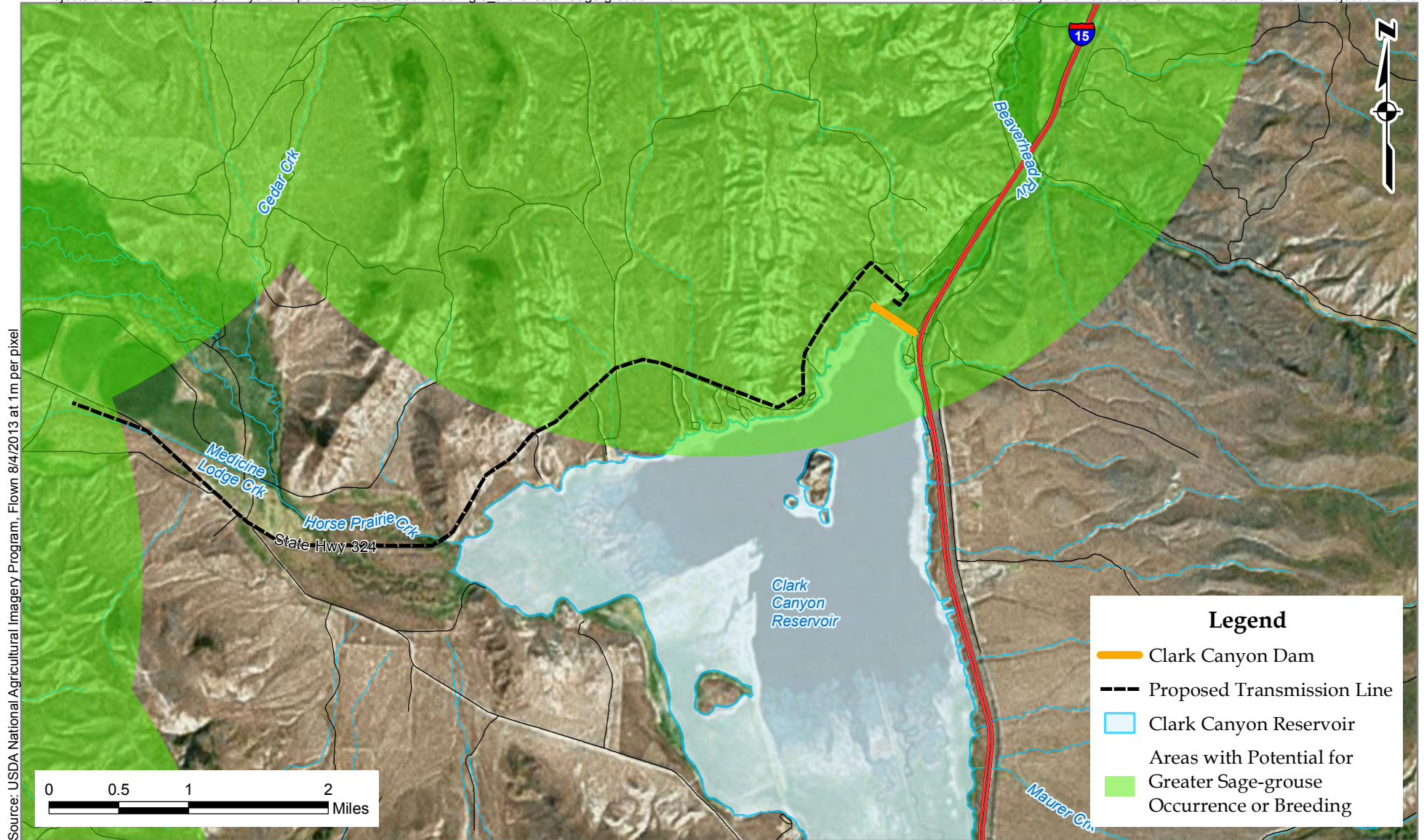
Predators of adults and juveniles include hawks, eagles, ravens, weasels, coyotes, and foxes. Common nest predators include ground squirrels, badgers, coyotes, ravens, and snakes (Dahlgren 2006). Predation can cause low rates of nest success and juvenile survival.

The proposed transmission corridor runs alongside Highway 324 and near a GSG core area. Active and historic leks are known to exist within a few miles of the highway (Montana Sage Grouse Working Group 2005; BLM 2010; MNHP 2015a). Research on sage-grouse populations and habitat in the Dillon Local Work Group Area is being conducted by the MFWP, BLM, and others. The research includes lek counts, habitat mapping, and analysis of migration patterns. The sagebrush grassland habitat between the Beaverhead River and Horse Prairie Creek is occupied habitat (Craig Fager, MFWP, personal communication).

Since 2000, the MNHP has four records of occurrence within 0.5 mi of the proposed Project, with the most recent observation documented in 2011 (MNHP 2015a; Figure 3.5-3). The MNHP geodatabase (MNHP 2015a) indicates that these records represent "Confirmed breeding area based on the presence of a nest, chicks, juveniles, or adults on a lek. Point observation location is buffered by a minimum distance of 6,400 m in order to encompass the latest research on the area used for breeding, nesting, and brood rearing and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 m." Actual lek locations are unknown at this time, locations would be confirmed with MFWP prior to Project licensing.

As of 2012, GSG had not been observed down close to Highway 324 and the proposed transmission corridor (Craig Fager, MFWP, personal communication)). Nonetheless they may utilize the area during the late brooding season, when food resources become scarce in more

xeric habitats, or during migration to and from breeding grounds. Any movement between breeding grounds in the Horse Prairie and Medicine Lodge drainages would entail crossing the highway and proposed transmission line corridor. Movement to and from breeding grounds in Montana and wintering areas in Idaho would also entail crossing through the Project area.



Notes:
Montana Natural Heritage Program
(MNHP) data from 5/8/2014

Figure 3.5-3
Potential Greater Sage-Grouse Occurrence
Clark Canyon Hydroelectric Project
Beaverhead County, Montana



Environmental Resources Management
191 Jewel Basin Ct, Suite 1A
Bigfork, Montana 59911

Other birds species of concern

The MNHP has one local record of occurrence of a sagebrush sparrow from a couple of miles north of the proposed transmission corridor in 2002 (MNHP 2015a). Southwestern Montana is near the northern extent of the species' breeding range, and sagebrush sparrows are generally uncommon. Nonetheless, there is abundant suitable habitat in the Project vicinity of the proposed transmission corridor and sagebrush sparrows are potentially present in the area during the breeding season.

Trumpeter swans are a sensitive species that utilize the Clark Canyon reservoir as migration stopover and winter habitat. A great blue heron rookery is known from the east side of the reservoir, but was last observed active in 1999 (MNHP 2015a). There is little or no waterfowl habitat north of the proposed transmission corridor, but wetland areas associated with Horse Prairie Creek, Medicine Lodge Creek, and the Beaverhead River all provide suitable habitat for nesting, wintering, and migrating birds.

3.5.1.3.3.2. *Small Mammals*

There are several small mammal species on the MNHP SOC list in Beaverhead County with the potential to occur in the Project area (MNHP 2015a). To date, no field-based wildlife surveys have been conducted by the Project.

Pygmy rabbit

The pygmy rabbit is a BLM sensitive species and a Tier I species of concern in Montana. Pygmy rabbits inhabit sagebrush-steppe habitats and are associated with tall, dense stands of sagebrush (approximately 1.5 to 3 ft tall) and deep, loose soils. Pygmy rabbits preferentially construct burrows under the tallest sagebrush in the local landscape within sandy loam soils, and frequently inhabit alluvial deposits, swales, other areas where soils accumulate, as well as suitable sites on benchtops (Gabler et al. 2000; Ulmschneider et al. 2004). They prefer flat and moderate slopes. They depend on sagebrush for much of their food, but also feed on grasses, forbs, and other shrubs when available. Pygmy rabbits are active year-round. Litters of up to six young are born from spring to early summer.

The MNHP has one record of occurrence from 1997 of a pygmy rabbit breeding colony approximately 1 mi south of the proposed transmission corridor in Garfield Canyon. There are also several additional occurrence records a few miles south of Clark Canyon Reservoir, from as recent as 2004. If these populations are still extant, dispersing individuals could occur within the proposed Project area.

Great Basin pocket mouse

The Great Basin pocket mouse is a BLM sensitive species and a Tier I species of concern to the MFWP. Southwestern Montana is near the northern extent of the species' range. Occupied habitats in Montana are arid and sometimes sparsely vegetated. They include grassland-shrubland, stabilized sandhills, and other landscapes with sandy soils where sagebrush cover exceeds 25 percent (Hendricks and Roedel 2002). Elsewhere, they are also known to occur in

pine woodlands, juniper-sagebrush scablands, shortgrass steppes, and shrublands. They tend not to occur in heavily forested habitats. The MNHP does not have records of occurrence near the Project (MNHP 2015a), but there are known populations in Beaverhead County and suitable habitat nearby. Where Great Basin pocket mice occur, especially in the northern portion of their range, they are frequently the most abundant small mammal in capture data.

Preble's shrew

Preble's shrew is a Tier II species of concern in Montana that may occur in the Project vicinity, but no occurrence has been documented by MNHP within the Project vicinity (MNHP 2015a). Throughout its range, the Preble's shrew occupies a variety of habitats; most Preble's shrews in Montana have been captured in sagebrush grassland habitats. They have been taken in Beaverhead County in grass- and shrub-dominated habitat (Hendricks and Roedel 2002). The species may be present in suitable habitats in and near the Project area.

Merriam's shrew

Merriam's shrew is a Tier II species of concern known to occur in Beaverhead County (MNHP 2015a). In Montana, they are captured mostly in arid sagebrush-grassland habitats, but are also known to occur in pastures and croplands dominated by nonnative grasses and forbs, and in poorly developed riparian habitat (Foresman 2001). They occupy a variety of habitats across their range, including sagebrush-steppe, pine woodlands, mountain mahogany shrublands, open ponderosa pine stands, aspen-mixed conifer forest, mine-reclamation land, bunchgrass grasslands, and dunes. No nearby records exist in the MNHP database (MNHP 2015a), but the species has been documented in Beaverhead County and suitable habitat exists in and near the Project area.

Dwarf shrew

The dwarf shrew is a Tier II species of concern that is known to occur in Beaverhead County, but no occurrence has been documented by MNHP within the Project vicinity (MNHP 2015a). The species is found in a wide array of habitats, including rocky slopes and meadows in lower-elevation forest, arid sagebrush slopes, shortgrass prairie, and pinyon-juniper woodland. However, most individuals captured have been taken from rocky locations in alpine terrain or subalpine talus bordered by conifer and aspen stands. Southwestern Montana is at the far western edge of the species' range. Given known distribution and habitat preferences it is unlikely, but possible, that they are present in the Project vicinity.

3.5.2. *Potential Project Effects on Botanical and Wildlife Resources*

3.5.2.1. Effects on Botanical Resources

Modification of Clark Canyon Dam to accommodate hydropower is not likely to have long-term effects on native plant communities. The power house, associated transformer pad, and parking area will be placed between the spillway stilling basin and the outlet stilling basin, and will be constructed on previously disturbed steppe vegetation. Other permanent disturbances will be associated with construction of the valve house and access road.

The entire corridor runs immediately adjacent to Highway 324, so no new access roads will be needed. Assuming there will be 13 poles per mile and that each pole will displace approximately 3 sq ft of vegetation and temporarily disturb an additional 22 sq ft, less than 0.01 ac of vegetation would be permanently displaced in the proposed transmission corridor and approximately 0.05 ac could be temporarily disturbed by construction activities. No trees will be removed within the proposed corridor. This small amount of disturbance and displacement is unlikely to have short- or long-term effects on local vegetation. Both the construction-related and permanent footprints of the Project are small and immediately adjacent to the existing ROW for Highway 324. All areas disturbed during construction will be revegetated according to the Revegetation Plan (Symbiotics 2012d), in an effort to limit noxious weed expansion into disturbed areas. Since the transmission line would be located in sagebrush and short grass prairie, very little to no vegetation maintenance would be needed to maintain clearance for the transmission line.

An intensive survey for Ute's ladies' tresses was conducted within suitable wetland area habitat along the proposed transmission line corridor in 2011 (Balance Environmental 2011b). No Ute's ladies' tresses were recorded during the survey, and are therefore not expected to be impacted by Project construction or operation.

Sensitive plant surveys were not conducted for the other SOC's listed by MNHP known to occur in the Project vicinity (Figure 3.5-1). Scallop-leaf lousewort has potential to be impacted by Project construction below the dam, as MNHP documents this species in the vicinity of the proposed powerhouse site (Figure 3.5-1). Construction activity and Project structures may remove occupied or potential habitat for other sensitive plants which were not specifically surveyed within the Project area, however this small amount of disturbance and displacement is unlikely to have short- or long-term effects on local populations of sensitive plants.

The Applicant would implement the Revegetation Plan (Symbiotics 2012d) as part of protecting vegetation. The Revegetation Plan includes the following measures:

- Preserving existing topography wherever possible;
- Following construction, ripping to a depth of 6 in any soils compacted by construction equipment;
- Removing noxious weeds around areas to be reseeded;
- Reseeding or replanting all disturbed soils using a mix of native plants that meets BOR requirements; and
- Spreading certified weed free mulch over seeded areas to retain moisture and protect from soil erosion.

Noxious weeds could be spread to and from the Project area by construction activities, and degrade or encroach upon habitat for sensitive plants. The Revegetation Plan (Symbiotics 2012d), describes the proposed restoration of disturbed habitats in the Project area with native vegetation and details noxious weed control measures.

Given appropriate and timely implementation of the Revegetation Plan, construction effects on vegetation are expected to be minor and short-term.

3.5.2.2. Effects on Wetlands

Construction activities, including pole placement for the transmission line, would avoid wetlands to the extent practicable. The wetland areas adjacent to the original river channel, tailrace channel, and along the river would be protected from negative construction effects by avoidance and the installation of a silt fence to prevent sediments from reaching the wetland areas.

To avoid adverse effects of Project construction on existing riparian habitat and provide for revegetation of disturbed areas after construction, the Applicant will develop and implement a Wetland and Riparian Habitat Protection Plan. This plan will include the following measures:

- Maintaining a 75 ft buffer zone from the seasonal high water mark except where the current access road is less than 75 ft from wetland and riparian areas;
- Flagging the buffer zone and adding silt fencing;
- Providing barrier fencing to delineate the boundary where the access road is less than 75 ft from wetland and riparian areas;
- Limiting the right-of-way to existing roads; and
- Weekly inspecting fences to determine if maintenance is needed.

The Applicant would also implement the Revegetation Plan (Symbiotics 2012d) as part of protecting wetland and riparian habitats.

3.5.2.3. Effects on Wildlife Resources

3.5.2.3.1. Effects on Wildlife Habitat

Because the duration of construction is expected to be short, and the Project area is not identified as critical wildlife habitat, disturbance effects to wildlife habitat are anticipated to be minimal. Some wildlife may be displaced from their habitats during construction of the Project. The powerhouse may displace small mammals, reptiles, amphibians, or birds that use the base of the dam. Other wildlife with burrows or nests along the proposed transmission line corridor may be temporarily displaced. The potentially disturbed area is small, such that displacement is not expected to have significant effects on the size, growth rate, or distribution of wildlife populations.

Noxious weeds could be spread to and from the Project area by vehicles, equipment, and workers, degrading habitat quality for many species of wildlife by reducing the quantity and quality of forage, cover, and other habitat components. Such degradation could in turn affect prey availability for predators such as raptors. The Revegetation Plan provides for the restoration of disturbed habitats in the Project area with native vegetation and details noxious weed control measures.

3.5.2.3.2. Effects on Wildlife Species

Potential effects of Project construction and operation on bird species and terrestrial mammals are described below.

3.5.2.3.2.1. Effects on Birds

Project construction activities may cause short-term disturbance and displacement of bird species. Noise from construction, and associated vehicles, equipment and workers can disturb nearby birds during sensitive periods in their life histories (e.g. nesting, brood-rearing, wintering, migration). Increased numbers of vehicles and humans can also disrupt movement patterns, nesting, and foraging behavior. Construction can increase dust locally, and displace and disrupt habitat features such as nest and roost trees. Any of these effects can cause nest failure or abandonment during building, egg-laying and incubation, or decrease availability of nest, perch, and roost sites. Additionally, bald eagles may be discouraged from foraging in the stilling basin below the tailrace during construction activities.

The existing ROW associated with Highway 324 already fragments habitat along the adjacent proposed transmission corridor, but the transmission lines would add a new vertical dimension to that fragmentation. New transmission lines may pose an electrocution risk to perching birds and a collision risk to birds in flight. Raptors are at risk of electrocution due to their use of power line poles as perching structures. Species that are less maneuverable such as cranes, pelicans, and large waterfowl are also susceptible to power line collision (Janss 2000). Birds that fly fast and low, such as geese, ducks, and smaller flocking birds, are also at higher risk. Lines that pose a high risk of collision include those over water, those that cross draws or other natural flyways, and those placed immediately above tree tops and ridgelines. Transmission lines that bisect areas of high bird movement, such as lines placed between nesting and feeding habitats, also pose a collision risk. The MFWP identified at least three segments of the proposed ROW where bird activity is concentrated and relatively high, including the portions within the Beaverhead River corridor and where the lines cross Horse Prairie and Medicine Lodge creeks.

Transmission features can also provide new perches for raptors in shrubland, grassland, and wetland habitats where few or none previously existed, thus exposing prey species, including GSG, to new or increased predation risks. Most of the habitats crossed by the proposed Project do not currently support an abundance of natural perching sites.

GSG, sagebrush sparrows, and other birds of conservation concern, including waterfowl species, would be affected similarly to raptors by the small amount of habitat displacement and disturbance associated with the Project. It is unlikely that local populations will be affected by habitat loss, though additional habitat fragmentation is of concern. However, given the existing fragmentation associated with Highway 324, the additive effects of an adjacent transmission corridor would likely be very limited. GSG for example, are known to avoid linear landscape features in general (Connelly et al. 2004). GSG movement patterns through the area are already influenced by the highway and are unlikely to be significantly altered by the addition of a transmission corridor immediately adjacent to the existing road.

Direct bird mortality can occur by destruction of occupied nests or roost sites during vegetation clearing, excavation, and grading, or by collision with vehicles on roads to and from the Project. Species with higher likelihood of impact include ground or shrub-nesting avian species, such as sage sparrows and GSG. Displacement from adjacent and nearby habitats would be a short-term impact for most individuals, with animals returning to similar use and movement patterns once construction and revegetation is complete. A comprehensive nest survey would be conducted within a to-be-determined buffer of the Project area prior to construction, to avoid any displacement or mortality to breeding and nesting birds.

The nature and duration of disturbance associated with operators' activities would be limited to occasional vehicle travel along the transmission corridor, which is adjacent to Highway 324. Operators would employ speed limits along access roads and comply with any Project-related protection measures for local wildlife (e.g. temporal and spatial restrictions on specific activities). Maintenance activities along the transmission corridor will be infrequent, and are not anticipated to cause additional adverse effects to raptors or associated habitat.

An Avian Protection Plan will be developed to guide Project construction and operation to minimize impacts to bird species. The plan will include best management practices, mitigation measures and engineered controls to be incorporated into the Project design, as well as any recommended buffers or seasonal constraints to limit disturbance to birds. For example, the Bald and Golden Eagle Protection Act recommends a minimum permanent buffer of 660 ft from eagle nests for all development activities, and suggests larger buffers may be needed in open landscapes. The 2010 Montana Bald Eagle Management Guidelines recommend at least a 0.5 mi buffer between new above-ground utility lines and eagle nests (MBEWG 2010). These guidelines also recommend seasonal disturbance restrictions from February 1st through August 15th to avoid disturbance or displacement of nesting birds.

Given appropriate implementation of these protection measures, the Project should have only minor, temporary effects on local bird populations and their associated habitats. The proposed transmission corridor may affect, but is unlikely to adversely affect, GSG and other birds of conservation concern.

3.5.2.3.2.2. *Effects on Terrestrial Mammals*

The small amount of habitat displaced by the Project is unlikely to have long-term negative effects on terrestrial mammals. Noise, dust, vehicles, equipment, and workers can disturb and displace local individuals. Displaced individuals can suffer direct or indirect mortality or decreased breeding success. Direct mortality can occur by destruction of occupied small mammal burrows or dens during vegetation clearing and grading, or by collisions with vehicles on roads to and from the Project. Species with higher likelihood of impact include those with limited mobility and fossorial (burrowing) species.

Construction effects on terrestrial mammals would be of very short duration and limited to individual-level effects in the immediate area of impact. These individual-level effects would be unlikely to affect short- or long-term population growth rates in the Project vicinity. Displacement from adjacent and nearby habitats would be a short-term impact for most

individuals, with animals returning to similar use and movement patterns once construction and revegetation is complete. Given the existing fragmentation associated with Highway 324, the additive effects of an adjacent transmission corridor would likely be very limited.

Small mammals may face higher risk of predation from raptors and corvids due to increased perch availability on the new transmission lines. This would in turn increase pressures on small mammal populations across any occupied grassland, shrubland, or wetland habitat.

Given appropriate implementation of protection measures, the Project should have only minor, temporary effects on local terrestrial mammal populations and their associated habitats.

3.5.3. Proposed Studies

No additional studies are proposed for botanical or wildlife resources.

3.6. Cultural Resources

3.6.1. Existing Conditions

This section describes the historical cultural conditions in the vicinity of the proposed Clark Canyon Dam hydroelectric Project.

3.6.1.1. Background

During the ethnographic period (Pre-European contact), the Clark Canyon watershed was occupied seasonally by the Lemhi-Shoshone Tribes. Lewis and Clark were the first Euro-Americans to pass through the Beaverhead Valley. On August 13, 1805, the Lewis and Clark expedition made their first contact with Sacagawea's Shoshone Tribe at a location that is currently inundated by Clark Canyon Reservoir. The location was named "Camp Fortunate" due to the hospitality of the tribe and their willingness to trade for horses, a necessity for crossing the Rocky Mountains. Their expedition crossed the Continental Divide at Lemhi Pass on August 12, 1805. Approximately 208 ac in the vicinity of Lemhi Pass are designated as a registered historic landmark by the U.S. Department of the Interior.

In 1862, gold was discovered near the town of Bannack, Montana and caused the first wave of rapid Euro-American settlement in the area. At the height of the area's gold rush, Bannack had a population of over 3,000 and was the first Montana territorial capital. The period was short lived though and old mining camps and ghost towns are all that remain.

In 1877, approximately 750 Nez Perce Native Americans fled north out of Idaho due to the demands of the United States Army that they move onto a reservation. On August 9, 1877, the United States Army attacked the Nez Perce along the north fork of the Big Hole River. The Battle of Big Hole lasted less than 36 hours, but with significant casualties on both sides. In 1992, legislation incorporated Big Hole National Battlefield with Nez Perce National Historical Park.

The city of Dillon originated during the construction of the Utah and Northern Railroad. The city was the site of a construction camp during the winter of 1880. The railroad was pushing north towards Butte, but winter conditions halted any progress until the spring of 1881. When construction resumed in the spring, the town remained. The city was named in honor of the president of the Union Pacific Railroad, Sidney Dillon.

