ATTACHMENT H

AMES HYDROELECTRIC PROJECT

DESCRIPTION OF PROJECT FACILITIES

The Ames Hydroelectric Project is located approximately 9 miles south of the Town of Telluride, Colorado in San Miguel County. A vicinity map is provided on Figure 1. A map showing the Project facilities is provided as Figure 2.

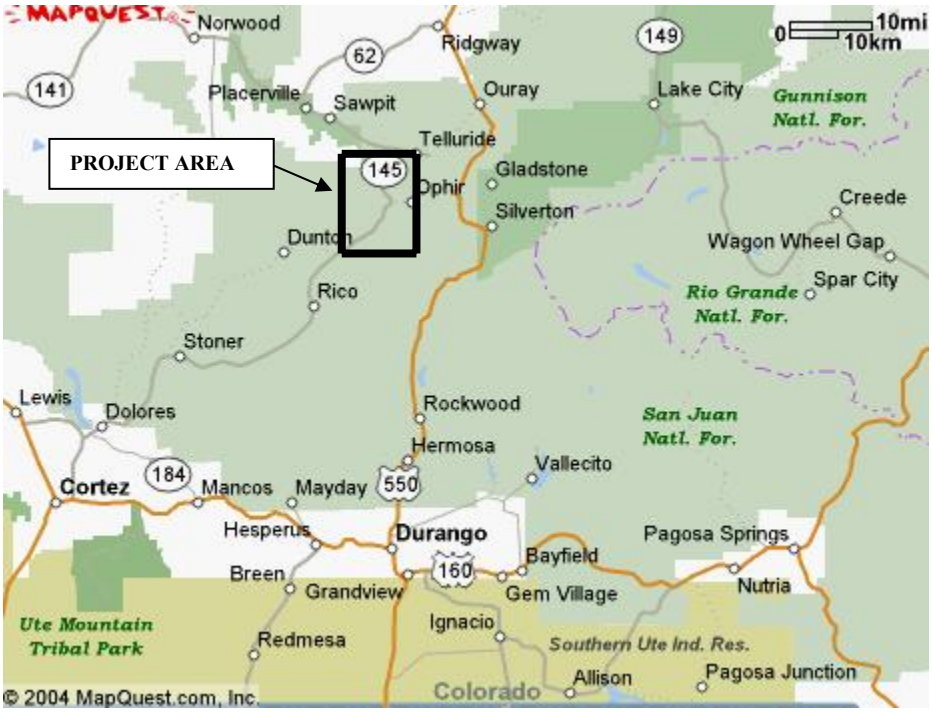

Figure 1

Vicinity Map