The remnants of the rail bed for the "Gilmore and Pittsburgh Railroad," course along the west end of the cultural resources study area. The railroad was built in 1909-1910, as collaboration between four businessmen with mining interests on the Idaho side of Bannock Pass, and the Northern Pacific Railroad Company, which financed its construction. The route was from the town of Armstead (now inundated by Clark Canyon Reservoir) and Salmon, Idaho. The NP assumed control of the railroad in 1913. The railroad never proved profitable and it was officially abandoned in 1940 and the rails were removed for salvage. The rail bed was adopted for use as the bed of State Secondary Route 324 in places. Remnants of the rail bed and small trash scatters associated with the railroad are anticipated in the vicinity.

A second railroad, the Utah and Northern branch of the Union Pacific, later known as the Oregon Short Line lies within the Project area. This north-south line intersected the Gilmore and Pittsburgh Railroad at Armstead. The remnants of the Utah and Northern rail bed continue below the Clark Canyon Dam and are crossed there by the proposed transmission line. The Union Pacific Company controlled the first railroad into Montana, a 390-mi long, narrow gauge branch known as the Utah and Northern. Construction of the 144.45 mi of this line in Montana started in 1877 and reached Silver Bow in 1880. A 57-mi long extension built in 1881 connecting the Utah and Northern with the Northern Pacific. The line was expanded to a full sized gauge in 1887. In 1889 the Utah and Northern line was merged with the Oregon Short Line Railroad Company. The alignment of this section of the railroad was changed to accommodate the new reservoir in the 1960s.

Clark Canyon Dam was constructed from 1961 to 1964 for flood control and irrigation. The town of Armstead, a railroad stop on both the Oregon Short Line and the Gilmore and Pittsburgh railroads, was inundated by the reservoir. Two historic “beaver slide” hay stackers are recorded near the west end of the cultural resources study area. Cattle ranching began here in the early 1880s and continues to this day.

3.6.1.2. Cultural Resources

An archaeological survey of the applicant’s cultural resources inventory area identified one prehistoric artifact, a single chert flake. As an isolated find, this artifact does not meet the criteria for listing on the National Register. One additional prehistoric cultural find was located within the transmission line corridor, and has an undetermined National Register status (Attachment H of Symbiotics [2012a]).

The Project area contains only a single structure that was considered for its eligibility to the National Register. Clark Canyon Dam is an earthen dam constructed in 1964 by BOR. This structure meets the 50-year age requirement, and therefore may be eligible for listing on the National Register.

There are four cultural properties intersected by the proposed transmission line corridor, only one of which is eligible for inclusion in the National Register.

3.6.2. Potential Project Effects to Cultural Resource Conditions

The proposed Project will be run-of-river, with minimal construction activities taking place in areas that have not already been disturbed. The 8-mi transmission line would be constructed in an 80-ft ROW from the north side of Clark Canyon Dam along highway 324.

Since the single prehistoric artifact that was located in the cultural resources work near the Dam does not meet the criteria for listing on the National Register of Historic Places, no impacts to archaeological resources are anticipated. Additionally, a single prehistoric property that also does not meet National Register listing criteria was located during the cultural resources study for the transmission line, but was also determined to not be impacted by construction of the Project (Attachment H of Symbiotics [2012a]).

A total of four historic properties were noted during cultural resources studies, Clark Canyon Dam and three properties in the vicinity of the transmission line corridor. Of the three properties found in the vicinity of the transmission line corridor, only one has the potential to be eligible for listing on the National Register. At this site, the nature of the proposed undertaking is such that there would be no physical impact to this property (Attachment H of Symbiotics [2012a]).

Clark Canyon Dam is an earthen dam constructed in 1964 by BOR. This structure currently meets the 50-year age requirement for listing on the National Register, and may qualify for eligibility. The Applicant will prepare a Historic Properties Management Plan for this structure utilizing the Advisory Council on Historic Preservation's guidance as well as FERC's Guidance for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects (FERC 2002) in consultation with the State Historic Preservation Office (SHPO) and BOR. The plan will include (1) a description of the subject property, indicating whether it is listed on or eligible to be listed on the National Register of Historic Places; (2) a description of the potential effect on the subject property; (3) proposed measures for avoiding or mitigating effects; (4) documentation of the nature and extent of consultation; and (5) a schedule for mitigating effects and conducting additional studies. The Historic Properties Management Plan will be filed with FERC for approval.

None of the tribes, including the Shoshone-Bannock, Eastern Shoshone, Nez Perce, and Salish-Kootenai, identified any Traditional or Cultural Properties (TCPs) that would be affected by the Project (FERC 2009).

If any previously unidentified cultural materials are found during construction, work will be stopped immediately. Montana SHPO will then be consulted, and an action plan for resource protection will be prepared and filed before work is resumed.

3.6.3. *Proposed Studies*

No additional cultural resources studies are proposed.

3.7. Recreational Resources

3.7.1. Existing Conditions

This section describes the recreational resource conditions in the Project vicinity.

Recreational opportunities on Clark Canyon Reservoir and the Beaverhead River south of Dillon are managed by the BOR. Recreational opportunities at the reservoir include boating, cultural/historic sites, camping, angling (including ice fishing), hiking, hunting, picnicking, photography, water sports, and wildlife viewing. The reservoir, at full pool, has 4,935 surface acres and 17 mi of shoreline offering good fishing for rainbow and brown trout (BOR 2015a). BOR's Clark Canyon Reservoir also has an additional 4,388 ac, 150 ac of which is developed for public use (BOR 2015b). There are several concrete boat ramps, picnic shelters, and a marina, along with nine campground sites including one for RVs-only for a total of 96 campsites. Combined annual recreation use at Clark Canyon Reservoir and BOR's nearby Barretts Diversion Dam is 57,000 visitors (BOR 2004).

The most popular species of game fish in the reservoir is rainbow trout, as it is regularly stocked with a fast growing strain of rainbow trout that grows very large. Brown trout and burbot can also be caught in the reservoir (Big Sky Fishing 2015; BOR 2015a). Other game fish in the reservoir include brown trout, common carp, and burbot (MFWP 2015b). Estimated angler days on the reservoir was 37,709 in 2009 (MFWP 2015b).

Recreational opportunities on the Beaverhead River downstream of the dam are primarily related to angling. The tailwater fishery below the dam has been classified as a blue ribbon trout stream (BOR 2004). It is a popular trout fishing destination, producing more large trout, especially brown trout, than any other river in Montana (Big Sky Fishing 2015). Main game fish in the Beaverhead River are brown trout, rainbow trout, and mountain whitefish (MFWP 2015b). Additional game fishing species include burbot and common carp (BOR 2004). In 2009, the river saw an estimated 38,706 angler days (MFWP 2015b). Due to heavy use, rules were first adopted in 1999 and amended in 2010 that restrict float fishing outfitting and non-resident float fishing on certain days of the week in popular sections of the river between the third Saturday in May and Labor Day. The number of watercraft that may launch per day is also limited. In the reach below Clark Canyon Dam, each outfitter is limited to launching, or using within the reach, a maximum of three boats per day (MFWP 2015b). Currently, the bag limit for all trout combined is two with only one rainbow trout and only one trout over 18 in.

The cattail nature trail, located along the Beaverhead River immediately downstream of the reservoir, offers wildlife watching opportunities for seasonal waterfowl (BOR 2004).

3.7.1.1. Recreation Resource Management Objectives

The BOR is currently responsible for management of the recreational resources in the reservoir and the area immediately downstream of the dam (FERC 1988a). BOR manages these resources through its Draft Resource Management Plan: Clark Canyon Reservoir and Barretts Diversion

Dam (2004). Additionally, MFWP manages fishing in the State of Montana, and has most recently updated its Beaverhead and Big Hole River Recreation Rules in 2010 (MFWP 2010).

Drought conditions, at times, have affected recreation use in Clark Canyon Reservoir and the Beaverhead River. Both have been closed to fishing to protect native fishes during extended droughts during the driest parts of the water year, most recently in 2004 (MFWP 2004e).

The Applicant is keenly aware of the 2015 drought conditions throughout the region and will consult with the appropriate resource agencies with regards to any possible drought-related impacts which may arise as a result of the proposed hydroelectric Project's features.

3.7.2. Potential Project Effects to Recreation Resources

The proposed Project will be run-of-river with minimal construction disruption to recreational activities. Impacts to local recreation will be limited to noise from Project construction. Noise-related impacts have the potential to alter recreational experiences at the Clark Canyon Dam /Beaverhead River fishing access area, the High Bridge fishing access area and the Beaverhead Campground.

To minimize the effects of construction activities on nearby recreation users, the Applicant proposes to limit construction activities to the hours between 7:00 am and 8:00 pm daily. Additionally, no construction would occur within one day before and after the peak summer holiday weekends of Memorial Day, Independence Day, and Labor Day. A sign would be posted at Beaverhead River Campground, clearly providing the dates and hours of construction, the Applicant's contact information including a 24-hour telephone number, and contact information for the campground manager. The sign would be posted in a location suitable to the BOR.

Temporary disturbance to anglers and other recreationists could occur during construction in the Project area, due both to actual construction and associated movement of equipment. These impacts would be minimized to the extent possible by limiting the area of the construction site and by continuing to provide some degree of angler access to the river immediately below the site. Interference with floating anglers within the Project area should be fairly low since boating access is relatively limited immediately below Clark Canyon Dam. Most boaters apparently enter the river at High Bridges fishing access site, located about two miles downstream, where access is better.

The Buffalo Bridge Access Road is adjacent to the proposed Project. It is expected that construction of the Project will have little to no direct impact on the Buffalo Bridge Access Road. It is likely Project quality monitoring staff will periodically use this access. However, it is anticipated that most Project equipment and traffic will access the Project location from the I-15 southbound off ramp directly onto BOR property. Regular use of the Buffalo Bridge Access Road by Project vehicles is not expected. Disturbances to normal public use of the Buffalo Bridge Access Road will include increased vehicular and construction equipment traffic in the area near the Buffalo Bridge Access Road. Flagging, traffic control devices, and construction access along the I-15 Highway and access ramps are anticipated. The Applicant will develop a Buffalo Bridge Fishing Access Road Management Plan in order to alert the public of potential

traffic hazards along the road leading to the fishing access site. The plan will include, but not be limited to:

- Identification of contents of a public notice to alert the public of potential traffic hazards,
- Locations for posting the public notice,
- The number, types, and locations of any barriers to be installed,
- A process to evaluate the effectiveness of the plan and to implement modifications if necessary, including, but not limited to rerouting construction vehicle traffic, and
- An implementation schedule.

The Applicant proposes to include an interpretive sign at the Clark Canyon Dam Fishing Access site. The sign would provide information to visitors about the concept and function of the Project, and how it affects sport fisheries, including measures taken to reduce or eliminate adverse effects. The Applicant would own the sign and have the responsibility to inspect and maintain it throughout the term of the license.

No operations-related impacts to recreational resources in the Project area are expected.

3.7.3. Proposed Studies

No additional recreational studies are proposed.

3.8. Land Use and Visual Resources

3.8.1. Existing Conditions

Existing conditions for land use and visual resources are discussed in the following section.

3.8.1.1. Land Use

Beaverhead County is the largest county in Montana, covering over 3.5 million acres of southwestern Montana. A total of 70 percent of the county's lands are public: about 59 percent federally administered and the remainder administered by the state. Federal lands in the County are shown in Table 3.8-1 below (Beaverhead County 2012). Montana state agencies include the Fish, Wildlife and Parks, the Department of Natural Resources and Conservation and Montana State Lands.

Publicly owned lands and resources at Clark Canyon Reservoir are administered through a coordinated effort of management responsibilities. The BOR is responsible for the primary jurisdiction and resource management of lands within the Clark Canyon Reservoir and Barretts Diversion Dam area. The MFWP is charged with management responsibilities of fish and wildlife resources at the reservoir including the supervision of fisheries regulations and the fish stocking program. The Beaverhead County Weed District is contracted by the BOR for noxious weed control. The East Bench Irrigation District, with oversight from the BOR, is responsible for management of the reservoir's water operations and the Clark Canyon Dam. The Clark Canyon Reservoir has a surface area of 4,935 ac and 17 mi of shoreline when full.

Proposed power generation facilities would be located on BOR lands. The proposed transmission line would cross BOR, Montana state land and run adjacent to private lands within the Beaverhead County Highway 324 ROW.

TABLE 3.8-1. FEDERAL LANDS IN BEAVERHEAD COUNTY

Agency	Percent of County
Forest Service	38.4
BLM	18.8
Park Service	0.0
Other	1.7
Total	58.9

Source: Beaverhead County 2012

3.8.1.2. Visual Resources

The Clark Canyon Dam and Reservoir presents a relatively natural appearance in a broad, open valley of rolling landscape, with low vegetation cover of grasses, shrubs with a few patches of taller, thicker vegetation. It is a dominant landscape feature that is quite visible to motorists traveling on Interstate Highway 15 and is very visible from adjacent lands. Dominant features

include the dam structure, Armstead Island, and a small number of recreation facilities. Wildlife viewing areas include a developed bird watching trail, as well as the delta areas near the mouths of Horse Prairie Creek and Red Rock River.

A short section of the Beaverhead River downstream of the dam, between the I-15 bridge at Pipe Organ Rock and exit 51 (Dalys exit), has been evaluated for eligibility as a “Recreation” classification of the Wild and Scenic River Act, as it is considered “outstandingly remarkable” for recreation, fish and historic values. However, this section of the river is not within the Project area or BOR jurisdiction.

3.8.2. *Potential Project Effects to Land Use and Visual Resources*

3.8.2.1. Land Use

Construction of the hydroelectric facility below Clark Canyon Dam and Reservoir and the associated transmission line will have no adverse impacts on the current land use plans and policies in Beaverhead County. Key issues and concerns that may arise from development are:

- Modifications to the existing dam to accommodate a hydroelectric facility.
- Location of the hydroelectric facility and transmission line corridor near developed recreation areas. Potential impacts to recreation are discussed in Section 3.7.2.

3.8.2.2. Visual Resources

Project construction activities would be visible from I-15, Highway 324, and other sites near the dam. Once construction is complete, the permanent presence of above- ground facilities, including the powerhouse, transformer, parking area, and transmission line would alter the current visual environment.

The facilities associated with the Project will be completed in a manner to minimize effects to land use and visual resources. The character of the visual resources in the Project area will be affected from the excavation and placement of material taken from construction activities associated with the power plant and valve house, access roads, transmission line, substations, maintenance structures, borrow and spoils areas as currently proposed and/or to be modified in future designs.

The Applicant would implement its Visual Resource Management Plan to ensure that Project design incorporates the use of color, form, grading, and revegetation to minimize the Project’s long-term visual contrast with the existing environment. The Project’s Visual Resource Management Plan will include measures to restrict or prevent views of Project features and related facilities from established recreation areas and roadways. When this is not possible, visual contrast will be reduced by blending the site or facility with existing natural visual patterns. By incorporating the architectural theme, form, color, and texture with visual design principles of order and simplicity, the Project will appear well crafted, and subordinate to the natural landscape. Since future actions by other parties may expose Project facilities to view, the Applicant will guide the development of visual considerations for portions of the Project on which concepts from the Visual Resource Management Plan have been successfully employed.

As part of the Visual Resource Management Plan, the Applicant proposes to address short-term impacts by limiting disturbance or displacement of vegetation to the extent possible.

Additionally, a Revegetation Plan will be developed and implemented in order to ensure that temporarily disturbed areas are revegetated and prevent encroachment of invasive weeds to disturbed areas. To reduce long-term effects, the Applicant proposes to consult with BOR on the design of Project features, including color and construction materials. The Applicant will also consult relevant comprehensive management plans to ensure that all new features of the proposed Project meet established visual quality objectives. These include:

- Prevention of adverse visual impacts, whenever possible, by means of preconstruction planning and design, particularly in the selection of facility locations;
- Reduction of adverse visual impacts that cannot be completely prevented, by designing features with appearances consistent with existing structures;
- Reduction of adverse visual impacts to existing vegetation during construction by means of post-construction vegetation rehabilitation; and
- Quality control during construction, operation, and construction rehabilitation to ensure that the preceding objectives are achieved.

Prior to construction, the Applicant will file a pre-construction visual impact assessment of the Project area. That assessment would include photographs taken from three proposed key observation points: the parking area at the Clark Canyon dam/Beaverhead River fishing access area; Highway 324 immediately above the power house; and the secondary access point on I-15 north of Clark Canyon Dam. The Visual Resources Management Plan will also include the filing of post-construction photographic assessments annually for the first three years of Project operation. The Applicant will consult with BOR during the design phase to identify appropriate colors for structures on Reclamation lands and to identify appropriate vegetation mixes for disturbed areas of the Project.

3.8.3. *Proposed Studies*

No additional studies are proposed for land use and visual resources.

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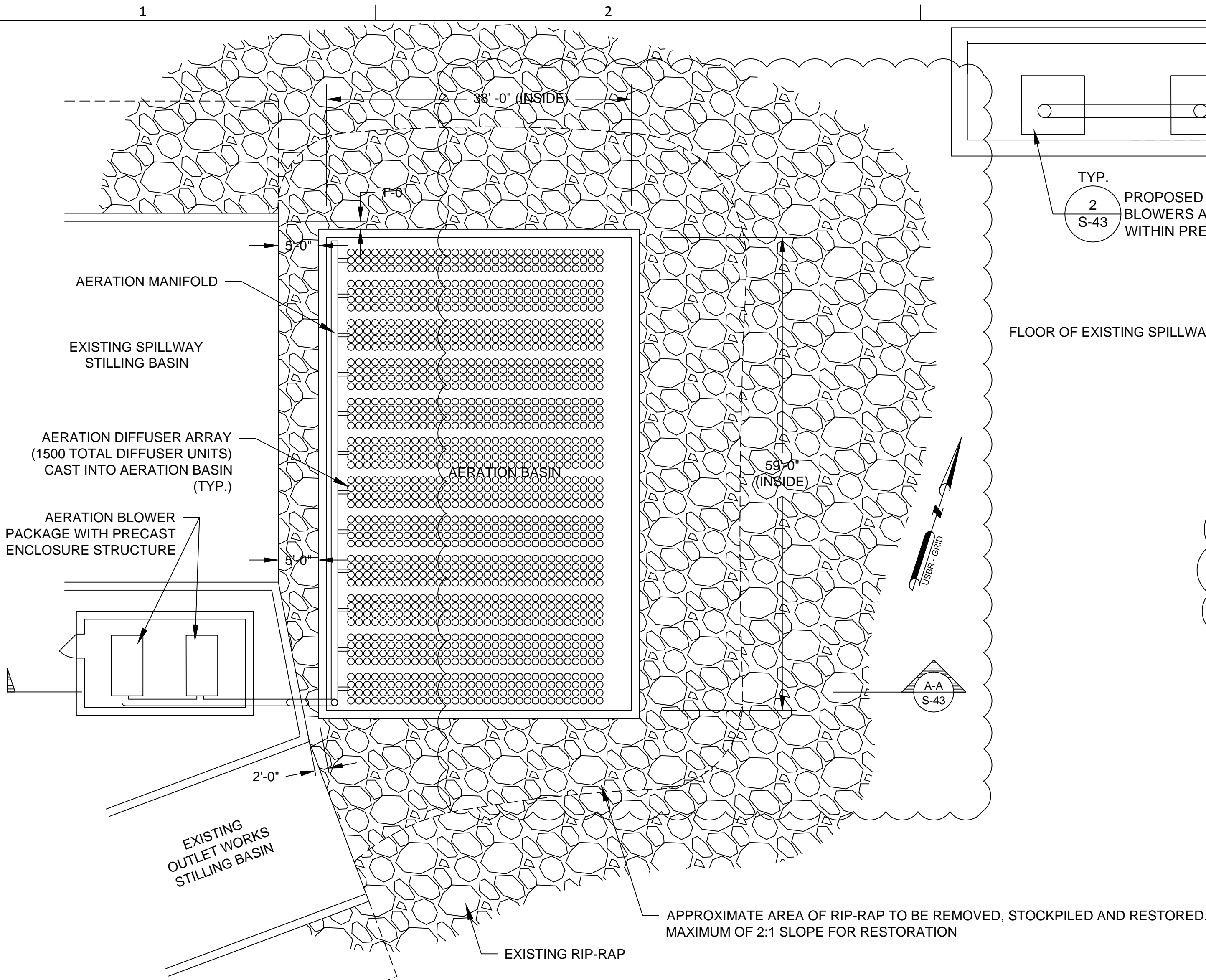
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APPENDIX A

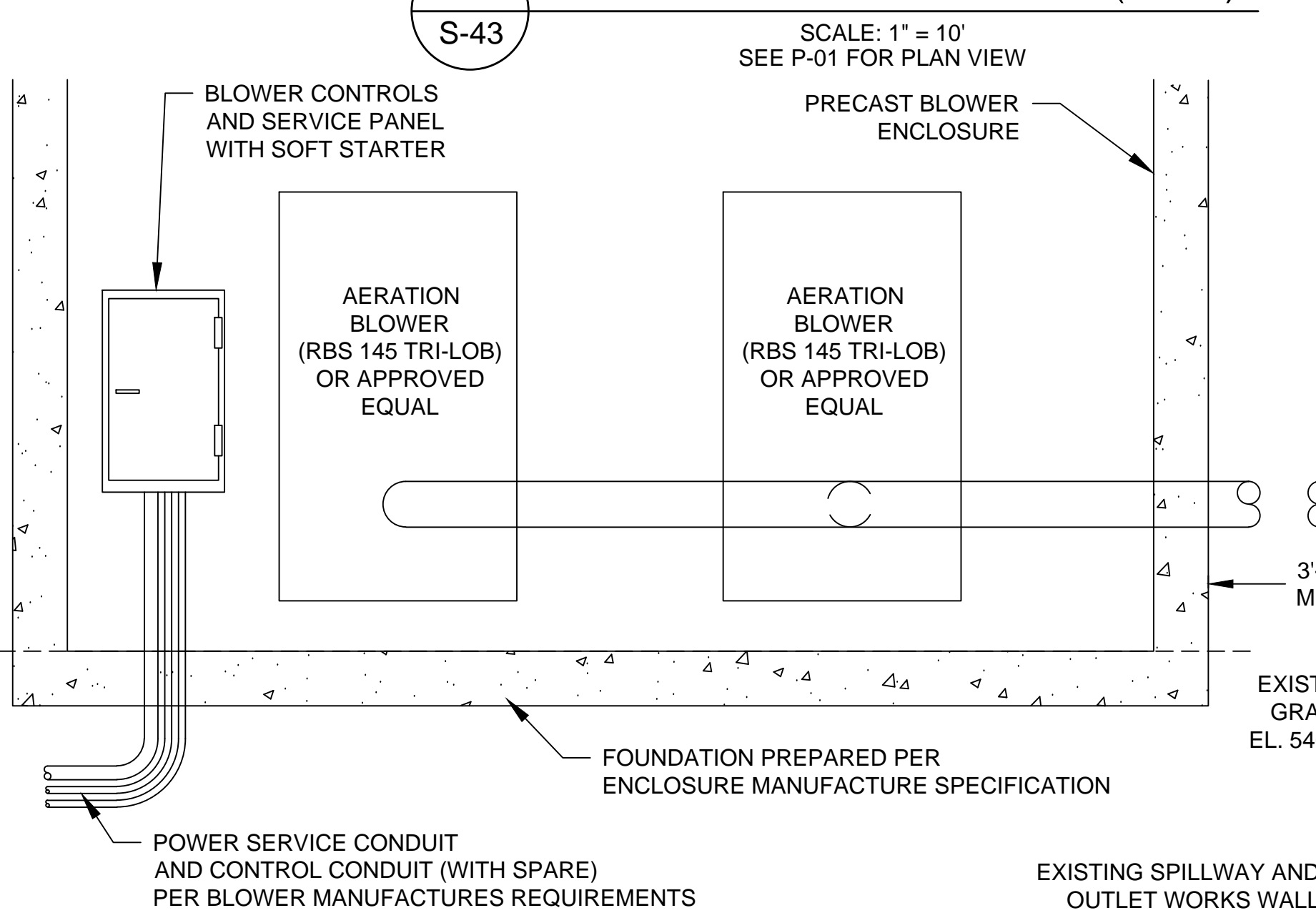
Aeration Drawings

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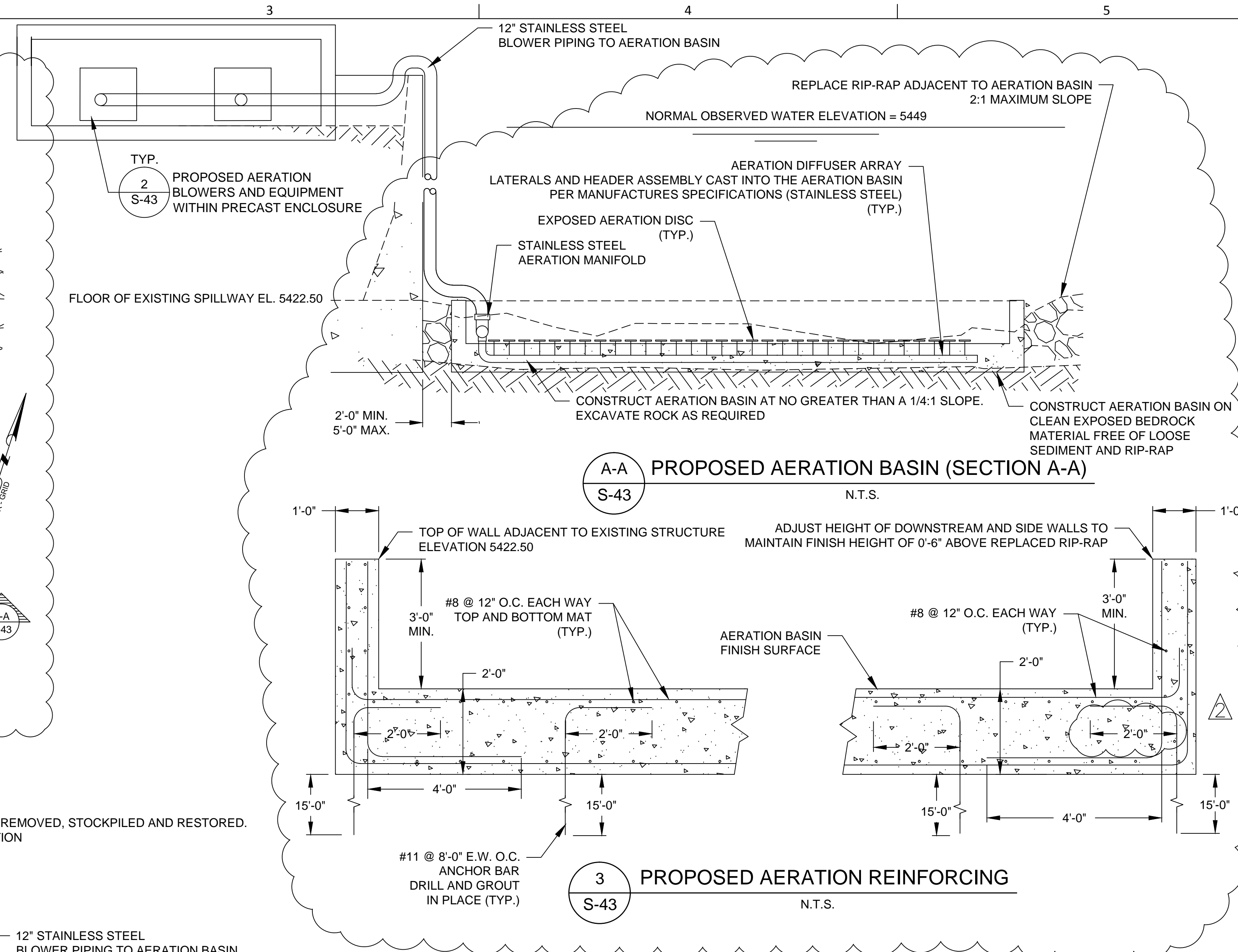
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PROPOSED AERATION BASIN (PLAN)



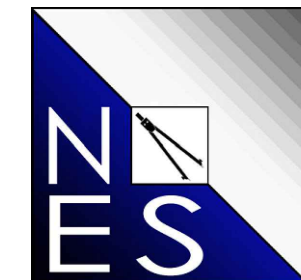
PROPOSED AERATION BLOWER PACKAGE DETAIL



AERATION BASIN ISOMETRIC

AERATION DIFFUSER DETAIL

DEVELOPER
CLARK CANYON
HYDRO LLC.



1680 WOODRUFF PARK
IDAHO FALLS, IDAHO 83401
(208) 932-2720 (PHONE)

QT	6/29/15
DRAWN BY	DATE
DB	6/29/15
REVIEWED BY	DATE
DS	6/29/15
TECHNICAL APPROVAL	DATE

SAFETY

ALWAYS THINK

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PICK-SLOAN MISSOURI BASIN PROGRAM
EAST BENCH UNIT, 12429
CLARK CANYON DAM
HYDRO ELECTRIC PROJECT
FERC. NO. 12429

NORTHWEST ENGINEERING SERVICES PC.

ACCEPTED:

AERATION BASIN AND
EQUIPMENT DETAIL

S-43
699-D-633
SHEET 6 OF 13

APPENDIX B

Oxygen Supplementation Calculations

EDI FLEXAIR® 9" Disc Diffuser
Oxygen Transfer Efficiency Data
Montana Spillway



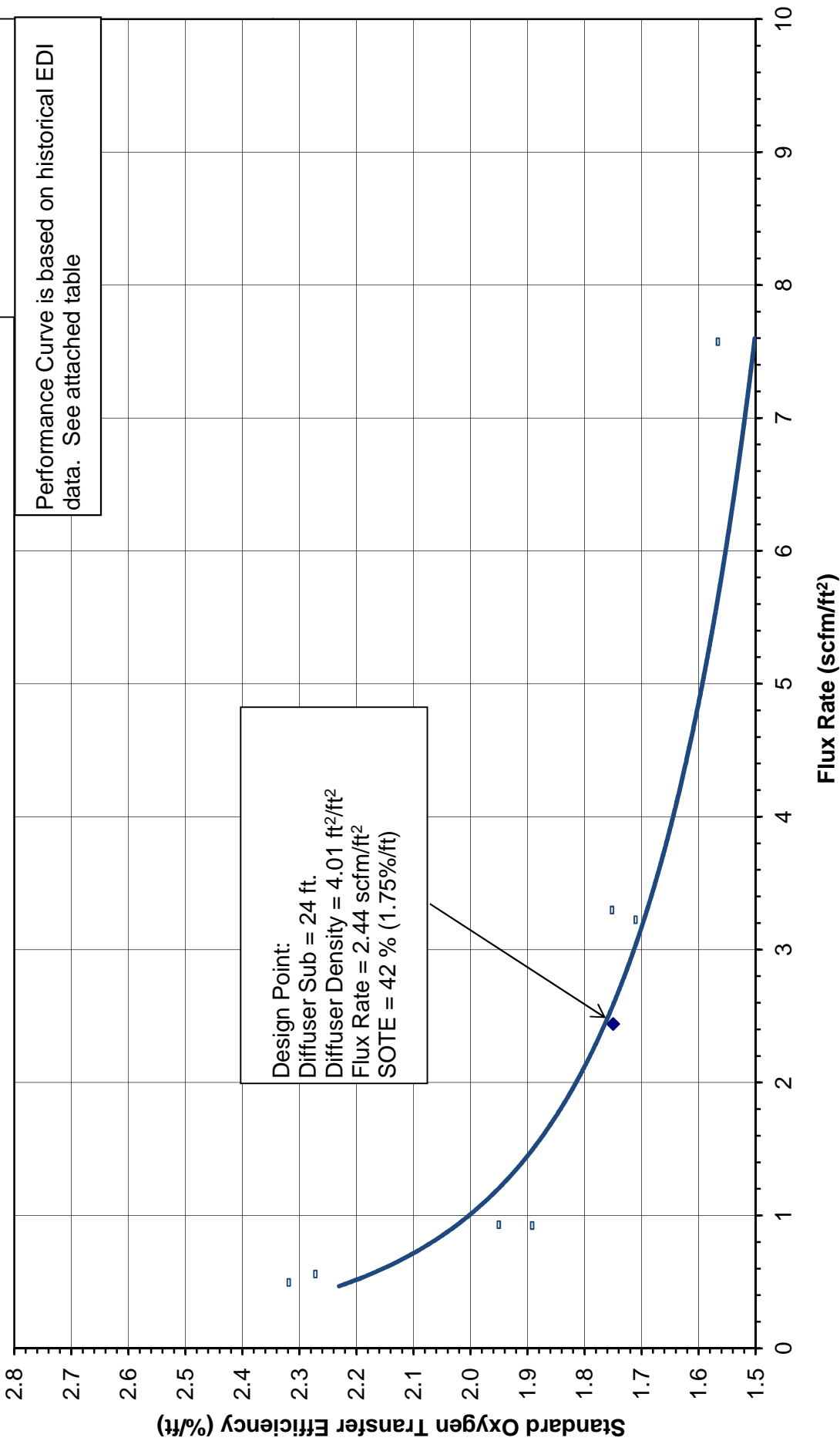
Test #	Flux Rate (scfm/ft ²)	AT/AD (ft ² /ft ²)	Sub. Depth (ft.)	Water Temp (°C)	TDS (mg/L)	SOTE (%)	SOTE (%/ft.)
4250	7.55	4.21	25.0	21.3	689	39.16	1.57
4251	7.60	4.21	25.0	21.5	972	35.85	1.43
4252	3.27	4.21	25.0	21.7	1185	43.80	1.75
4253	3.20	4.21	25.0	21.8	1397	42.77	1.71
4254	0.90	4.21	25.0	22.1	1553	47.30	1.89
4255	0.90	4.21	25.0	22.2	1708	48.77	1.95
4256	0.47	4.21	25.0	22.5	1843	57.98	2.32
4257	0.53	4.21	25.0	22.7	1978	56.80	2.27

* SOTE is presented in standard conditions (20°C, 1 atm) and normalized to 1000 TDS

▬ Sub=25ft, AT/AD=4.2

◆ Design Point

**EDI FLEXAIR® 9-inch Disc Diffuser
Oxygen Transfer Efficiency Curve
Montana Spillway**



Environmental Dynamics International
5601 Paris Road
Columbia, Missouri 65202
573-474-9456

r0.4

EDI FlexAir™ Aeration System for Effluent Post Aeration

Project: Montana spill way

Consulting Engineer: Jake Wilder
Civil Science

Date: 3-Oct-11

Design Assumptions

Design Peak Flow	452	mgd
Influent DO Concentration	0.5	mg/l
Effluent DO Concentration	8	mg/l
Site Elevation	5000	ft
Wastewater Temperature	10	°C
Reactor Volume	83916.2916	cf
Residence Time	2.000	min
Alpha Factor	0.85	
Beta Factor	0.95	
Depth Correction Factor	0.4	

Site Conditions

Operating Ambient Pressure	12.23	psia
Csmt	11.29	mg/l
C*	14.49	
C*20	11.66	mg/l

Design Calculations

Air Supply to FlexAir Diffuser 2.74247442 scfm
Active Area of Diffuser 59 in²

Water Depth 25 ft
Air Release Depth 24 ft
AT/AD (Area of Tank / Area of Diffuser) 4.01

KLa, field 0.42 1/min
KLA 0.49 1/min
KLA20 0.62 1/min
SOR 2279.03 lbs/hr

% Oxygen Transfer Efficiency, SOTE 39.0 %

Air Requirement 5597.4 scfm
No. Diffuser Units 2041 units
Volumetric Aeration Rate 67 scfm/kcf

Estimated Operating Pressure 11.90 psig
Air Release Depth 24 ft
HL (Blower thru Manifold) 1.5 ft
HL (Header) 0.5 ft
HL (Diffuser Assembly) 1.5 ft
Total 27.5 ft

APPENDIX C

Blower Specifications and Installation



SPECIFICATIONS FOR ELECTRIC BLOWER PACKAGES ROBOX EVOLUTION

1. COMPRESSOR

- Oil free atmospheric air positive displacement rotary blower.
- Three-lobed rotors with ground profile, statically and dynamically balanced, made in nodular cast iron GS 400-15 EN 1563
- Housing cast with integrated LOW PULSE device for damping pressure impulses, reinforced with ribbing to eliminate distortion caused by torsional loads and made in high strength grey cast iron G250 EN 1561
- Side-covers reinforced with ribbing to resist rotor shaft loads, made in high strength grey cast iron G 250 EN 1561.
- Shafts integrated with rotors made in nodular cast iron GS 400-15 EN 1563 or coupled to rotors by means of interference press fit and locking key, made in steel C40 EN 10083/1
- Roller bearings for a calculated operating life of 100,000 hours at the maximum design speed and pressure conditions
- Maximum peripheral speed of the lobe head below 40 m/s
- Hardened and ground involutes profile helical tooth timing gears, made in steel 16 Mn Cr 5, coupled to the shafts by means of hydraulic oil pressure onto 1 : 50 tapered cone, gears can be removed with hydraulic oil pressure.
- Wear free piston ring labyrinth seal on each shaft, without sliding parts and vent holes to limit the pressure inside the oil sumps
- Oil seal on each shaft, without sliding parts and wear free coupled with piston ring labyrinth seal to prevent oil vapour leaking.
- Oil seal on the drive shaft by means of lip seal ring in high strength rubber (VITON) and hardened and ground shaft protection sleeve to ensure extended working life
- Lubrication of all bearings (drive side and gear side) and of the timing gears by oil bath with oil splash disks locked onto the drive shaft

2. BASEFRAME

- Compact base frame supporting both the compressor and the electric motor, integrated with reactive outlet silencer and transmission belt tensioning device, made in high strength steel plate
- Anti-vibration mounts capable of withstanding compression and shear loads with vibration damping level > 80%
- Can be supplied with integrated soundproofed cabin (enclosure, hood)

3. INLET SILENCER

- Silencer consisting of a series of compartments based on the principle of sound wave interference, capable of being adjusted according to the rotation speed of the compressor for reducing sound energy emitted in the base frequency of the compressor itself (below 500 Hz), and a second absorption section for the reduction of the sound energy emitted at frequencies above 500 Hz.
- Maximum pressure drop DP = 10 mbar

4. INLET FILTER

- Inlet filter integrated in the inlet silencer.
- Filter element located downstream of the sound absorbing material of the inlet silencer, to prevent any contamination of the conveyed air and to protect the compressor.
- Efficiency of the filter element 93% for particles ≥ 10 micron
- Inspection hatch for easy replacement of the filter element.
- Maximum pressure drop with new filter element DP = 5 mbar
- Maximum pressure drop with clogged filter element DP = 25 mbar

5. DISCHARGE SILENCER

- Discharge silencer consisting of diffusion and resonance sections provides a wide range of frequent and sound pressure reduction without sound absorbing material in order to avoid contaminating the plant downstream to the compressor package.
- Silencer integrated with the base frame supporting both the compressor and the electric motor.
- Maximum pressure drop 30 mbar

6. CHECK VALVE

- Check valve on the outlet silencer to prevent the reverse rotation of the compressor when motor stopped.
- Rubber **Flapper made** with steel reinforced central core without articulation hinge provides a positive wear resistant and maintenance free seal.
- High strength rubber for maximum operating temperature $T_2 = 150^{\circ}\text{C}$

7A. SAFETY VALVE

- Direct acting spring loaded safety valve fitted on the outlet of the discharge silencer before the non return valve in order to limit the differential pressure on the compressor.
- Metal to metal seat seal surfaces (maintenance free)
- Maximum settable pressure 1000 mbar
- Maximum operating temperature 150°C

7B. STARTING/SAFETY VALVE (optional)

- Starting valve to fully unload the air flow capacity of the compressor during the electric motor starting phase allows low absorbed current start-up, located on the outlet of the discharge silencer before the non return valve (instead of the valve as per section 7A)
- Fully automatic operation, no external power supply required.
- Closing time adjustable from 2 to 15 seconds.
- Seat seal in high strength rubber for maximum operating temperatures of 150°C .
- Pilot valve for operation as safety valve
- Maximum settable pressure 1000 mbar
- Fine tuning of the maximum overpressure on opening at full capacity (tolerance 30 mbar)

8. PIPING

- The compressor and silencers are directly connected to each other with flanges, without connecting pipes so as to reduce overall dimensions and pressure losses.
- The valves are directly fitted onto the compact base frame which also works as discharge silencer with dedicated brackets, without connection pipes in order to reduce bulk and loss of pressure.
- Connection to the system pipes by means of flexible connectors fitted at the outlet nozzle of the discharge silencer to compensate the pipes thermal expansion and to reduce the vibration transmission.
- Flexible rubber reinforced connector with fabric inserts is suitable for operation up to 2 bar and temperatures up to 150°C , held in position with pipe clamp straps.



9. ELECTRIC MOTOR

- Asynchronous three-phase electric motor with squirrel cage rotor constructed in compliance with NEMA standards.
- High efficiency motor suitable for operation with 480 V +/- 10% and 60 Hz +/- 2% supply.
- Minimum protection grade IP 54
- Cooling system TEFC casing cooled with external fan on the shaft.
- Assembly arrangements IM B 3 (with terminal box at the top)
- Insulation class F
- Over-temperature class B
- Minimum service factor 1.15
- Drive side bearing to support the radial load induced by the V-belt transmission.

10 V-BELT TRANSMISSION

- V-belts with (V) cross sections
- Service factor > 1.4 on fitted power
- Belt tensioning device based on the motor weight with automatic compensation for the belt stretching and maintenance free.

11 SOUNDPROOF HOOD (ENCLOSURE, CABIN)

- Hood made up of modular self-supporting panels in galvanized plate type Z200 EN 10142 suitable for outdoor installation.
- Sound-absorbing material consisting of open cell polyurethane foam thickness 50 mm with profiled finish, fire resistant according to ISO 3795 (MVSS TN 302)
- Perimeter panels supported directly on the ground and detached from the structure of the blower package to eliminate the transmission of vibrations (noise) from the package to the panels.
- Seal between panels by means of special rubber joints to ensure airtight closure in order to allow outdoor installation.
- Additional hood ventilation provide by auxiliary fan motor, 3 phase 60 Hz, ensuring the extraction of hot air from inside the hood independently of the rotation speed of the compressor and even after the compressor stops.
- Hood air inlet and outlet ducts silenced with a lined single-chamber plenum and lined bends
- Access for routine maintenance operations from the front side of the hood.
- Compressor discharge pipe on opposite side to the front.
- Hoods can be arranged side by side or against a wall, minimum distance required 4 inches to reduce compressor room area

12A. INSTRUMENTS (STANDARD EQUIPMENT)

- Pressure gauge for measuring the outlet pressure, diameter **63 mm (21/2")**, in glycerine bath, precision class 1.6, dial with scale **0 - 1.6 bar (0 - 23.5 psig)** relative.
- Vacuum gauge for measuring the filter clogging, diameter **63 mm (21/2")**, precision class 1.6 dial with scale **0/ -60 mbar (0 - 28" Hg)** relative, divided into the following sectors:
 - **0 / - 35 mbar etc** white sector, normal operation
 - **-35 / - 45 mbar etc** yellow sector, filter clogged, replace the filter element
 - **-45 / - 60 mbar etc** red sector, stop the compressor and replace the filter element

12B. ELECTRONIC MONITORING SYSTEM (OPTIONAL)

- System of sensors, controlled by microprocessor and integrated with the electro-compressor package for monitoring and recording the following parameters every 15 minutes
 - Inlet and discharge pressure
 - Inlet and discharge temperature of the compressor and inside hood temperature
 - Oil temperature and level in the two sumps
 - Speed and direction of rotation of the compressor
- Alarm function to trigger remote signalling when the pre-alarm threshold is exceeded for any of the monitored parameters
- Stop function to stop the electro-compressor package when the critical threshold is exceeded for any of the monitored parameters
- Diagnostic display for viewing the operating parameters and to indicate the parameters that generated the alarms/stoppage
- Pushbutton panel for setting up the software and managing alarms
- EPROM memory for storing the settings and operating data

13. TECHNICAL DATA

Installation site

- Altitude _____ (**ft**)
- Atmospheric pressure _____ (**psi**)
- Maximum temperature _____ (**°F**)
- Relative humidity _____ (%)

Design parameters

- Inlet capacity _____ (**icfm**) Mass capacity _____ (**scfm**)
- Discharge pressure _____ (**psig**)
- Absorbed power _____ (**HP**) SPL _____ (**dB(A)**)
- Fitted power _____ (**HP**) Poles _____

Selecting the compressor

- Specific compressor selection software prepared and guaranteed by the constructor of the compressor
- Option to print out the performance curve of the compressor in the actual foreseen operating conditions
- Selection of the most suitable **NEMA** standard electric motor
- Calculation of the appropriate V-belt transmission

DP (PSI)	Poles rpm	6				4					
		900	1000	1100	1200	1300	1400	1500	1600	1700	1800
4	Q1 cfm	2347,6	2655,7	2963,9	3272,1	3580,2	3888,4	4196,6	4504,7	4812,9	5121,1
	DT °F	48	48	47	46	46	46	45	45	45	44
	Nsof HP	50,4	56,6	62,9	69,4	76,1	83,0	90,2	97,6	105,2	113,2
	Nmot HP	60	75	75	100	100	100	100	125	125	125
	Lp(A) sc	81	83	84	86	88	89	90	92	93	94
	Lp(A) cc	<70	<70	<70	<70	<70	<70	<70	<70	71	72
6	Q1 cfm	2251,8	2560,0	2868,2	3176,3	3484,5	3792,7	4100,8	4409,0	4717,2	5025,3
	DT °F	76	74	73	72	71	70	69	69	68	68
	Nsof HP	74,6	83,5	92,5	101,7	111,0	120,6	130,5	140,6	150,9	161,6
	Nmot HP	100	100	125	125	125	150	150	200	200	200
	Lp(A) sc	83	85	87	88	90	91	93	94	95	96
	Lp(A) cc	<70	<70	<70	<70	<70	<70	71	72	73	74
7	Q1 cfm	2210,0	2518,2	2826,4	3134,5	3442,7	3750,9	4059,0	4367,2	4675,4	4983,5
	DT °F	90	88	86	85	84	83	82	81	80	80
	Nsof HP	86,7	96,9	107,3	117,8	128,5	139,5	150,7	162,1	173,8	185,8
	Nmot HP	100	125	125	150	150	200	200	200	200	200
	Lp(A) sc	84	86	88	89	91	92	94	95	96	97
	Lp(A) cc	<70	<70	<70	<70	<70	70	72	73	74	75
8	Q1 cfm	2171,1	2479,3	2787,4	3095,6	3403,8	3712,0	4020,1	4328,3	4636,5	4944,6
	DT °F	105	102	100	98	97	95	94	93	93	92
	Nsof HP	98,8	110,4	122,0	133,9	146,0	158,3	170,8	183,6	196,7	210,0
	Nmot HP	125	125	150	150	200	200	200	200	250	250
	Lp(A) sc	85	87	88	90	92	93	95	96	97	98
	Lp(A) cc	<70	<70	<70	<70	<70	71	73	74	75	76
10	Q1 cfm	2100,0	2408,2	2716,3	3024,5	3332,7	3640,8	3949,0	4257,2	4565,4	4873,5
	DT °F	135	131	128	125	123	122	120	119	118	117
	Nsof HP	123,0	137,2	151,6	166,2	180,9	195,9	211,1	226,6	242,4	258,4
	Nmot HP	150	150	200	200	200	250	250	250	300	300
	Lp(A) sc	86	88	90	92	93	95	96	98	99	100
	Lp(A) cc	<70	<70	<70	<70	71	73	74	76	77	78
11	Q1 cfm	2067,1	2375,3	2683,5	2991,6	3299,8	3608,0	3916,1	4224,3	4532,5	4840,7
	DT °F	151	146	143	139	137	135	133	132	130	129
	Nsof HP	135,1	150,7	166,4	182,3	198,4	214,7	231,3	248,1	265,2	282,6
	Nmot HP	150	200	200	200	250	250	250	300	300	350
	Lp(A) sc	87	89	91	93	94	96	97	98	100	101
	Lp(A) cc	<70	<70	<70	71	72	74	75	76	78	79
13	Q1 cfm	2005,6	2313,8	2621,9	2930,1	3238,3	3546,4	3854,6	4162,8	4470,9	4779,1
	DT °F	184	178	172	168	165	162	160	158	156	155
	Nsof HP	159,3	177,6	196,0	214,6	233,4	252,4	271,6	291,1	310,9	331,0
	Nmot HP	200	200	250	250	300	300	300	350	350	400
	Lp(A) sc	89	91	93	94	96	97	99	100	101	102
	Lp(A) cc	<70	<70	71	72	74	75	77	78	79	80
15	Q1 cfm					3181,3	3489,5	3797,6	4105,8	4414,0	4722,2
	DT °F					194	190	187	185	183	181
	Nsof HP					268,3	290,0	312,0	334,2	356,6	379,4
	Nmot HP					300	350	350	400	400	400
	Lp(A) sc					97	99	100	101	103	104
	Lp(A) cc					75	77	78	79	81	82

Nsof : Blower absorbed power

Nmot : Recommended motor power

Lp(A) sc : Sound pressure level following ISO 3746 at 1 m, free field with soundproof piping and without soundproof hood

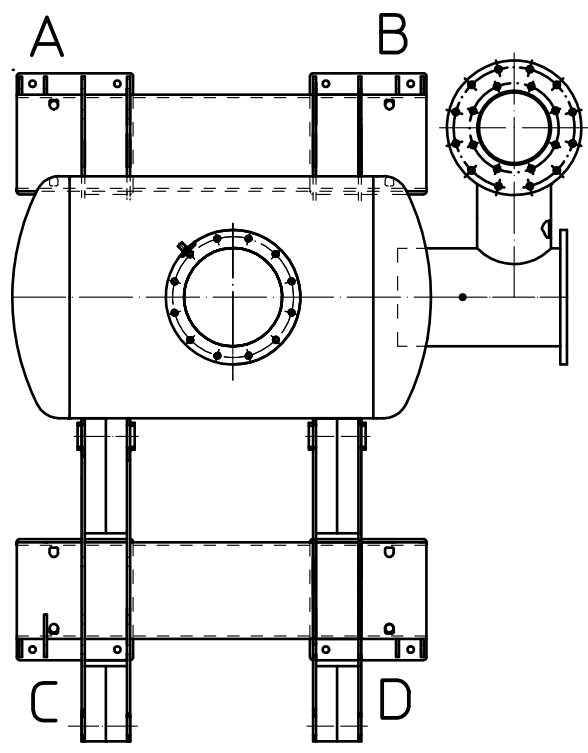
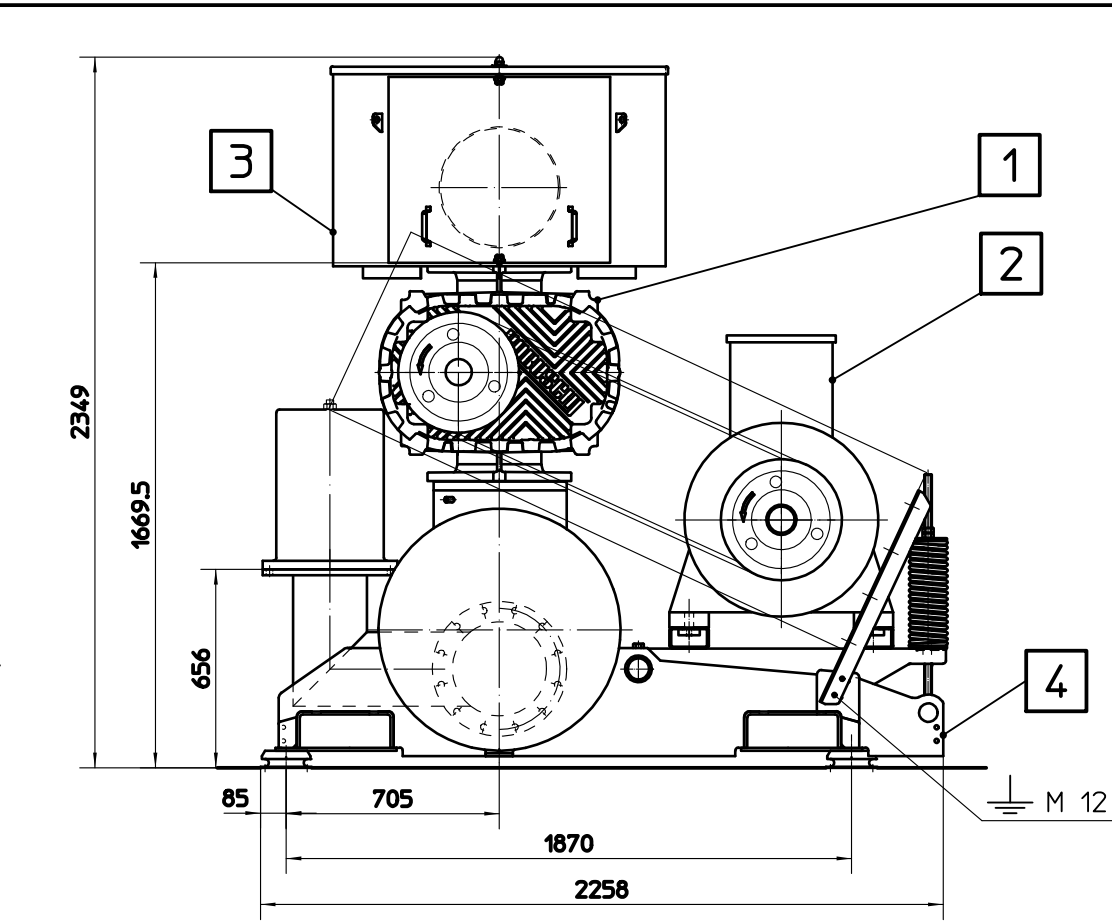
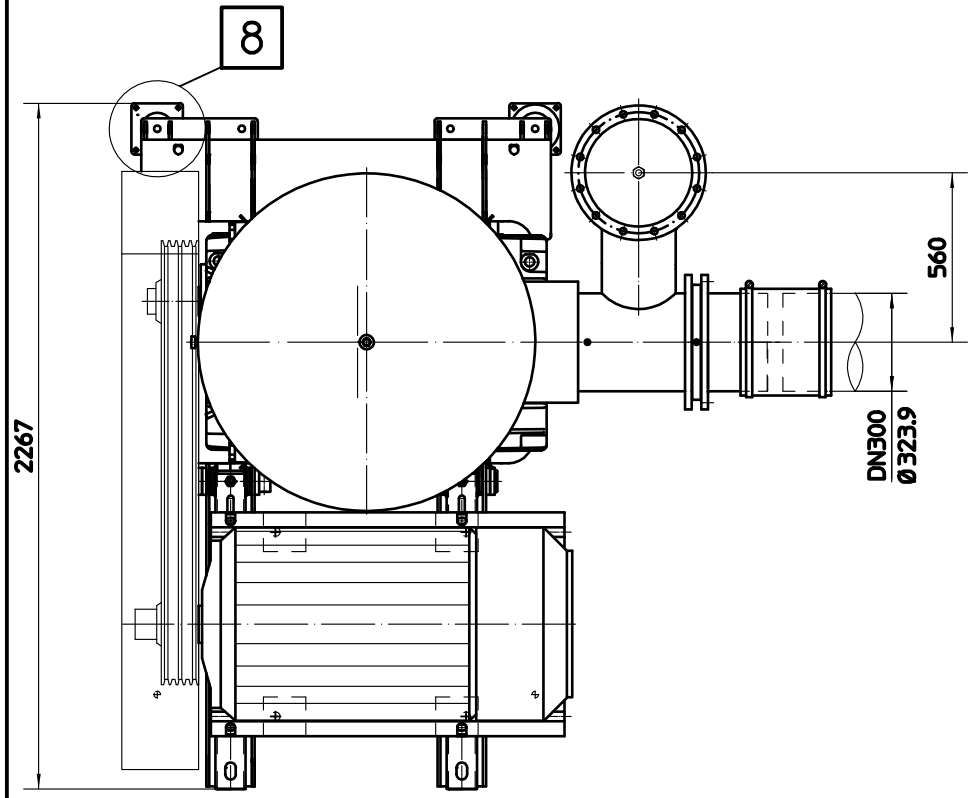
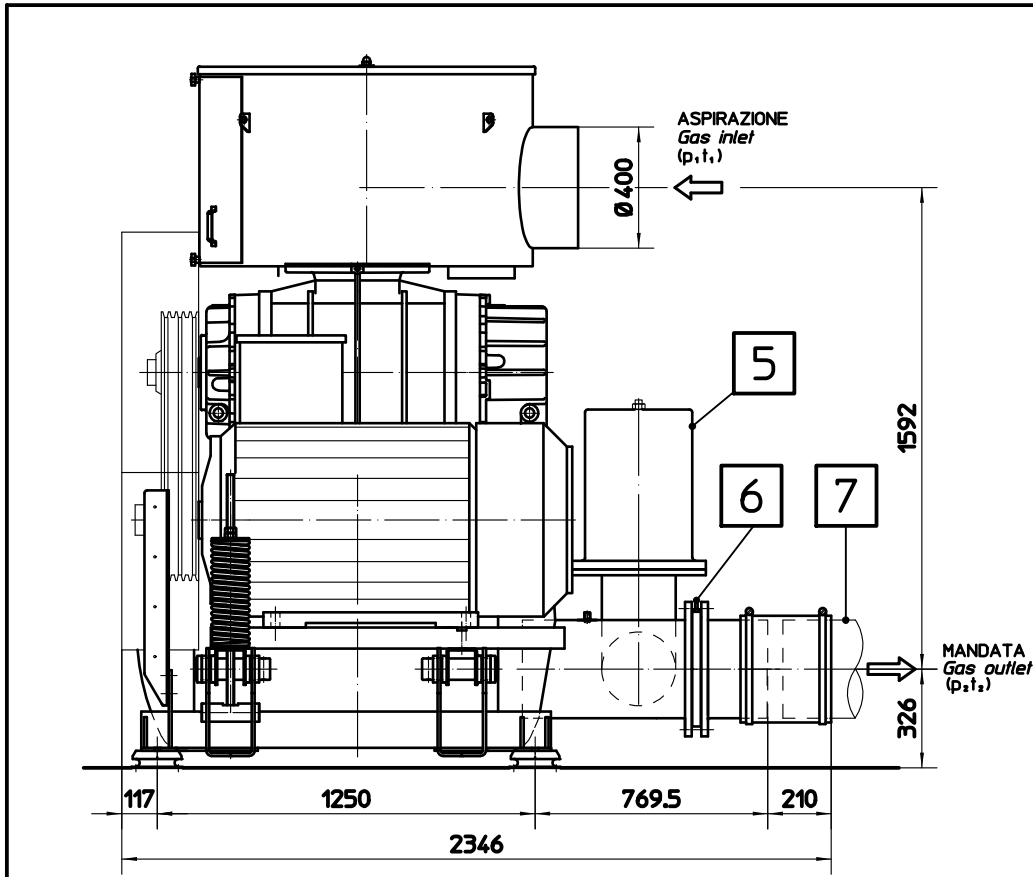
Lp(A) cc : Sound pressure level following ISO 3746 at 1 m, free field with soundproof piping and soundproof hood

Performances based on atmospheric air at standard conditions : Sea level 14.7 PSIA, 68°F Inlet Temperature, 36% Relative Humidity

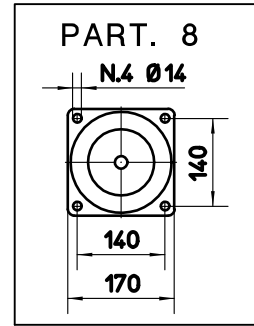
For performances with gases other than atmospheric air or at non-standard conditions contact your Authorized ROBUSCHI representative

Performance tolerances following the ROBUSCHI procedure TE1.S.0015

Sound pressure level tolerance +/- 2 dB(A)



Commissa : ---
Work order No. ---
Cliente : ---
Customer ---
Ordine : ---
Order ---
Impianto : ---
Plant ---
Localita' : ---
Place ---
Servizio : ---
Service ---
Specifica : ---
Data sheet ---
ITEM : ---



SOFFIATORE Blower		MOTORE ELETTRICO Electric motor		TRASMISSIONE V-belt drive		MASSA Weight	
Tipo : -		Costruttore : -		Puleggia soff. : Ø -		CARICHI STATICI Static loads	
Type		Manufacturer		Blower pulley		A + -	
Portata : -		Tipo : -		Puleggia motore : Ø -		B + -	
Capacity		IEC : -		Motor pulley		C + -	
Potenza : -		Potenza : -		Tipo cinghie : -		D + -	
Power		Power		V-Belt		CARICO DINAMICO Dynamic load	
Velocita' : -		Velocita' : -		Numero cinghie : -			
Speed		Speed					
p1 = -		Alimentazione elettrica - Electric supply : -					
[mbar]		- [V] - [A]					
t1 = -		Fasi : -					
[°C]		- [Hz]					
p2 = -							
[mbar]							
t2 = -							
[°C]							

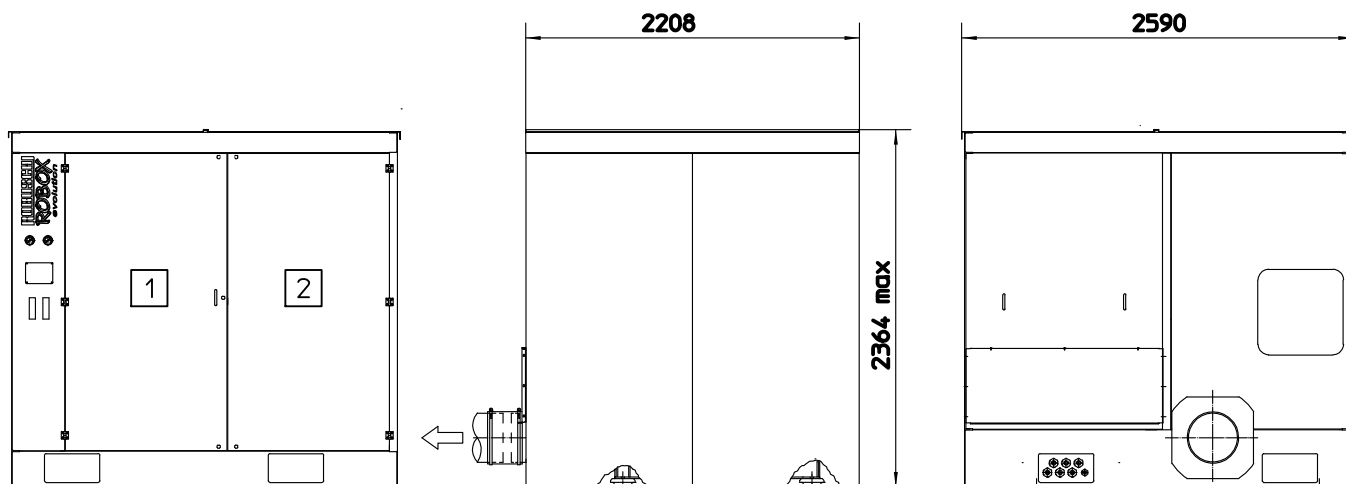
8	202838-0000	SOPPORTI ANTIVIBRANTI / Shock insulating feet	RA 1200 B/M20	4		
7	.	RACCORDO ELASTICO / Elastic connector	ER 300	1		
6	.	CORPO VALVOLA / Valve	VCR 300	1		
5	94A018000016	VALVOLA DI SICUREZZA / Safety valve	RVP 300	1		
4	325792-1093	SILENZIATORE BASE / Base silencer	BASCULA 300/5	1		
3	SP2799474065	SILENZIATORE FILTRO / Inlet silencer	SPF 300-5-ES	1		
2	.	MOTORE ELETTRICO / Electric motor		1		
1	.	SOFFIATORE / Blower	RBS 145/F	1		
Pas.	N° Disegno	Denominazione			N° pezzi	N° modello
8						Smussi
7						non quotati
6						
5						Rugosità
4						Ra in um
3						Sostituito da:
2						Data:
1						Sostituisce:
						Data:
Mod.N°	Descrizione modifiche			Data	Disegnato	Data
	Disegnato	Controllato	Approvato	Verif.Norme	Quote senza indicazione di tolleranza	
Data	27/04/2007		27/04/2007			
Firma						
A termini di legge ci riserviamo la proprietà di questo disegno della ROBUSCHI & C. spa. col divieto di riprodurlo o di renderlo noto a terzi o a ditte concorrenti senza la nostra autorizzazione					ROBOX 5	
					EL 145/5P	
ROBUSCHI®					Disegno	Foglio
N° 280486-0000						
					①	⑤
					②	⑥
					③	⑦
					④	⑧

ROBOX 5 evolution

ISTRUZIONI DI MONTAGGIO MOTORE ELETTRICO IN CABINA
INSTRUCTION FOR INSTALLATION OF ELECTIC MOTOR INSIDE ENCLOSURE

SCHEMA GENERALE

GENERAL LAY-OUT

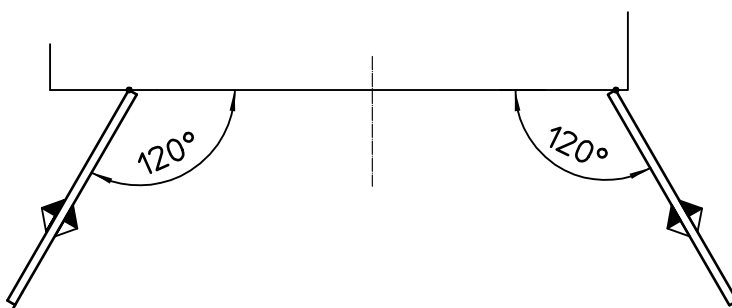
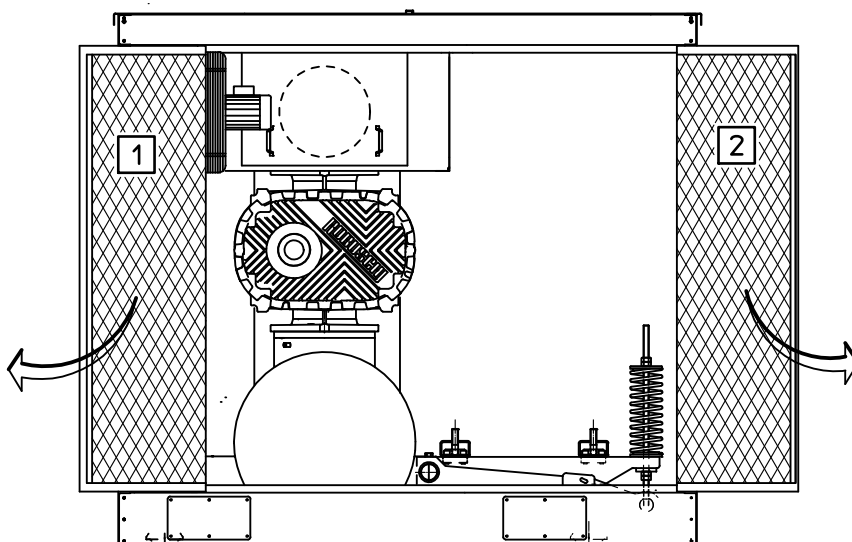


1 PORTE FRONTALI

FRONT DOORS

APRIRE LE PORTE 1 e 2
E BLOCCARLE, COME INDICATO

OPEN THE DOORS 1 and 2
AND LOCK THEM AS INDICATED

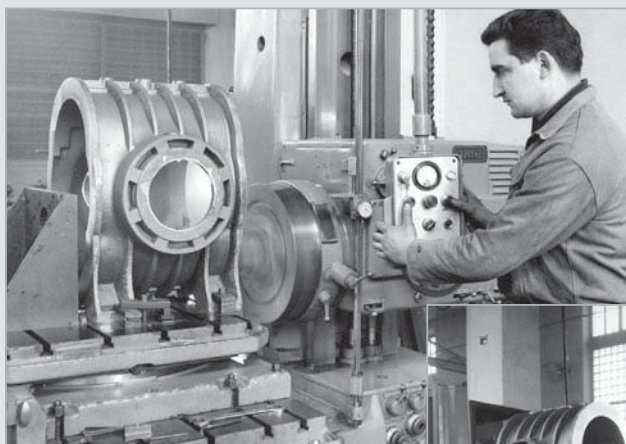


BLOWERS

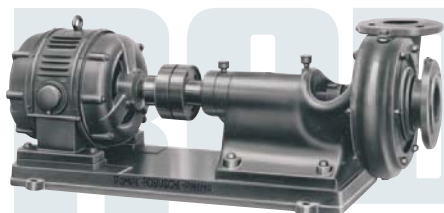
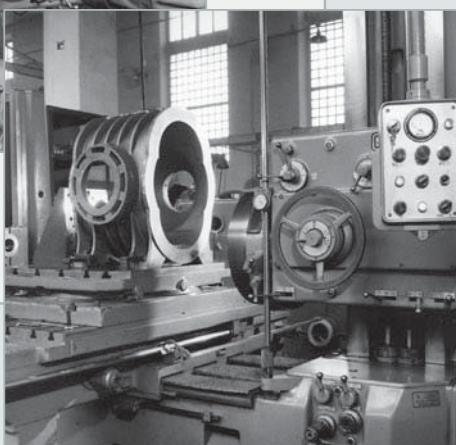




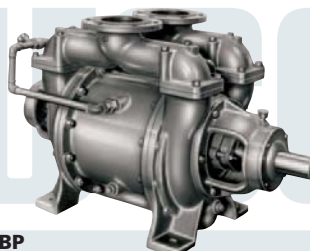
With over 60 years of history, Robuschi is capable of combining, in the best possible manner, its experience with the most advanced technological innovations. At the beginning of 1941, the main activity was the repair of centrifugal pumps that were primarily used in agriculture. Robuschi's production, design and financial growth commenced between the 60s and the 80s. In fact, Robuschi has established itself at a national and international level with the production of the following product lines: chemical and industrial centrifugal pumps; channel pumps for waste water; liquid ring vacuum pumps and low pressure positive displacement blowers. The innovations introduced at a production level and the investments made in new markets are the launching pads to arrive to the pre-set targets. The company efforts tend to make this occur under a partnership condition within and outside the company, through the professional growth of its employees and the enhancement of customer relations.



ROR The 60s:
ROR blowers
casing - sides manufacture



1941 RG
Centrifugal pumps



1950-60 RBP
Vacuum pumps



1955-60 ROR
2 lobe blowers

PRESSURE-VACUUM OPERATION (15 psig to 15" Hg)

RBS



LOBE BLOWERS

Low pressure three lobe rotary blower with patented LOW-PULSE system to eliminate pressure and delivery pulsation.

page 3

ROBOX evolution



PACKAGED SYSTEMS

Traditional low pressure compression unit with **RBS** three lobe blower.

page 5

CRBS - GRBS



TABLE TOP BLOWER PACKAGE

Compact low pressure compression unit with **RBS** three lobe blower.

page 9

VACUUM OPERATION (15 psig to 27" Hg)

RB-DV



AIR INJECTION VACUUM BLOWER

Three lobe rotary blower, vacuum operation, equipped with a **ROBUSCHI** patented atmospheric air injection cooling system.

page 10

ROBOX evolution /DV



COMPACT UNIT WITH AIR INJECTION VACUUM BLOWER

Compact unit for vacuum operation with **RB-DV** air injection vacuum blower, suitable for fixed vacuum pneumatic transport and centralized vacuum systems.

page 10

TRB-DV



UNIT WITH AIR INJECTION VACUUM BLOWER FOR MOBILE APPLICATIONS

Compact unit with **RB-DV** air injection vacuum blower, equipped with acoustic enclosure for application on mobile units.

page 10

HIGH VACUUM (.075 Torr / .001 mbar abs.)

RBS/AV



HIGH VACUUM BLOWERS

Three lobe rotary blower used in series with a primary vacuum system for high vacuum applications.

page 11



RBS is the innovative positive displacement rotary blower with three special profile lobes that, combined with a new configuration of our LOW-PULSE system, reduces the residual pressure pulsation of the conveyed gas below 2% of the operating pressure.

Safety: high efficiency gear operation is guaranteed by the oil splash lubrication system with discs coupled to the drive shaft.

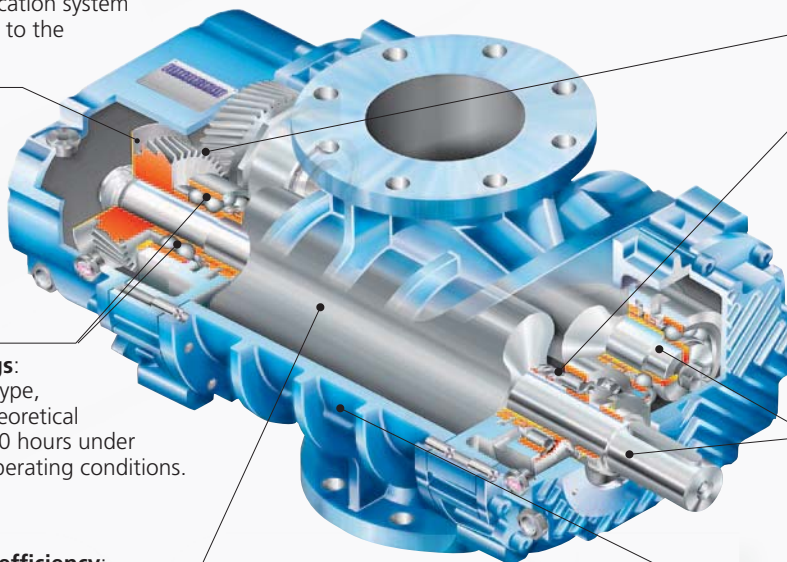
Strong and silent: helical tooth synchronizing gear with ground surfaces and involute profile.

Long life bearings: reinforced rolling type, calculated for a theoretical lifespan of 100,000 hours under the most severe operating conditions.

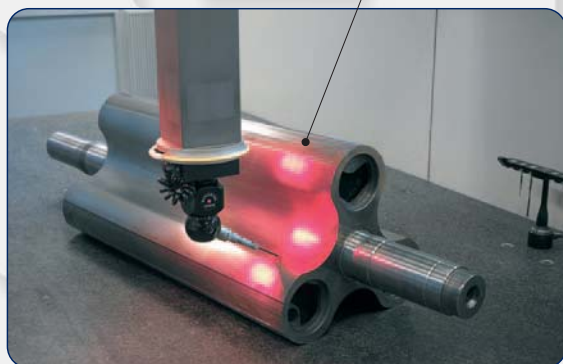
Peak volumetric efficiency: the ground profile of the rotors insures optimum internal clearances.

Reliability and efficiency: the rotor shaft is sealed with our innovative labyrinth seal coupled to oil splash discs and insures the flow of oil free gas while maintaining its long lasting efficiency by not having parts that are subjected to wear.

High performance: oversized shafts allow higher operating pressures and rotation speeds.



RBS in ATEX version, available on request.



State of the art machining procedures and three dimensional control insure optimum performance.

The precision milling and boring of the blower casing guarantee reduced tolerances and optimum efficiency



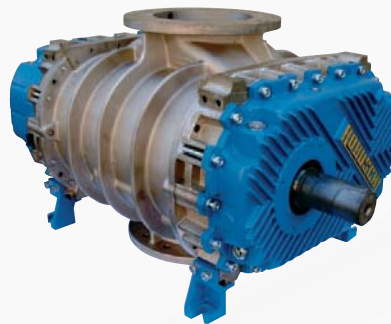
OPERATIONS

BLOWER WITH OIL COOLER



The blower is equipped with dual cooling coils that keep the oil temperature below 100°C / 212°F in all operating conditions. This version is recommended when the gas discharge temperature exceeds 140°C / 284°F.

BLOWER WITH SPECIAL COATING

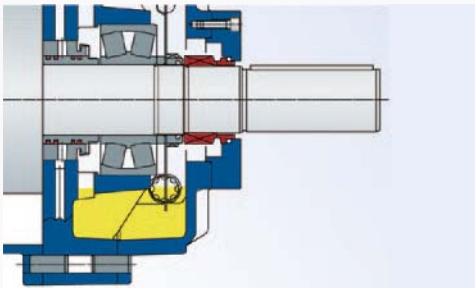


Two types of coating are available for components in contact with the conveyed liquid (casing, sides and rotors) when aggressive:

- Synthetic resin based: prevents the contamination of parts from the conveyed gas.
- Nickel and phosphorus alloy: prevent the chemical corrosion of parts from the conveyed gas.

* contact Robuschi to check for compatibility

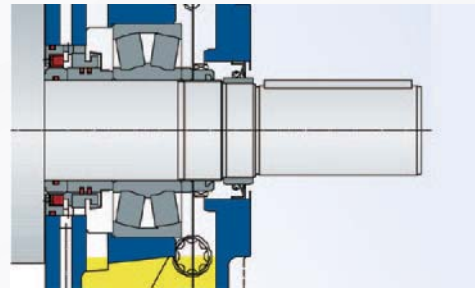
BLOWER WITH SPECIAL SEALS

**Single mechanical seal**

The blower is equipped with a single mechanical seal on the drive shaft instead of the standard seal. The single mechanical seal is used when the blower's suction pressure is higher than 100 mbar/ 1.45 PSI (e.g.: blowers in closed nitrogen circuits).

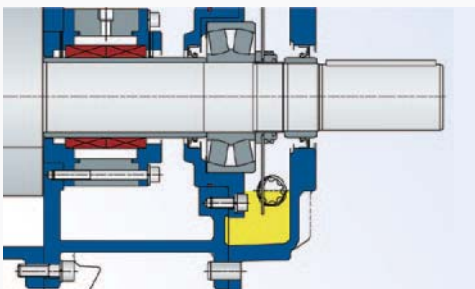
TMS-V: available from RBS 35 size up.

TMS-H: available from RBS 75 size up.

**Lip seal**

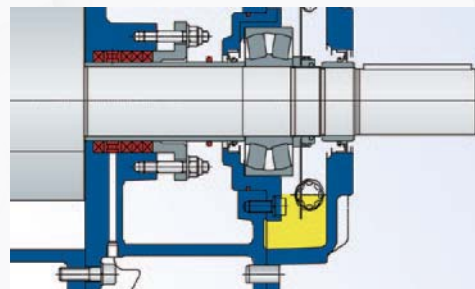
The blower is equipped with four glass reinforced PTFE lip seals on the rotor shafts instead of the standard seals. These seals prevent contact between the lubricating oil and the conveyed gas (e.g.: vapor or other gasses that are incompatible with oil).

Available from RBS 35 size up.

**Double mechanical seal**

The blower is equipped with four double mechanical seals on the rotor shafts instead of the standard seals and externally lubricated through the circulation of a compatible liquid (usually water).

These prevent contact between the lubricating oil and the conveyed gas. Available from the RBS 115 size up and in the vertical flow version - V only.

**Gland seal**

The blower is equipped with four gland seals on the rotor shafts instead of the standard seals for external injection of cooling fluid (normally water).

These prevent contact between the lubricating oil and the conveyed gas. Available from the RBS 115 size up and in the vertical flow version - V only.

ROBOX evolution is an integrated compression unit designed to convey gas at low pressure, and incorporates the RBS three lobe positive displacement rotary blower, which is driven by an electric motor utilizing a special belt drive, and includes all accessories and acoustic enclosure.

The complete range of Robuschi blower units includes RBS blower sizes from 15 to 165, all with the innovative characteristics of the **ROBOX evolution** compression unit.

These characteristics reduce: **system costs** thanks to the **optimization of space**; **operating costs** thanks to the **low energy consumption** and to the **exclusion of all standstill risks** insured by the innovative **electronic control system SENTINEL**; **maintenance costs** thanks to the **easy** access to all parts for normal **service operations**.

ROBOX evolution in the ATEX version, available on request.

ROBOX evolution ES 5

Simple oil change: the oil is changed from outside the acoustical enclosure by means of two tanks, one for each oil sump. The consequent drain of exhausted oil is done through a specific draining valve.

Hot air and relief valve discharge.

Acoustic enclosure:

- upgraded air inlets and outlets;
- panels with dual reactive sound insulation.

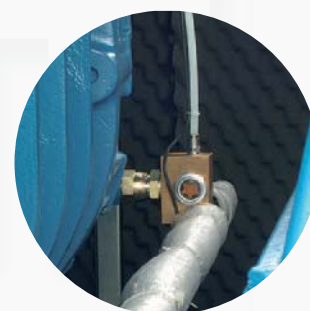


Transport Access Fixtures: for efficient handling and transport of the packaged system.



ROBOX
evolution

Oil level monitor: the oil level can be checked during blower operation from outside the enclosure by means of level gauges positioned on the filler tanks.



COMPACT

ROBOX evolution is dimensionally friendly

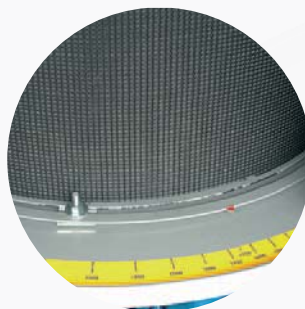
For this reason, several **ROBOX evolution** can be placed side by side significantly reducing the space they require and the dimensions of the blower room, resulting in decreased system costs.



SIMPLE INSPECTION

ROBOX evolution allows maintenance operations to be carried out in an easier and effortless manner:

- **Simplified access:** all maintenance operations are performed from the front with the removal of the front panel or panels and/or the opening of the upper panel with gas springs;
- **Effortless adjustment and replacement of soundproof filter SPF:** by simply opening the noise enclosure's upper panel (or removal of the front panel);
- **Oil level sight glass:** the oil level can be checked externally, with the blower running, by means of levels positioned on the front panel of the enclosure;
- **Simple oil change:** two pipes on the internal wall of the noise enclosure, accessible through the front panel, allow both the oil drain and the subsequent top up;
- **Automatic belt tensioning:** an oscillating suspension system of the motor maintains the correct belt tension at all times, thereby reducing the load on the bearings;
- **Simple belt replacement:** this is carried out from the front without using any additional equipment thanks to the automatic tensioning device.



SPF filter adjustment



SPF filter replacement



Immediate oil level check



Oil change

RANGE



ES 5



ES 4



ES 3



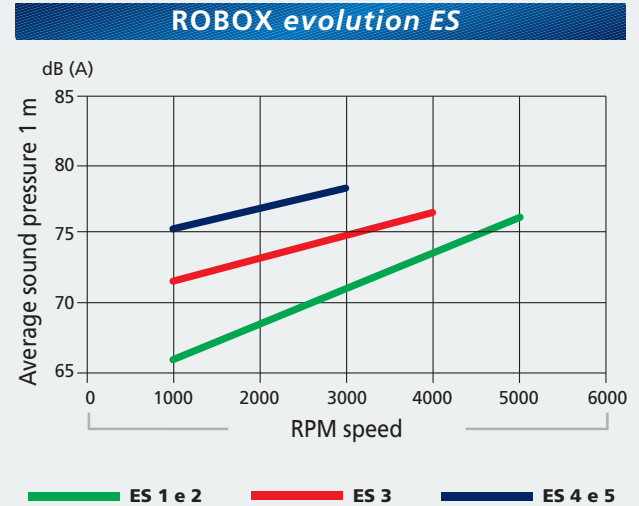
ES 1 - 2

ROBOX
evolution

SILENT OPERATION

ROBOX evolution offers cutting edge technology for silent operation of low pressure compression units. **The emitted sound level is in fact 7 dB(A) lower than the previous series, in all operating conditions**, thanks to a combination of innovative components:

- **Robuschi RBS blower:** (equipped with a special device) to eliminate the flow pulsation induced by the compression;
- **SPF inlet silencer:** designed with a patented interference device to reduce the sound waves generated at the inlet and adjustable according to the blower speed;
- **Discharge silencer:** consisting of a resonance chamber and absence of internal sound absorbing materials;
- **Noise enclosure:** optimization of the intake air conveyance and ventilation, thereby reducing noise pollution.



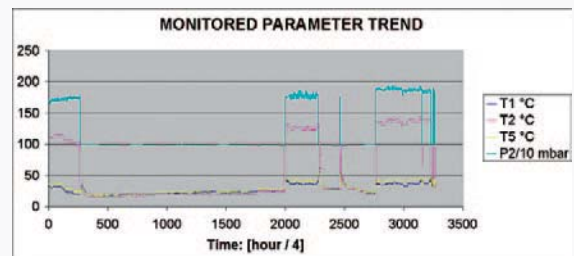
MONITORED OPERATION

ROBOX evolution is ready-to-fit the exclusive **SENTINEL** electronic monitoring system that safeguards both the blower system and your investment.

SENTINEL:

- **Prevents all failures:** in the event of an operational fault, a pre-alarm warning is activated and if reset of the normal values does not occur, the blower system stops and sends a remote alert signal;
- **Signals the maintenance operations:** through the continual control of the oil level and wear of the belts;
- **Reduces down time to a minimum:** to immediately identify and eliminate the cause of each problem controlling the following **11 operating parameters**:

- Blower rotation direction;
- Blower speed;
- Inlet pressure;
- Discharge pressure;
- Inlet temperature;
- Discharge temperature;
- Oil temperature in oil sump drive side;
- Oil temperature in oil sump gear side;
- Internal acoustic enclosure temperature;
- Oil level in oil sump drive side;
- Oil level in oil sump gear side;



VALVES

R V P - R V V (standard)

RVP:

Direct relief valve for pressure operation.

RVV:

Direct relief valve for vacuum operation.

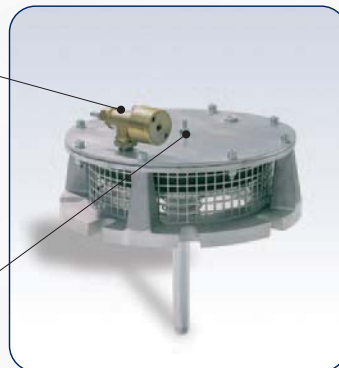


V S M (optional)

This valve allows operating the system with a low absorbed power when the blower is started with a static back pressure (e.g. in waste water treatment plants). The start time is adjusted by means of a special screw. The VSM valve is also equipped with a special pilot valve, PSM, dial on the lid, which also works as a relief valve in pressure with a maximum over pressure 5% lower than the setting pressure.

PSM
pilot valve

Start time
adjustment



ACCESSORIES

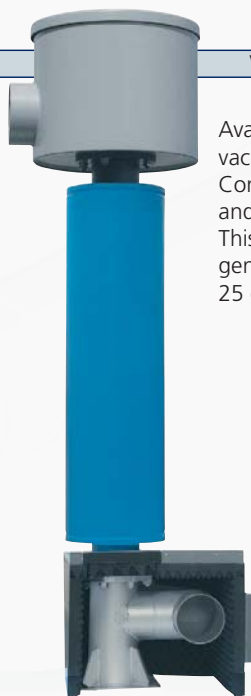
S D L - S C E

Absorptive silencers are available for the **ROBOX evolution** unit to further reduce the generated noise level.



VACUUM SILENCER KIT

Available for **ROBOX evolution** units in vacuum operations: ES../V and ES../DV. Consisting of SDL absorptive silencers and SPS exhaust silencers. This reduces the sound pressure level generated by the exhaust outlet up to 25 dB(A).



These are compression units for low pressure gas conveying, based on the **RBS** series three lobe positive displacement rotary blower, run by an electric motor through a special belt drive (GRBS) or directly coupled by means of coupling joint with or without reduction gear (CRBS). They are provided with all the necessary accessories for reliable, safe and silent operation.

The CRBS and GRBS units can be used for capacities higher than 900 m³/h / 530 cfm and for fitted powers over 250 kW / 335 hp.

The heart of the unit is the innovative **RBS** series blower.

CRBS - GRBS in the ATEX version available on request.

RBS blower

Acoustic enclosure with ventilation system (only on request)

Inlet silencer: wide band resonance chamber without sound proofing material.

Electric motor: it is possible to fit medium voltage and in ex-proof motors.

Base

Discharge silencer: wide band resonance chamber without sound proofing material.

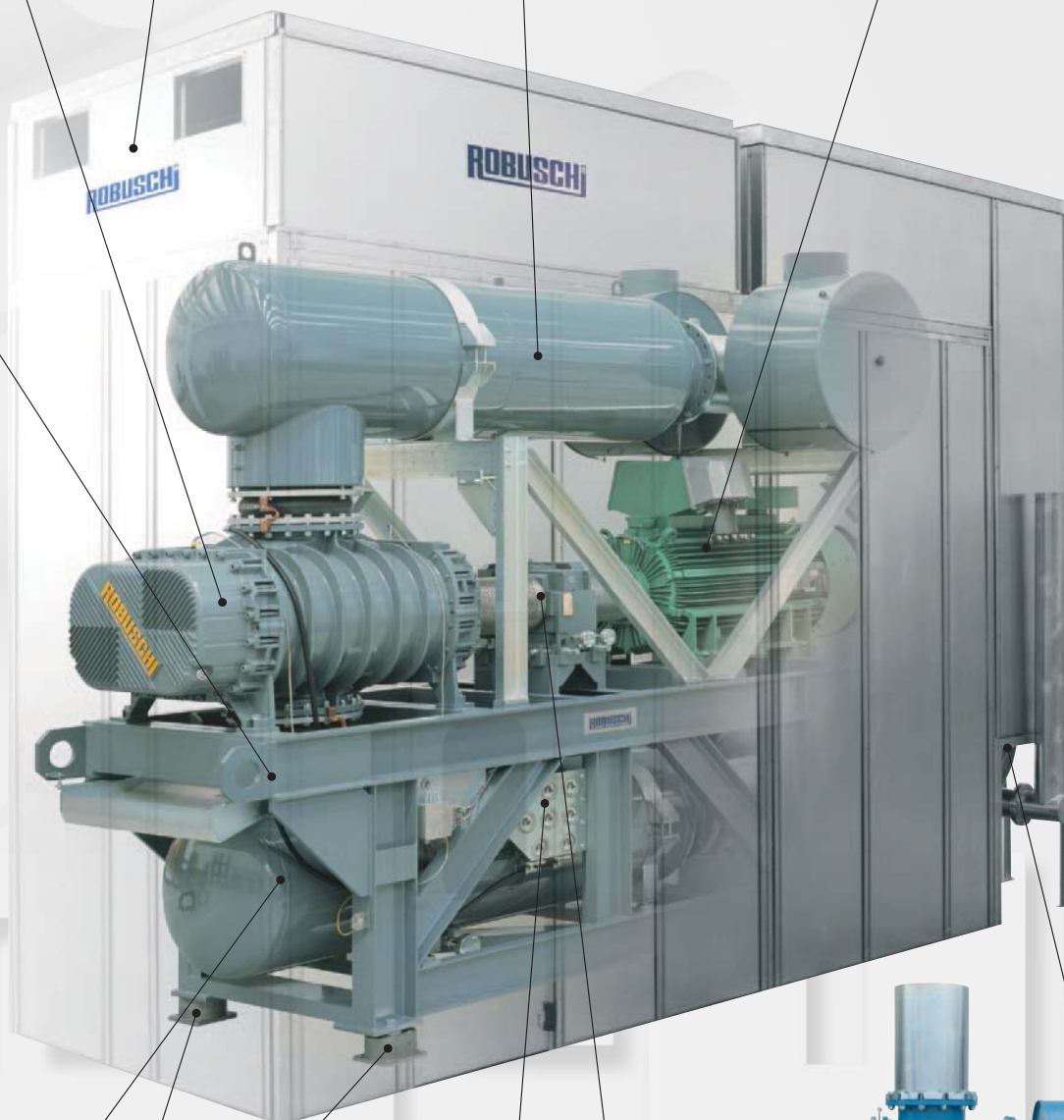
Anti-vibration mounts

Instruments panel: based on the customer's specifications.

Drive:

- Belt and pulley with tensioning device for motors up to 250 kW / 335 hp.
- Direct with flexible coupling or reduction gear for motors up to 500 kW / 670 hp.

Relief valve



The **RB-DV** series consists of three lobe rotary blowers used as exhausters which make it possible to reach a high compression ratio by means of a **patented atmospheric air injection device** that reduces overheating of the gas and the power absorbed by the blower.

The main characteristics of these blowers are as follows:

- Maximum vacuum 93% - 28" Hg on a dead head;
- Nominal capacity from 840 to 10,500 m³ / h³ from 494 CFM to 6200 CFM;
- Vacuum pressure up to 27" / -900 mbar;
- Gases and vapors can be handled;
- No sliding parts, therefore no wear;
- Safe operation and minimum maintenance;
- No oil mist;
- **Available upon request in the ATEX version.**



ROBOX evolution-D V

Air injection vacuum blower

ROBOX evolution vacuum unit with **RB-DV** air injection vacuum blower.

The unit maintains all the innovative characteristics of **ROBOX evolution**: silent, compact, easy maintenance.

ROBOX
evolution DV



T R B - D V

Air injection vacuum blower

TRB-DV are **compact units** equipped with **acoustic enclosure** for **applications on mobile units** with tanks for the disposal of solids and liquids. Capable of working in vacuum function for tank filling and in pressure for the subsequent emptying of the tank.



For more detailed information, consult the **ROBUSCHI RB-DV TRB-DV catalog**.



The **RBS /AV blowers** are rotary lobe blowers used to increase the capacity of the primary vacuum pumps when operating at their minimum suction pressure (as a booster).

The main characteristics of these blowers are as follows:

- Suction pressure from 0.001 to 20 mbar absolute;
- Suction capacity from 300 to 9,400 m³/h - 175 to 5,500 cfm;
- Gases and vapors can be handled;
- No sliding parts, therefore no wear;
- Safe operation and minimum maintenance;
- Available upon request in the ATEX version.

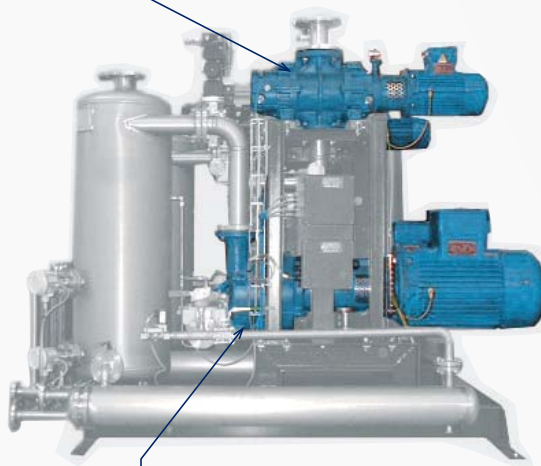


The **RBS/AV** blowers must be used in series with a primary vacuum system (VP) and for pressures lower than 50 mbar absolute.

Robuschi can supply primary vacuum systems consisting of liquid vacuum pumps with deliveries up to 4,200 m³/h - 2,500 cfm.



High vacuum blowers:
ROBUSCHI RBS/AV







VP
Liquid ring vacuum pumps:
ROBUSCHI RVS




















For more detailed information, consult the **ROBUSCHI RBS/AV catalog**.



PROCESSES

-  Water treatment
-  Pneumatic transport of bulk material
-  Vacuum - evaporation systems
-  Combustion air

INDUSTRIES

-  Food industry
-  Shipbuilding
-  Paper industry
-  Cement works
-  Thermoelectric power stations
-  Chemical-petrochemical
-  Tanning industry
-  Waste water treatment
-  Detergents
-  Desalination
-  Pharmaceutical
-  Wood
-  Mining
-  Maritime
-  Hospitals
-  Plastics
-  Industrial cleaning
-  Textiles
-  Glass industry



• Sewage purification
ROBOX evolution blower unit



• Industrial: Pneumatic transport of wood chippings
ROBOX evolution blower unit



• Mobile units for the suction of dusts and/or liquids. Vacuum blower unit: TRB-DV



• Paper industry: Centralized vacuum systems
ROBOX evolution pressurized blower unit in pressure (P) / air injection vacuum (DV)

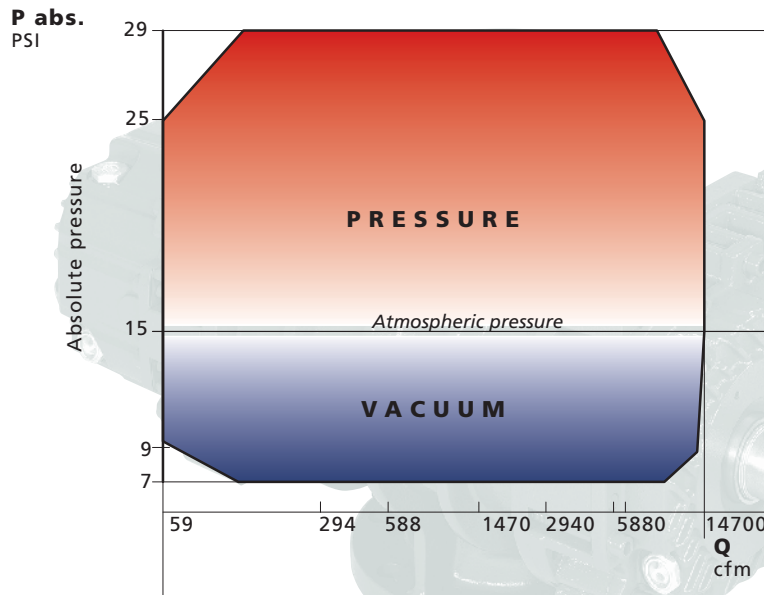


• Food industry: Systems for evaporation - drying processes.
High vacuum blower (RBS/AV) used as a booster in primary vacuum systems



• Engineering: Treatment of oil emulsions and cleaning liquids by means of thermocompression concentration system.
Lobe blowers (RBS)

Pressure - vacuum blowers



R B S

Pressure/vacuum lobe blowers

Capacity up to
25,000 m³/h - 14,700 cfm.

From page 14

ROBOX evolution

Pressure/vacuum blower units

Capacity up to
10,500 m³/h - 6,200 cfm.

From page 16

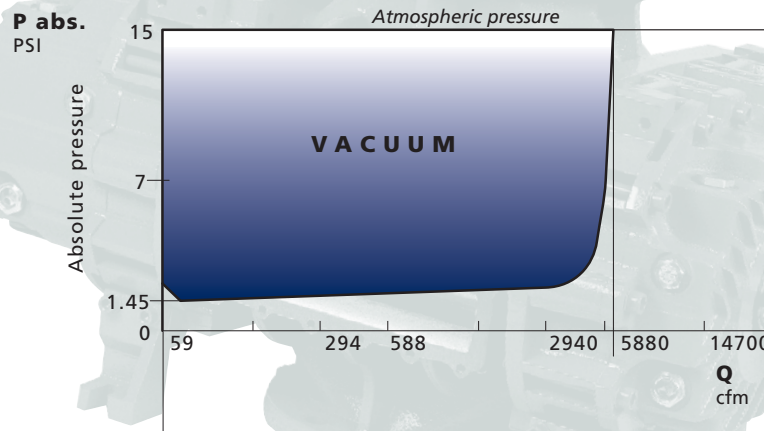
CRBS - GRBS

Pressure/vacuum table top blower package.

Capacity from 2,500 to
25,000 m³/h - 1,450 to 14,700 cfm.

page 18

Air injection vacuum blowers (medium vacuum)



RB-DV

Air injection vacuum blower

Capacity up to 10,000 m³/h - 5,900 cfm.

See specific catalog

ROBOX evolution /DV

Vacuum blower units for stationary applications.

Capacity up to 10,500 m³/h - 6,200 cfm.

See specific catalog

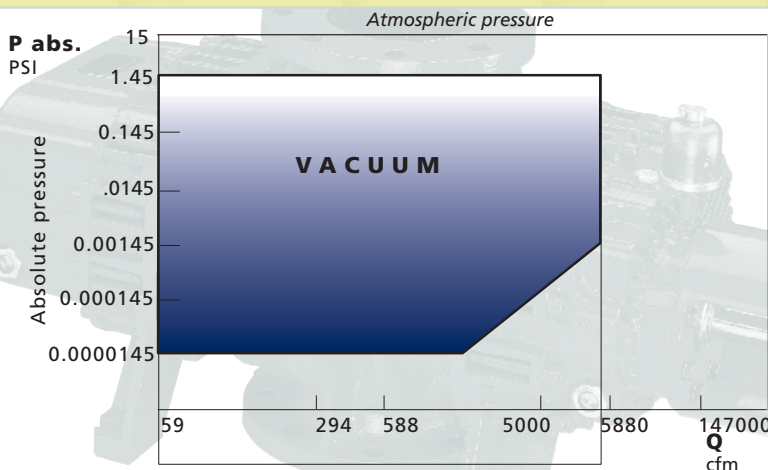
TRB-DV

Vacuum blower units for mobile applications.

Capacity from 550
to 1,000 m³/h - 300 to 600 cfm.

See specific catalog

High vacuum blowers



RBS/AV

High vacuum blowers

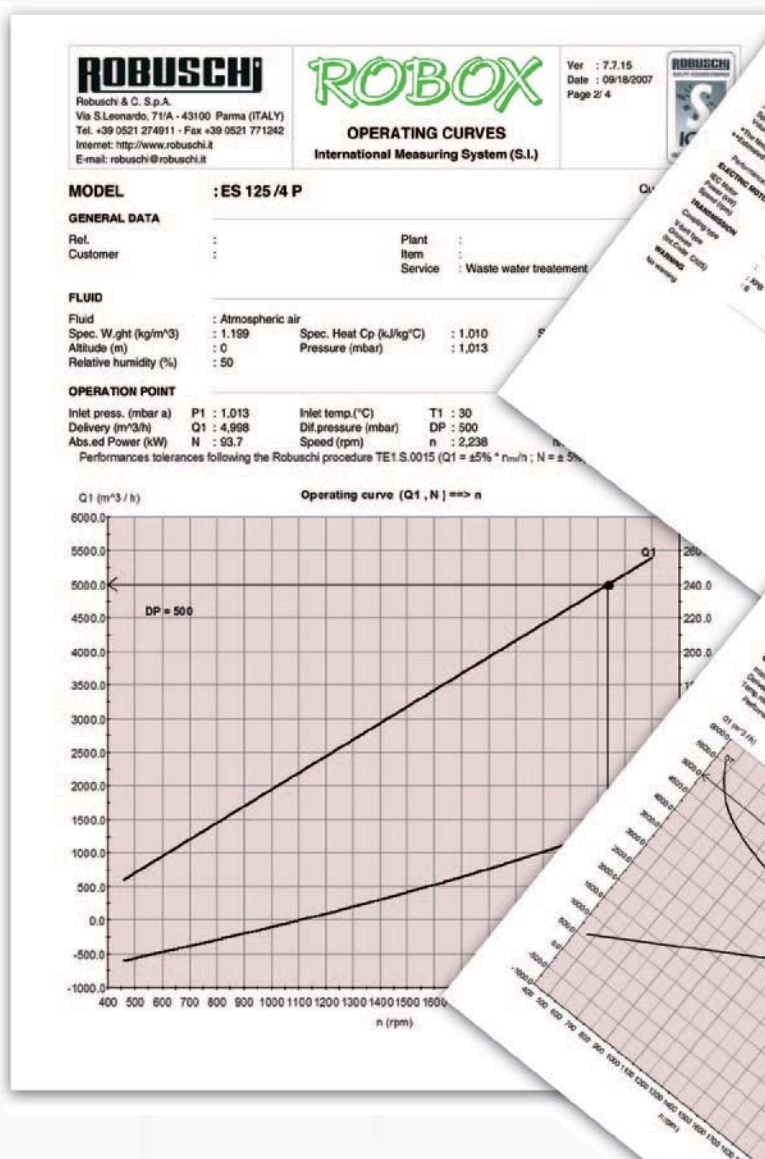
Capacity up to 9,400 m³/h - 5,500 cfm.

See specific catalog

SELECTION SOFTWARE

Robuschi has created a specific selection program to determine the operating parameters of the complete range of our positive displacement blowers. **When the conditions of service change (altitude, temperature, humidity) or when the conveyed gas is different from atmospheric air**, the selection program provides a detailed Data Sheet of each machine, including **specifications for the electric motor and drive components** along with couplings or belts and pulleys.

The program is available through the Robuschi sales network and in the download area of the Internet site www.roboschi.com.



CODE DESCRIPTION

RBS / - -

Blower sizes:

from 15 to 225

Operations:

R = cooled
RN = Nickel and phosphorus alloy coating
RC = synthetic resin based coating
TMS = single mechanical seal
TL = lip seal
TMD = double mechanical seal
PR = gland seal

Versions:

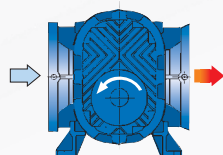
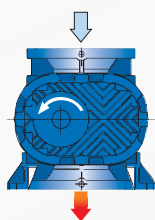
F = flanged blower
H = horizontal flow
V = vertical flow
SP = blower without feet
FI = reverse flow
SD = right-hand shaft
SS = upper shaft

Certifications:

ATEX Cat. II - III
 on request...

VERSIONS

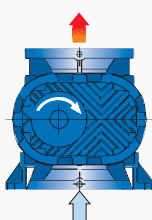
RBS / V



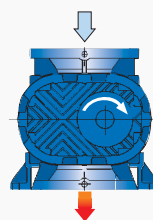
RBS / H

STANDARD

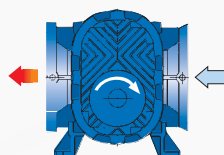
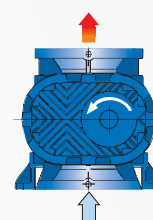
RBS / V-FI



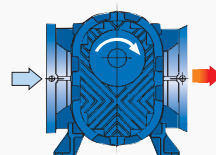
RBS / V-SD



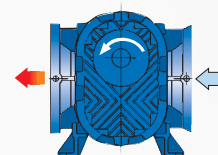
RBS / V-FI-SD



RBS / H-FI



RBS / H-SS



RBS / H-FI-SS

ON REQUEST

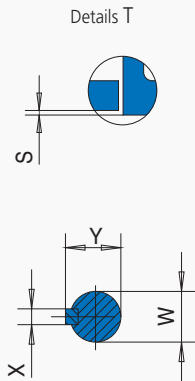
➡ Suction

➡ Discharge

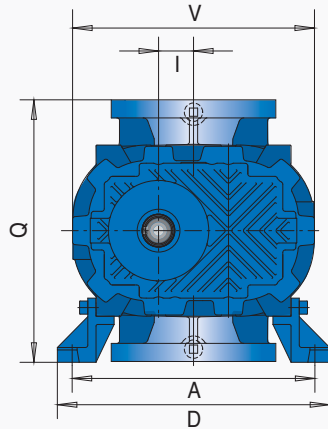
MATERIALS

DETAILS	STANDARD	BLOWER DIMENSION	
		15 - 106	115 - 225
ROTORS	UNI-EN • DIN • ASTM	UNI-EN 1563 GS 400-15 • DIN 1696 0.7040 • A 536-84 GR 60-40-18	UNI-EN 1563 GS 400-15 • DIN 1696 0.7040 • A 536-84 GR 60-40-18
SHAFTS	UNI-EN • DIN • ASTM	UNI-EN 1563 GS 400-15 • DIN 1696 0.7040 • A 536-84 GR 60-40-18	UNI-EN 10083/1 C40 • DIN 17200 1.1186 • A 576-86 GR 10 40
CASING/COVERS	UNI-EN • DIN • ASTM	UNI-EN 1561 G250 • DIN 1691 0.6020 • A 48 GR 30	
GEARS	UNI-EN • DIN • ASTM	UNI-EN 10084 18NiCrMo 5 • DIN 17212 1.6523 • A 534 CI 4720	

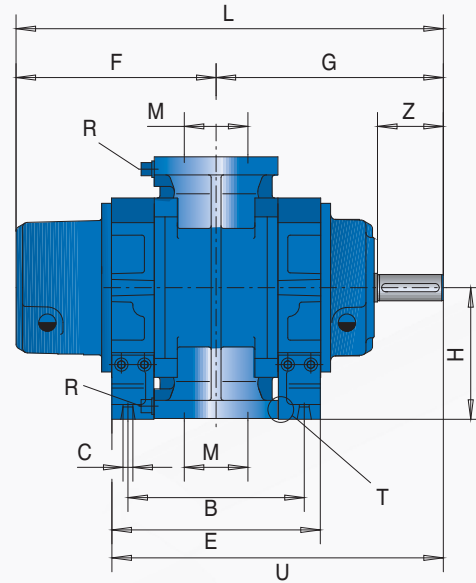
DIMENSIONS AND WEIGHTS



Dimension W with k6 tolerance
up to 2" - m6 over 2"

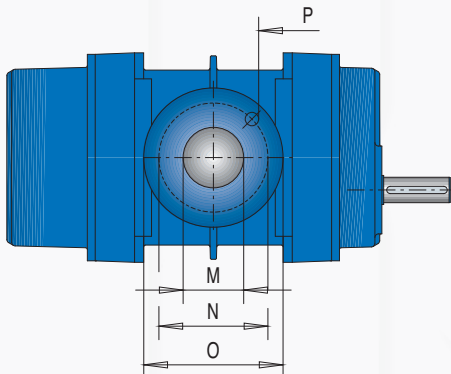


R pressure gauge connection G3/8"



Type	A	B	C	D	E	F	G	H -0.5	I	L	M	Q	S	U	V	W	Z	X	Y	Weight(lb)
RBS 15	7.75"	7.00"	0.50"	9.75"	8.00"	7.75"	7.50"	4.50"	1.25"	15.50"	2.00"	8.75"	1/16"	11.50"	10.00"	0.945"	2.00"	0.315"	1.063"	80
RBS 25	7.75"	8.25"	0.50"	9.75"	9.50"	9.50"	8.25"	4.50"	1.25"	16.75"	2.50"	8.75"	1/16"	13.00"	10.00"	0.945"	2.00"	0.315"	1.063"	90
RBS 35	11.50"	8.50"	0.50"	13.00"	10.00"	10.00"	10.50"	6.25"	1.75"	20.00"	3.25"	12.50"	1/16"	15.50"	11.50"	1.496"	3.25"	0.394"	1.614"	187
RBS 45	11.50"	10.75"	0.50"	13.00"	12.25"	10.75"	11.50"	6.25"	1.75"	22.25"	3.25"	12.50"	1/16"	17.75"	11.50"	1.496"	3.25"	0.394"	1.614"	214
RBS 46	11.50"	14.75"	0.50"	13.00"	16.25"	12.75"	13.50"	6.25"	1.75"	26.25"	4.00"	12.50"	1/16"	21.75"	11.50"	1.496"	3.25"	0.394"	1.614"	258
RBS 55	13.50"	10.75"	0.50"	15.25"	12.75"	12.75"	13.00"	7.25"	2.00"	25.25"	4.00"	14.50"	1/16"	19.25"	13.50"	1.899"	4.25"	0.551"	2.028"	317
RBS 65	13.50"	13.50"	0.50"	15.25"	15.25"	13.50"	14.25"	7.25"	2.00"	27.50"	6.00"	14.50"	1/16"	21.75"	13.50"	1.899"	4.25"	0.551"	2.028"	353
RBS 66	13.50"	17.75"	0.50"	15.25"	19.50"	15.50"	16.50"	7.25"	2.00"	32.00"	6.00"	14.50"	1/16"	26.25"	13.50"	1.899"	4.25"	0.551"	2.028"	425
RBS 75	14.50"	12.50"	0.75"	16.50"	14.50"	13.50"	14.25"	8.75"	2.75"	28.00"	5.00"	17.75"	1/16"	21.50"	16.25"	2.165"	4.25"	0.630"	2.323"	463
RBS 85	14.50"	17.00"	0.75"	16.50"	19.00"	16.00"	16.75"	8.75"	2.75"	32.50"	6.00"	17.75"	1/16"	26.25"	16.25"	2.165"	4.25"	0.630"	2.323"	551
RBS 86	14.50"	21.25"	0.75"	16.50"	23.25"	18.00"	18.75"	8.75"	2.75"	37.00"	7.75"	17.75"	1/16"	30.50"	16.25"	2.165"	4.25"	0.630"	2.323"	697
RBS 95	17.00"	16.00"	0.75"	19.25"	18.25"	16.25"	17.75"	10.50"	3.25"	34.00"	6.00"	20.75"	1/16"	26.50"	20.50"	2.362"	5.50"	0.708"	2.520"	794
RBS 105	17.00"	19.75"	0.75"	19.25"	22.00"	18.25"	19.50"	10.50"	3.25"	37.75"	7.75"	20.75"	1/16"	30.25"	20.50"	2.362"	5.50"	0.708"	2.520"	882
RBS 106	17.00"	25.75"	0.75"	19.25"	27.75"	21.25"	22.50"	10.50"	3.25"	43.75"	7.75"	20.75"	1/16"	36.25"	20.50"	2.362"	5.50"	0.708"	2.520"	971
RBS 115	23.25"	19.00"	0.75"	25.25"	21.00"	18.50"	20.25"	11.75"	4.25"	38.75"	7.75"	23.50"	1/16"	30.75"	24.25"	2.756"	5.50"	0.787"	2.933"	1190
RBS 125	21.75"	23.25"	0.75"	25.25"	25.50"	20.75"	22.25"	11.75"	4.25"	43.25"	9.75"	23.50"	1/16"	35.00"	24.25"	2.756"	5.50"	0.787"	2.933"	1334
RBS 126	21.75"	31.00"	0.75"	25.25"	33.25"	24.75"	26.25"	11.75"	4.25"	51.00"	11.75"	23.50"	1/16"	43.00"	24.25"	2.756"	5.50"	0.787"	2.933"	1477
RBS 135	26.75"	14.25"	1.00"	30.25"	23.50"	21.25"	23.25"	14.25"	5.25"	44.50"	9.75"	28.25"	1/16"	35.00"	31.00"	3.346"	6.75"	0.866"	3.543"	2006
RBS 145	26.75"	29.50"	1.00"	30.25"	33.75"	25.25"	27.25"	14.25"	5.25"	52.50"	11.75"	28.25"	1/16"	43.25"	31.00"	3.346"	6.75"	0.866"	3.543"	2293
RBS 155	26.75"	35.25"	1.00"	30.25"	37.50"	28.25"	30.25"	14.25"	5.25"	58.50"	11.75"	28.25"	1/16"	49.25"	31.00"	3.346"	6.75"	0.866"	3.543"	2601
RBS 165	31.50"	29.50"	1.25"	36.25"	32.50"	26.50"	29.50"	15.75"	6.75"	56.25"	11.75"	31.25"	1/16"	45.75"	38.25"	3.397"	8.25"	1.102"	4.173"	3946
RBS 175	31.50"	38.25"	1.25"	36.25"	41.25"	31.00"	33.75"	15.75"	6.75"	64.75"	13.75"	31.25"	1/16"	54.50"	38.25"	3.397"	8.25"	1.102"	4.173"	4167
RBS 205	40.25"	35.00"	1.50"	45.00"	38.25"	31.25"	33.00"	19.75"	8.50"	64.25"	15.75"	39.25"	1/16"	52.00"	47.25"	4.724"	8.25"	1.260"	5.000"	6327
RBS 225	40.25"	48.75"	1.50"	45.00"	52.00"	38.00"	39.75"	19.75"	8.50"	78.00"	19.75"	39.25"	1/16"	65.75"	47.25"	4.724"	8.25"	1.260"	5.000"	7209

FLANGE DRILLING



PN10 UNI-EN 1092-2 o ANSI 125 FF

UNI PN10

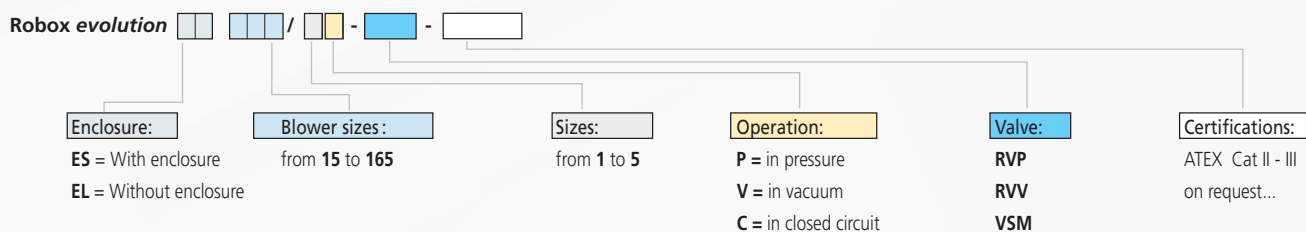
M (DN)	N	O	P	No. holes
50	5.00"	6.50"	0.75"	4
65	5.75"	7.25"	0.75"	4
80	6.25"	7.75"	0.75"	4
100	7.00"	9.00"	0.75"	8
125	8.50"	10.00"	0.75"	8
150	9.50"	11.25"	1.00"	8
200	11.75"	13.50"	1.00"	8
250	13.75"	16.00"	1.00"	12
300	15.75"	18.75"	1.00"	12
350	18.00"	20.75"	0.75"	16
400	20.25"	23.25"	1.00"	16
500	24.50"	27.25"	1.00"	20

ANSI 125 FF

M (inch)	N	O	P	No. holes
2"	4.75"	6.50"	0.75"	4
2 1/2"	5.50"	7.25"	0.75"	4
3"	6.00"	7.75"	0.75"	4
4"	7.50"	9.00"	0.75"	8
5"	8.50"	10.00"	1.00"	8
6"	9.50"	11.25"	1.00"	8
8"	11.75"	13.25"	1.00"	8
10"	14.25"	16.00"	1.00"	12
12"	17.00"	18.75"	1.00"	12
14"	18.75"	20.75"	1.25"	12
16"	21.25"	23.25"	1.25"	16
20"	25.00"	27.25"	1.25"	20

PLEASE, NOTE:
Non-binding dimensions in inches - Flow direction: downwards from above.

CODE DESCRIPTION



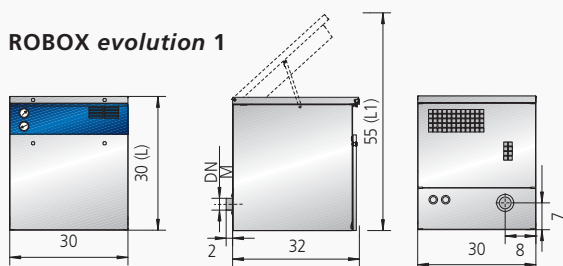
PERFORMANCES

ROBOX		OPERATION													
ROBOX dimension	Blower dimension	MAX PRESSURE DATA							MAX VACUUM DATA						
		Pressure		Capacity		Motor		Noise	Pressure		Capacity		Motor		Noise
		mbar (g)	PSI	m³/h	CFM	kW	BHP	dB(A)	mbar (a)	IN. Hg.	m³/h	CFM	kW	BHP	dB(A)
1	ES 15	900	13	240	140	11	15	<70	500	15	235	140	11	15	<70
	ES 25	700	10	320	190			70	500	15	300	180			<70
2	ES 35	1000	15	480	285	22	30	73	500	15	480	285	18,5	25	70
	ES 45	1000	15	690	410			76	500	15	690	410			73
	ES 46	700	10	1080	640	30	40	75	500	15	1050	620	30	40	72
	ES 55	1000	15	1010	595			76	500	15	1010	595			73
	ES 65	1000	15	1070	630	45	60	77	500	15	1350	795	45	60	74
	ES 65	1000	15	1370	810			77	*	*	*	*			*
3	ES 66	700	10	1950	1150	55	75	77	500	15	1850	1090	45	60	73
	ES 75	1000	15	1600	940			76	500	15	1590	935			76
	ES 85	1000	15	2850	1680	90	120	77	500	15	2330	1370	55	75	74
	ES 86	700	10	2360	1390			77	500	15	3000	1765			78
	ES 95	1000	15	2590	1525	90	125	77	500	15	2590	1525	75	100	75
	ES 95	1000	15	2590	1525			77	500	15	2590	1525			75
4	ES 86	700	10	3100	1825	90	125	76	*	*	*	*	75	100	*
	ES 105	1000	15	3370	1980			78	500	15	3370	1980			76
	ES 106	700	10	4710	2770	132	200	78	500	15	4500	2648	110	150	78
	ES 115	1000	15	4025	2370			77	500	15	4025	2370			76
	ES 125	1000	15	5190	3050	200	300	78	500	15	5190	3050	110	150	78
	ES 126	700	10	5300	3120			78	500	15	7200	4237			77
	ES 135	1000	15	5400	3180	200	300	78	500	15	5400	3180	110	150	76
5	ES 126	700	10	7360	4330			78	*	*	*	*			*
	ES 145	1000	15	10000	5900	315	473	78	500	15	8000	4700	200	300	79
	ES 155	700	10	12400	7360			78	500	12	10200	6000			79
	ES 165	1000	15	10400	6120	400	600	81	500	15	10400	6120	250	375	82

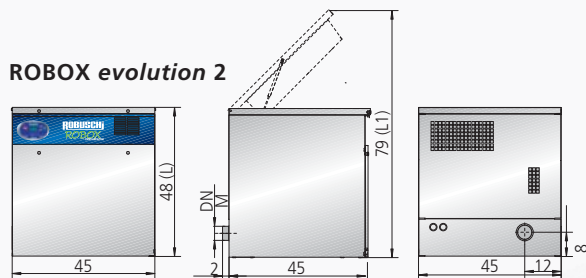
Performances related to atmospheric air: absolute pressure 14.7 psi, temperature 68° F, relative humidity 50%.

DIMENSIONS AND WEIGHTS

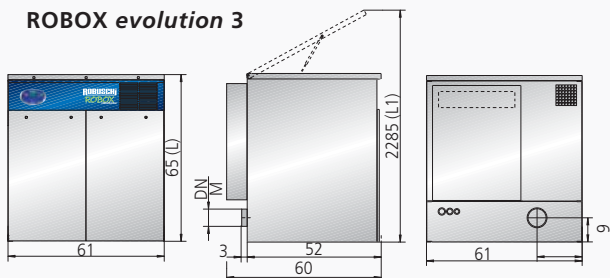
ROBOX evolution 1



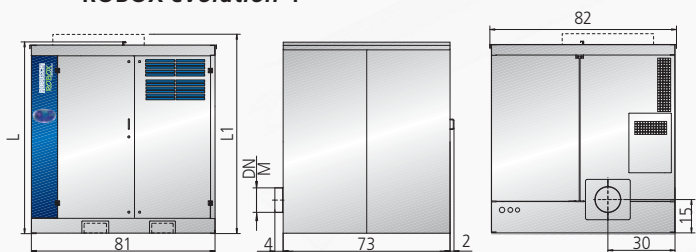
ROBOX evolution 2



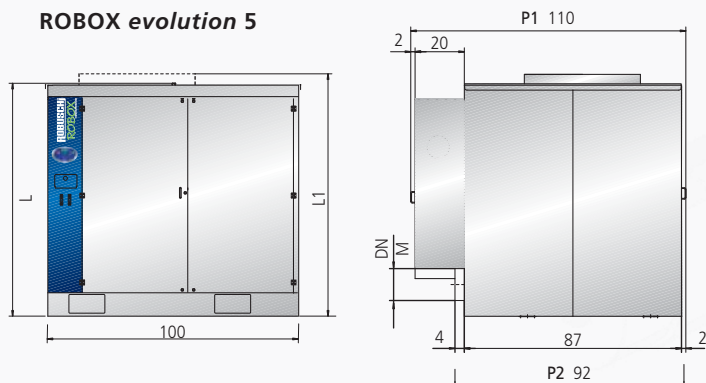
ROBOX evolution 3



ROBOX evolution 4



ROBOX evolution 5



P1 Silencer panels (S) assembled after transport

P2 Silencer panels (S) positioned inside for transport

ROBOX evolution		DIMENSIONS (in)				WEIGHT (lb)*	
Size	Blower	DN	M	L	L1	without enclosure	with enclosure
1	ES 15	2.50"	3.00"	33.75"	55.00"	165	313
	ES 25	2.50"	3.00"	33.75"	55.00"	176	324
2	ES 35	4.00"	4.50"	47.50"	78.75"	581	805
	ES 45	4.00"	4.50"	47.50"	78.75"	540	871
	ES 46	4.00"	4.50"	47.50"	78.75"	609	926
	ES 55	4.00"	4.50"	47.50"	78.75"	650	981
	ES 65	4.00"	4.50"	47.50"	78.75"	683	1014
3	ES 65	6.00"	6.75"	65.00"	90.00"	959	1565
	ES 66	6.00"	6.75"	65.00"	90.00"	1025	1631
	ES 75	6.00"	6.75"	65.00"	90.00"	1091	1698
	ES 85	6.00"	6.75"	65.00"	90.00"	1202	1808
	ES 86	6.00"	6.75"	65.00"	90.00"	1334	1940
	ES 95	6.00"	6.75"	65.00"	90.00"	1510	2134
4	ES 86	7.75"	8.75"	84.25"	-	2072	3307
	ES 105	7.75"	8.75"	84.25"	-	2513	3748
	ES 106	7.75"	8.75"	84.25"	-	2844	3946
	ES 115	7.75"	8.75"	84.25"	-	2690	4123
	ES 125	9.75"	10.75"	84.25"	-	2866	4101
	ES 126	9.75"	10.75"	84.25"	-	3009	4244
5	ES 135	9.75"	10.75"	84.25"	87.50"	3594	4828
	ES 126	11.75"	12.75"	93.00"	-	4608	5798
	ES 145	11.75"	12.75"	93.00"	-	5291	6614
	ES 155	11.75"	12.75"	93.00"	-	5600	6923
	ES 165	11.75"	12.75"	93.00"	96.75"	6945	8378

* without motor

RBS -

CODE DESCRIPTION

Drive:

C = with direct coupling
G = with V-belt transmission

Blower sizes:

from 165 to 225

Certifications:

ATEX Cat II - III
on request...

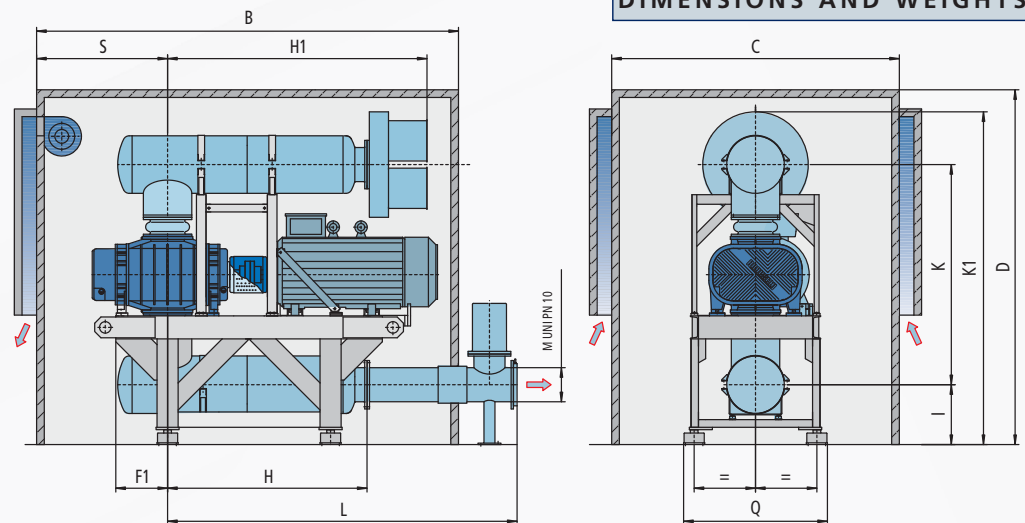
PERFORMANCES

GRBS - CRBS	OPERATION													
	MAX PRESSURE DATA							MAX VACUUM DATA						
	Pressure		Capacity		Motor		Noise	Pressure		Capacity		Motor		Noise
	mbar (g)	PSI	m³/h	CFM	kW	BHP	dB(A)	mbar (a)	IN. Hg.	m³/h	CFM	kW	BHP	dB(A)
165	1000	15	10420	6120	400	550	84	500	15	10430	6130	250	350	84
175	1000	15	14420	8450	550	750	85	500	15	14430	8480	315	450	85
205	1000	15	16430	9650	600	800	84	500	15	16440	9660	355	500	84
225	700	10	24870	14650	650	900	84	450	13	24580	14570	450	600	84

DIMENSIONS AND WEIGHTS

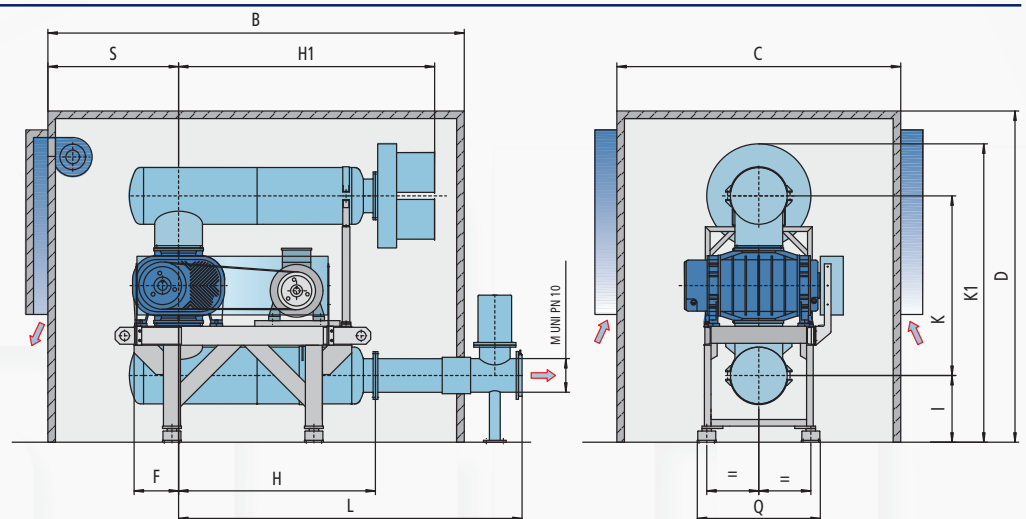
C R B S

Direct coupling



G R B S

V-Belt coupling



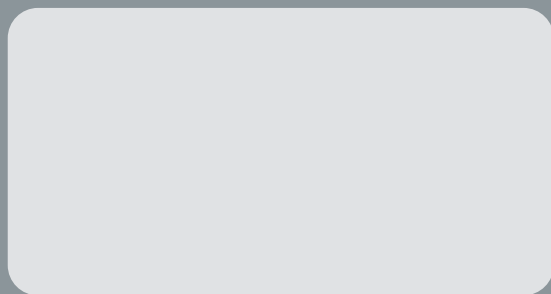
Type	M	With reduction gear	Without reduction gear	C	D	F	F1	H	H1	I	K	K1	With reduction gear	Without reduction gear	Q	S	weight(lb)*
165/V	11.75"	208.75"	169.25"	114.25"	130.00"	19.25"	26.50"	69.00"	96.75"	24.00"	83.50"	120.00"	164.25"	125.00"	52.00"	67.50"	6945
175/V	13.75"	224.50"	185.00"	118.00"	153.50"	19.25"	31.25"	82.25"	106.50"	25.50"	94.25"	140.50"	176.25"	136.75"	52.00"	73.50"	8818
205/V	15.75"	244.00"	204.75"	126.00"	165.25"	23.50"	31.25"	98.00"	122.75"	28.00"	104.50"	154.25"	197.00"	157.75"	72.75"	77.00"	12,566
225/V	19.75"	271.75"	232.25"	133.75"	181.00"	23.50"	38.25"	116.25"	142.75"	31.50"	112.00"	169.00"	224.00"	184.75"	72.75"	80.50"	14,991

* without motor

SALES & ASSISTANCE NETWORK

Robuschi has a capillary distribution network: a network of agents and two branches in Milan and Padua able to cover the whole of Italy; seven Robuschi branches in Germany, Denmark, France, Benelux, China, Brazil and USA with over 50 distributors / agents able to cover 70 different countries. Thanks to its flexibility and promptness, Robuschi can offer specialized advice, pre - after sales assistance and prompt service to satisfy our customer's every need.





ROBUSCHI®

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 E-mail: c.harper@robuschiusa.com

ROBOX

SELECTION
U.S.A. Measuring System

Ver : 12.0.1
 Date : 10/21/2011
 Page 1/ 5



MODEL : ES 125 /4 C

Quantity :

GENERAL DATA

Ref. :	Plant :
Customer :	Item :
	Service : Waste water treatment

FLUID

Fluid :	Atmospheric air		
Spec. W.ght (lbm/ft^3) :	0,058	Cp/Cv :	1,397
Altitude (ft) :	5,000	Pressure (psi) :	12,23
Relative humidity (%) :	50	Temperature (°F) :	100

TECHNICAL DATA

Delivery (l cfm) Q1 : 2.529	*Delivery (S cfm) Q2 : 1.923	
Dif.pressure (psi) DP : 11,90	Inlet press. (psi a) P1 : 12,23	Outlet pres.(psi a) P2 : 24,13
Temp.rise(°F) DT : 189	Inlet temp.(°F) T1 : 100	Outlet temp.(°F) T2 : 289
	Spec.W.ght (lbm/ft^3) SW : 0,058	H2O injection (USG/min) ia : 0,00
Abs.ed Power (hp) N : 170,4	**Sound Pressure Level (dBA) : 83	Heat radiation (Btu/h) Wd : 9,78
Speed (rpm) n : 2.045	n/nmax (%) : 85	
Volumetric efficiency (%) : 84,6	Adiabatic efficiency (%) : 77,0	Total efficiency (%) : 59,4

*The S cfm capacity is referred to CAGI standard conditions: 14.7 psi a, 68 °F, 36 %RH

**Estimated sound pressure level at 1 m, free field with soundproof piping

Performances tolerances following the Robuschi procedure TE1.S.0015(Q1 = ±5% * n_{mx}/n ; N = ± 5%)

ELECTRIC MOTOR

NEMA Motor :	TEFC	
Power (hp) :		Hz :
Speed (rpm) :		Poles :

TRANSMISSION

Coupling type :	Size :	
V-belt type :	Length (in) :	Shaft centres (in) : 0,00
Grooves :	Mot.pulley Diam. (in) :	Blower pulley diam. (in) :
(Int.Code) :	(Int.Code) :	(Int.Code) :

WARNING

No warning

ROBUSCHI BLOWER REFERENCE LIST FOR UNITED BLOWER, INC.

Item	Job	Job Name	ST	Equipment - Qty.	Ship Date	Contact/Owner/Rep.	Comments
1	4030	City of Raymond	WA	RB30/40 - 3	5/9/1990	City of Raymond	Up to 73000 hours
		Raymond WWTP		41000 HRS - 73000 HRS		Ron Hebish	on one unit
		Raymond, WA 98577		cplg drive		360-942-4125	
2	4035	City of Dunedin	FL	RB120/100 - 3	8/1/1990	Ken Stidham	Running well
		Dunedin WWTP				Director of Waste	
		PO Box 1348				727-298-3254	
		Dunedin, FL 34698					
3	4058	El Paso Water Utilities	TX	RB150H/200-2	12/24/1991	Michael Parker	Running well
		Johnathan Roges WTP				915-594-5752	
		El Paso, TX 79927				fax 915 859-8666	
4	4084	Lucerne Valley	CA	RB80V/30TEFC-1	10/7/1991	Don Reisig - Specialty Minerals	Repeat customer
		Lucerne Valley WWTP				760-248-5347	
		Lucerne Valley, CA 92356					
5	V163	Pinetop WWTP	AZ	Robuschi RB 100/75-3	5/22/1987	Phil Hayes	Rebuilding one blower
		2600 W. Alisa Lane				928-368-5370	October 2008
		Lakeside, AZ 85929					
6	4299	Cuchara Water & Sanitation	CO	RB61/20-1	4/27/1994	City of Cuchara, CO	One of four leaked oil
		16925 State Hwy 2		RB80/30 - 1		719-742-3108	at shaft after 13 years
		Laveta, CO 81055		RB100/60 - 1		Bob Northup	
7	4342	City of McAllen WTP	TX	RB121/100-2	12/5/1994	Hector Ramos	Blowers running very well.
		P.O. Box 220				Maintenance	
		McAllen, TX 78502-0220				956-688-3392	
8	4820	Blue Plains WWTP	DC	RBS135/200NE-2	8/15/2004	Warren	Blowers running well but
		5000 Overlook Ave., SW				phone 202-787-4043	may be replaced in future
		Washington, DC 20032				fax 202-787-4021	plant expansion
9	4037	City of Largo Water Reclamation	FL	RB120/125TEFC-3	7/10/1990	Jeff Behrens	Blowers running well.
		5000 150th Ave.				727-518-3076	May see upgrade 2010.
		Clearwater, FL 33760					
10	4094	Yuciapa II	CA	RB120-150-2	1993	Kevin Lee - Maintenance	Blowers ran well until process
		Henry N. Wochholz WTP.				909-795-2491 ext 2	changed in 2007.
		Calimesa, CA 92320					
11	4061	City of Livingston WWTP	TX	Robuschi RB150-2	6/13/1991	City of Livingston, TX	One blower lost bearings
		Livingston, TX				Tim Smith	in early 2008
						936-327-3251	
12	4185	Winterset WTP	IA	Robuschi RB80-3	6/14/1992	City of Winterset, IA	Replaced two 20 HP motors
		Winterset IA 50273				Perry Watson	Blowers run fine.
						515-462-3764	One Blower Lost Oil
						Jack Loynachan, superintend	April 2011 - Was Repaired

13	4006	Arapahoe Co Water and Waste Water Authority 13031 East Caley Ave. Centennial, CO 80111	CO	Robuschi RB140-3 Robuschi 100-2	1993	Les Nelson 303-903-8947	Replaced one blower in 2005. Three of five are in service with 15000 to 20000 hrs each.
14	5058	Town Of Sahuarita Wastewater Treatment Plant 375 W Sahuarita Sahuarita, AZ 85629	AZ	Robuschi RBS95 -2	12/19/2008	Town Of Sahuarita Public Works Dept. Al Davis cell 760-705-5245 520-344-7100 aldavis@powerc.net	Startup Dec. 2008
15		Two Rivers WWTP 1015 S Lakeview Dr Manitowoc, WI 54220	WI	Robuschi 100 Hp ROBOX ES 106/4C - 3	4/1/2008	City of Two Rivers Larry Lambries 920-793-5558 office 920-973-8070 cell	
16		Parker Sanitation WWTP 19801 E Main St Parker, CO	CO	Robuschi 125 Hp ROBOX ES 115/4C - 3	6/21/2008	Parker Sanitation James Roche 303-841-8058 office	Startup 2008
17	5123	Muddy Creek WWTP 14655 Hopewell Church Road Midland, NC 28107	NC	Robuschi RBS 46/15-2 Robox ES 2 46/25 - 2	4/10/2010	Water & Sewer of Cabarrus Co. Mark Lomax 704-786-1783 x 31 mlomax@wsaacc.org	Startup June 2010
18	5053	Neuse River WWTP 8500 Battle Bridge Rd. Raleigh, NC 27610	NC	Robuschi RBS 165/350/NE -3	12/21/2009	City of Raleigh Bruce Norris 919-661-4637 luther.norris@raleigh.nc.us	Startup May 2010
19	5077	NSD SOSC Plant 1515 Soscol Ferry Rd. Nappa, CA 94559	CA	Robuschi RBS 75/25/NE -2	1/29/2009	Napa Sanitation District Brian Thomas 707-312-1566 BTHOMAS@napasan.com	Startup April 2009
20	5076	McCordsville WWTP 8260 N. 600 West McCordsville, IN	IN	Robuschi RBS 86/60/NE- 2	2/9/2009	Town Council of McCordsville Ron Crider 260-351-3284	Startup May 2009
21	5086	Van Buren WWTP 9341 East 400 North Van Buren, IN 46991	IN	Robuschi RBS 65/25/NE-2 ROBOX ES	8/27/2009	City of Van Buren Frank 765-934-4665	Startup Nov. 2009
22	5092	Zapata WTP Kennedy & 10th Street Zapata, TX	TX	Robuschi RBS 66/25/NE-2	12/4/2009	Zapata County Waterworks Mingo Castaneda 956-236-4130	Startup May 2009
23	5093	Atkins WTP 293 Galla Park Rd. Pottsville, AR 72858	AR	Robuschi RBS 105/75/NE-1	8/26/2009	Town of Arkansas Terry 479-968-2782	Startup May 2010

APPENDIX D

Stocking History for Rainbow Trout

APPENDIX D. STOCKING HISTORY FOR RAINBOW TROUT.

Date	No. of Fish	Length (in)	Hatchery Source
5/6/1992	19,433	2.4	Giant Springs Trout Hatchery
5/20/1992	20,000	2.5	Giant Springs Trout Hatchery
6/9/1992	16,972	4	Big Springs Trout Hatchery
6/9/1992	44,583	3.9	Big Springs Trout Hatchery
6/9/1992	59,680	4	Big Springs Trout Hatchery
6/9/1992	69,480	3.9	Big Springs Trout Hatchery
6/18/1992	19,910	4	Big Springs Trout Hatchery
6/8/1993	50,540	3.2	Big Springs Trout Hatchery
6/8/1993	55,100	3.2	Big Springs Trout Hatchery
6/15/1993	6,800	3.4	Giant Springs Trout Hatchery
6/16/1993	17,000	3.4	Giant Springs Trout Hatchery
6/16/1993	33,200	2.5	Giant Springs Trout Hatchery
6/16/1993	39,524	2.8	Giant Springs Trout Hatchery
5/31/1994	64,440	3.3	Big Springs Trout Hatchery
5/31/1994	66,588	3.3	Big Springs Trout Hatchery
5/31/1994	66,588	3.3	Big Springs Trout Hatchery
5/30/1995	51,122	4.1	Bluewater Springs Trout Hatchery
5/30/1995	58,905	4	Bluewater Springs Trout Hatchery
6/1/1995	45,239	4.3	Bluewater Springs Trout Hatchery
6/13/1995	10,000	4.3	Bluewater Springs Trout Hatchery
6/13/1995	35,437	4.3	Bluewater Springs Trout Hatchery
5/28/1996	50,502	3.9	Bluewater Springs Trout Hatchery
5/28/1996	63,128	3.9	Bluewater Springs Trout Hatchery
5/29/1996	53,530	4.2	Bluewater Springs Trout Hatchery
6/18/1996	42,688	3.8	Bluewater Springs Trout Hatchery
6/2/1997	37,011	4	Bluewater Springs Trout Hatchery
6/9/1997	29,105	4.2	Bluewater Springs Trout Hatchery
6/9/1997	37,891	4.2	Bluewater Springs Trout Hatchery
6/11/1997	32,436	4.3	Bluewater Springs Trout Hatchery
6/11/1997	50,275	4.3	Bluewater Springs Trout Hatchery
5/26/1998	54,443	3.8	Bluewater Springs Trout Hatchery
5/26/1998	55,822	3.8	Bluewater Springs Trout Hatchery
5/28/1998	55,741	3.8	Bluewater Springs Trout Hatchery
6/2/1998	34,362	3.9	Bluewater Springs Trout Hatchery
6/1/1999	37,944	4.3	Bluewater Springs Trout Hatchery
6/1/1999	47,430	4.3	Bluewater Springs Trout Hatchery
6/3/1999	36,720	4.4	Bluewater Springs Trout Hatchery
6/3/1999	36,720	4.4	Bluewater Springs Trout Hatchery
6/7/1999	34,260	4.4	Bluewater Springs Trout Hatchery

Date	No. of Fish	Length (in)	Hatchery Source
6/6/2000	200,000	4	Ennis National Fish Hatchery
6/4/2001	80,564	4	Ennis National Fish Hatchery
6/5/2001	84,328	4	Ennis National Fish Hatchery
6/6/2001	56,536	4	Ennis National Fish Hatchery
6/21/2001	27,000	5	Ennis National Fish Hatchery
4/11/2002	7,920	7.2	Washoe Park Trout Hatchery
4/15/2002	8,910	7.2	Washoe Park Trout Hatchery
4/17/2002	1	1	Big Springs Trout Hatchery
4/17/2002	9,900	7.2	Washoe Park Trout Hatchery
4/17/2002	11,880	7.2	Washoe Park Trout Hatchery
4/18/2002	11,055	7.2	Washoe Park Trout Hatchery
6/3/2002	14,880	6.5	Big Springs Trout Hatchery
6/5/2002	4,680	5.8	Big Springs Trout Hatchery
6/5/2002	10,463	6.5	Big Springs Trout Hatchery
6/11/2002	235,461	4.2	Ennis National Fish Hatchery
4/3/2003	7,020	7.8	Washoe Park Trout Hatchery
4/4/2003	7,020	7.8	Washoe Park Trout Hatchery
4/7/2003	7,020	7.8	Washoe Park Trout Hatchery
4/8/2003	7,020	7.8	Washoe Park Trout Hatchery
4/9/2003	7,020	7.8	Washoe Park Trout Hatchery
4/9/2003	7,020	7.8	Washoe Park Trout Hatchery
4/10/2003	7,800	7.9	Washoe Park Trout Hatchery
5/15/2003	11,550	7.04	Giant Springs Trout Hatchery
5/15/2003	11,880	7.04	Giant Springs Trout Hatchery
5/19/2003	13,657	6.5	Giant Springs Trout Hatchery
3/24/2004	2,320	8.14	Washoe Park Trout Hatchery
3/25/2004	6,690	8.14	Washoe Park Trout Hatchery
3/25/2004	7,292	8.14	Washoe Park Trout Hatchery
3/26/2004	7,292	8.14	Washoe Park Trout Hatchery
3/26/2004	7,292	8.14	Washoe Park Trout Hatchery
3/29/2004	7,292	8.14	Washoe Park Trout Hatchery
3/29/2004	7,292	8.14	Washoe Park Trout Hatchery
3/30/2004	7,292	8.14	Washoe Park Trout Hatchery
3/30/2004	7,292	8.14	Washoe Park Trout Hatchery
3/31/2004	7,292	8.14	Washoe Park Trout Hatchery
4/1/2004	5,115	8.13	Washoe Park Trout Hatchery
10/21/2004	21,739	6	Ennis National Fish Hatchery
10/22/2004	1	5.23	Big Springs Trout Hatchery
10/22/2004	22,544	6	Ennis National Fish Hatchery
4/7/2005	10,500	7.09	Washoe Park Trout Hatchery

Date	No. of Fish	Length (in)	Hatchery Source
4/8/2005	10,500	7.09	Washoe Park Trout Hatchery
4/12/2005	10,350	7.1	Washoe Park Trout Hatchery
4/15/2005	10,868	7.1	Washoe Park Trout Hatchery
6/9/2005	33,000	4.39	Ennis National Fish Hatchery
6/13/2005	33,000	4.51	Ennis National Fish Hatchery
6/15/2005	34,000	4.55	Ennis National Fish Hatchery
6/27/2005	55,000	3.5	Washoe Park Trout Hatchery
4/3/2006	8,360	7.2	Washoe Park Trout Hatchery
4/4/2006	10,159	7.2	Washoe Park Trout Hatchery
4/5/2006	10,956	7.2	Washoe Park Trout Hatchery
4/6/2006	10,965	7.2	Washoe Park Trout Hatchery
4/7/2006	10,956	7.2	Washoe Park Trout Hatchery
4/8/2006	10,956	7.2	Washoe Park Trout Hatchery
4/11/2006	8,300	7.2	Washoe Park Trout Hatchery
6/14/2006	34,744	4	Ennis National Fish Hatchery
6/14/2006	40,530	4	Ennis National Fish Hatchery
6/14/2006	111,066	2.89	Washoe Park Trout Hatchery
6/19/2006	33,162	4	Ennis National Fish Hatchery
6/19/2006	35,006	4	Ennis National Fish Hatchery
6/20/2006	33,612	4.3	Ennis National Fish Hatchery
6/20/2006	35,625	4	Ennis National Fish Hatchery
4/9/2007	11,602	6.78	Washoe Park Trout Hatchery
4/10/2007	11,602	6.78	Washoe Park Trout Hatchery
4/11/2007	11,602	6.78	Washoe Park Trout Hatchery
4/12/2007	11,602	6.78	Washoe Park Trout Hatchery
4/13/2007	10,468	6.78	Washoe Park Trout Hatchery
4/16/2007	10,469	6.88	Washoe Park Trout Hatchery
4/17/2007	5,200	6.88	Washoe Park Trout Hatchery
5/30/2007	19,747	5.2	Bluewater Springs Trout Hatchery
6/4/2007	40,875	4.09	Bluewater Springs Trout Hatchery
6/4/2007	41,030	4.03	Bluewater Springs Trout Hatchery
6/6/2007	39,045	4.15	Bluewater Springs Trout Hatchery
6/6/2007	39,270	4.14	Bluewater Springs Trout Hatchery
6/11/2007	42,075	4.23	Bluewater Springs Trout Hatchery
5/28/2008	36,765	4.09	Bluewater Springs Trout Hatchery
5/28/2008	36,765	4.09	Bluewater Springs Trout Hatchery
6/2/2008	40,000	4.27	Bluewater Springs Trout Hatchery
6/2/2008	44,064	4.27	Bluewater Springs Trout Hatchery
6/4/2008	46,542	4.03	Bluewater Springs Trout Hatchery
6/4/2008	52,808	3.83	Bluewater Springs Trout Hatchery

Date	No. of Fish	Length (in)	Hatchery Source
6/1/2009	48,031	4	Bluewater Springs Trout Hatchery
6/1/2009	48,544	4	Bluewater Springs Trout Hatchery
6/10/2009	37,173	4	Bluewater Springs Trout Hatchery
6/10/2009	43,202	4	Bluewater Springs Trout Hatchery
6/15/2009	18,280	4	Bluewater Springs Trout Hatchery
6/15/2009	38,612	4	Bluewater Springs Trout Hatchery
6/15/2009	39,874	4	Bluewater Springs Trout Hatchery
6/7/2010	48,007	4.18	Bluewater Springs Trout Hatchery
6/9/2010	40,128	3.96	Bluewater Springs Trout Hatchery
6/9/2010	53,127	4.15	Bluewater Springs Trout Hatchery
6/14/2010	26,719	3.88	Bluewater Springs Trout Hatchery
6/14/2010	30,080	4.05	Bluewater Springs Trout Hatchery
6/14/2010	55,378	3.9	Bluewater Springs Trout Hatchery
6/13/2011	50,827	4.02	Bluewater Springs Trout Hatchery
6/13/2011	51,041	4.05	Bluewater Springs Trout Hatchery
6/15/2011	50,136	4.15	Bluewater Springs Trout Hatchery
6/27/2011	39,508	4.46	Bluewater Springs Trout Hatchery
6/29/2011	13,500	4.37	Bluewater Springs Trout Hatchery
6/29/2011	36,040	3.89	Bluewater Springs Trout Hatchery
6/29/2011	36,523	3.91	Bluewater Springs Trout Hatchery
7/2/2012	57,358	3.91	Bluewater Springs Trout Hatchery
7/2/2012	59,798	3.93	Bluewater Springs Trout Hatchery
7/5/2012	39,571	4.07	Bluewater Springs Trout Hatchery
7/26/2012	109,477	2.12	Bluewater Springs Trout Hatchery
7/15/2013	34,819	4.26	Bluewater Springs Trout Hatchery
7/15/2013	36,179	4.24	Bluewater Springs Trout Hatchery
8/12/2013	68,529	2.89	Bluewater Springs Trout Hatchery
7/14/2014	48,899	4.16	Bluewater Springs Trout Hatchery
7/14/2014	54,560	4.18	Bluewater Springs Trout Hatchery
8/18/2014	69,095	3.02	Bluewater Springs Trout Hatchery
8/18/2014	99,897	2.97	Bluewater Springs Trout Hatchery

APPENDIX E

Agency Consultation



IN REPLY REFER TO:

MT-432
PRJ-18.00

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Region
Montana Area Office
P.O. Box 30137
Billings, Montana 59107-0137

JUL 08 2015

ORIGINAL

Peter Clermont
Director
Aquila Infrastructure Management Incorporated
55 University Avenue, Suite 201
Toronto, Ontario Canada M5J 2H7

Subject: Re: Clark Canyon Dam Hydroelectric Project Licensing, Clark Canyon Dam
Hydroelectric Project, Federal Energy Regulatory Commission (FERC)
No. 14677-001, Beaverhead County, Montana

FILED
SECRETARY OF THE
COMMISSION
2015 JUL 13 A 9:44
FEDERAL ENERGY
REGULATORY COMMISSION

Dear Mr. Clermont:

In response to your June 22, 2015, correspondence, Reclamation submits that since the previous licensing effort, the East Bench Unit and Clark Canyon Dam meets the criteria to become eligible to be listed on the National Register of Historic Places. Further consultation with the State Historic Preservation Office and final eligibility determination will need to be completed. Reclamation reserves the right to comment more specifically when more detailed information is provided. New or relevant resource information may come to light and will be provided at that time.

Reclamation will assume the licensing schedule noted in your transmittal is unofficial until a formal commitment from the Commission on what an expedited licensing schedule would look like is issued. As you and your consultants move forward with your re-Licensing efforts, be mindful of the status of work remaining to move the project forward to construction, these include but are not necessarily limited to:

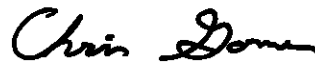
- Formal submittal of the dual bifurcation Value Engineering proposal.
- Acceptance of the design package by Reclamation
- Execution of the Construction Operation and Maintenance Agreement
- Submittal and approval of an Emergency Action Plan
- Submittal and approval of a Site Security Plan
- Submission of Surety Bond or Irrevocable Letter or Credit
- Submittal and acceptance of construction submittals.
- Receipt of Notice to Proceed from the Federal Energy Regulatory Commission

Reclamation continues to support your efforts in developing Clark Canyon Dam. At this point, Reclamation has stopped all work and staff has re-prioritized workload. It should be understood that any project re-initiation will take substantial coordination and time.

To that end, the sooner a full project schedule is developed and provided to Reclamation the sooner we can develop a workload planning effort.

If you have any questions, please contact Chris Gomer at 406-247-7312, or e-mail cgomer@usbr.gov.

Sincerely,



Chris Gomer
Facility O&M Division

Enclosure

cc: Ms. Kimberly Bose
Secretary
Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street Northeast
Washington, DC 20426

Mr. Dennis Miotke, Manager
East Bench Irrigation District
1200 Highway 41
Dillon, Montana 59275

Dan Sharp
Northwest Engineering Services
1190 Stocks Avenue
Rexburg, Idaho 83440

Clark Canyon Hydro

June 12, 2015

Richard Long, Facility Operation & Maintenance Division
U.S. Bureau of Reclamation
P.O. Box 30137
Billings, MT 59107-0317

Re: Clark Canyon Dam Hydroelectric Project Licensing

Dear Richard Long,

Clark Canyon Hydro, LLC (Clark Canyon) appreciates the cooperation from local, state and federal agencies and other stakeholders in the federal licensing of the Clark Canyon Dam Hydroelectric Project (Project) which began with a Stage One Consultation document in 2004 and resulted in issuance of a license by the Federal Energy Regulatory Commission (FERC or Commission) 2009 (FERC No. 12429). Since the license issuance, Clark Canyon has also appreciated agency and stakeholder assistance with numerous resource protection plans as well as the engineering design process in preparation for the start of construction of the Project. The last ten years has been a substantial effort for all involved. Despite these efforts, Clark Canyon was unable to begin construction of the Project, and FERC terminated the license on April 20, 2015. *Clark Canyon Hydro, LLC*, 150 FERC ¶ 61,195 (2015).

Clark Canyon intends to finish development of the Project by applying for another original license with FERC. In order to ensure Clark Canyon's priority to the site vis-à-vis other potential developers, on April 21, 2015, Clark Canyon applied for a preliminary permit for the site. FERC has assigned the permit application proceeding Project No. 14677, and it is expected that any license application submitted by Clark Canyon will be assigned this docket number as well.

Clark Canyon is also initiating the process to develop a new license application for the Project. The Commission's order terminating Clark Canyon's original license recognized Clark Canyon's efforts to develop the Project and encouraged Clark Canyon to continue these efforts. The Commission specifically stated that Clark Canyon could file a new license application, which the Commission could address on an expedited basis if Clark Canyon obtains concurrence from affected federal and State agencies and other interested stakeholders and makes a filing that includes all necessary information. The Commission further indicated that it did not anticipate Clark Canyon would need to perform much additional work to prepare a new application, and indicated it expected FERC Staff would work with Clark Canyon to determine what portions of the FERC licensing regulations could be waived and other steps taken to develop an expedited process. *Clark Canyon Hydro, LLC*, 150 FERC ¶ 61,195, at P 55 (2015).

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105		

2164 Channing Way, #131
Idaho Falls, ID 83404
U.S.A.

55 University Avenue
Toronto ON M5J 2H7 Canada
Tel: 416.340.1937

Through this letter, Clark Canyon is informing federal and State resource agencies and stakeholders of its intent to submit another original license application and its proposed plan to develop this application on an expedited basis, consistent with the FERC regulations. Clark Canyon intends to prepare a license application pursuant to section 4.38 of the Commission's regulations, 18 C.F.R. § 4.38, which begins with the transmittal of an Stage One Consultation document to the agencies and stakeholders. This initial consultation package must include a description of the proposed project and supporting information; information on project design, the impact of the proposed project, reasonable hydropower alternatives, and what studies the applicant should conduct, including the following as set forth in section 4.32(b)(2) of FERC's regulations, 18 C.F.R. § 4.32(b)(2):

- (1) detailed maps showing the project boundaries and the specific location of proposed project features;
- (2) a general engineering design of the proposed project;
- (3) a summary of the proposed operational mode of the project;
- (4) identification of the environment to be affected, the significant resources present, and Clark Canyon's proposed environmental protection, mitigation, and enhancement plans;
- (5) streamflow and water regime information, including drainage area, natural flow periodicity, monthly flow rates and durations, mean flow figures illustrating the mean daily streamflow curves for each month of the year at the point of diversion or impoundment, with location of the stream gauging station, the method used to generate the streamflow data provided, and copies of all records used to derive the flow data used in the engineering calculations;
- (6) a statement of whether Clark Canyon will seek benefits under the Public Utility Regulatory Policies Act of 1978; and
- (7) detailed descriptions of any proposed studies.

Section 4.38 of FERC's regulations also provides that Clark Canyon must hold a joint meeting no earlier than 30 days, but no later than 60 days, from the date the Stage One Consultation document is submitted to the agencies, 18 C.F.R. § 4.38(b)(3), and further provides an opportunity for agencies and stakeholders to provide comments on the Stage One Consultation document, to request studies, and to review and comment on the draft license application. 18 C.F.R. § 4.38(b)(5) and (c)(4).

To facilitate the preparation of a new license application for the Clark Canyon Project, Clark Canyon intends to request waiver of certain FERC regulations pursuant to section 4.38(e). 18 C.F.R. § 4.38(e). Clark Canyon anticipates that such requests for waiver will include waiver of the requirement to submit a notice of intent and pre-application document (18 C.F.R. §§ 5.5. and 5.6), waiver of certain time periods set forth in section 4.38, including, if agreed upon by the agencies and Indian tribes, a shortened comment period on the Stage One Consultation document and the draft license application. Clark Canyon anticipates requesting such waivers as part of the filing of its final license application with the Commission.

The proposed Clark Canyon Project (FERC No. 14677) would be located on an existing Clark Canyon dam owned by the U.S. Bureau of Reclamation south of the city of Dillon Montana. A map of the proposed project is included with this letter. The proposed 4.7-MW project would operate in run-of-river mode using flows from the Beaverhead River. The project configuration is approximately the same as that which was previously licensed, with minor changes in the size of the turbines (but not the installed capacity) and the size of some conduits connected to the turbines.

The following is Clark Canyon's proposed preliminary schedule for preparation of a new license application for the Project:

Preliminary Date:	Major Schedule Item:
July 17, 2015	Stage 1 Consultation Document transmitted to the agencies and stakeholders <p><i>This document contains project descriptions including boundaries, feature dimensions/location, operation, stream flow & water regime information, environmental & anticipated effects of the proposed project, and a detailed list of studies & methodologies that has been completed.</i></p> <p><i>On a typical project this document would be more conceptual and preliminary. However, since this project has gone through extensive licensing and engineering over the last 10 years this document will include information that has been developed over this time in consultation with the agencies and stakeholders.</i></p>
August 17, 2015 <i>preliminary date</i>	Public Meeting in Dillon, Montana <p><i>The meeting will be held in Dillon, Montana with an opportunity for a site visit. At least 15 days before the meeting a letter will be provided to the agencies and stakeholders containing information on the time and location. This information will also be included the local newspaper at least 14 days prior to the meeting.</i></p>
August 31, 2015	Comments on the Stage 1 Consultation Document Due <p><i>Within 60 days comments on the Stage 1 Consultation Document and associated studies are due.</i></p> <p><i>Clark Canyon would like to discuss with the agencies and stakeholders at the meeting whether it is feasible for this time period to be shortened to 45 days from the issuance of the Stage 1 Consultation Document.</i></p>
September 9, 2015	Draft License Application transmitted to the agencies and stakeholders <p><i>The draft license application includes the information in the Stage 1 Consultation Document and responds to any comments and recommendations made by any resource agency and Indian tribes. Also includes a discussion of the study results and any proposed protection, mitigation and enhancement measures.</i></p>
October 9, 2015	Comments on the Draft License Application Due <p><i>Because of the last 10 years of licensing and engineering with consultation with resource agencies and stakeholder the Draft License Application will be the same as the Stage 1 Consultation with the addition of the comments</i></p>

Preliminary Date:	Major Schedule Item:
--------------------------	-----------------------------

and recommendations. Upon agreement with the agencies and stakeholder, Clark Canyon anticipates requesting a shortened 30-day comment period for the Draft License Application.

October 16, 2015	License Application filed with the FERC with copies sent to the agencies and stakeholders
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After the License Application has been filed with the FERC, FERC will begin the post-application process during which it will solicit comments, terms and conditions, and recommendations from the agencies and/or stakeholders and issue an environmental document.

If you have any questions or concerns or updates to contact information, please contact Erik Steimle at Erik.Steimle@erm.com. Clark Canyon expect to transmit its Stage 1 Consultation Document to you by July 17, 2015. We are requesting that information be sent to us within 30 days of the date of this letter. If you have any questions or need additional information feel free to contact:

Erik Steimle
Erik.Steimle@erm.com
503-998-0230

Please send any hard copy correspondence to the following address:

Clark Canyon Hydro
12184 Channing Way, #131
Idaho Falls, ID 83404

Sincerely,

Clark Canyon Hydro, LLC



Peter Clermont
Director

2184 Channing Way, #131
Idaho Falls, ID 83404
U.S.A.

55 University Avenue
Toronto ON M5J 2H7 Canada
Tel. 416.340.1937

Document Content(s)

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Teleconference Memorandum

**Environmental
Resources
Management**

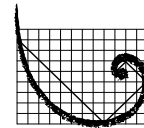
Date: 23 June 2015

Subject: Clark Canyon Dam Hydroelectric Project Licensing
(FERC No. 12429) Request for Information

1001 SW 5th Avenue,
Suite 1010
Portland, OR 97204
(503) 488-5282
(503) 488-5124 (fax)

Matt Jaeger with Montana Fish, Wildlife and Parks (MFWP) received the request for information (RFI) letter and reached out by telephone to Erik Steimle of ERM on June 23rd, 2015.

Mr. Jaeger asked questions about the timeline and process of the proposed project. Mr. Jaeger and Mr. Steimle discussed the project, water quality standards, and fisheries in the Beaverhead River.



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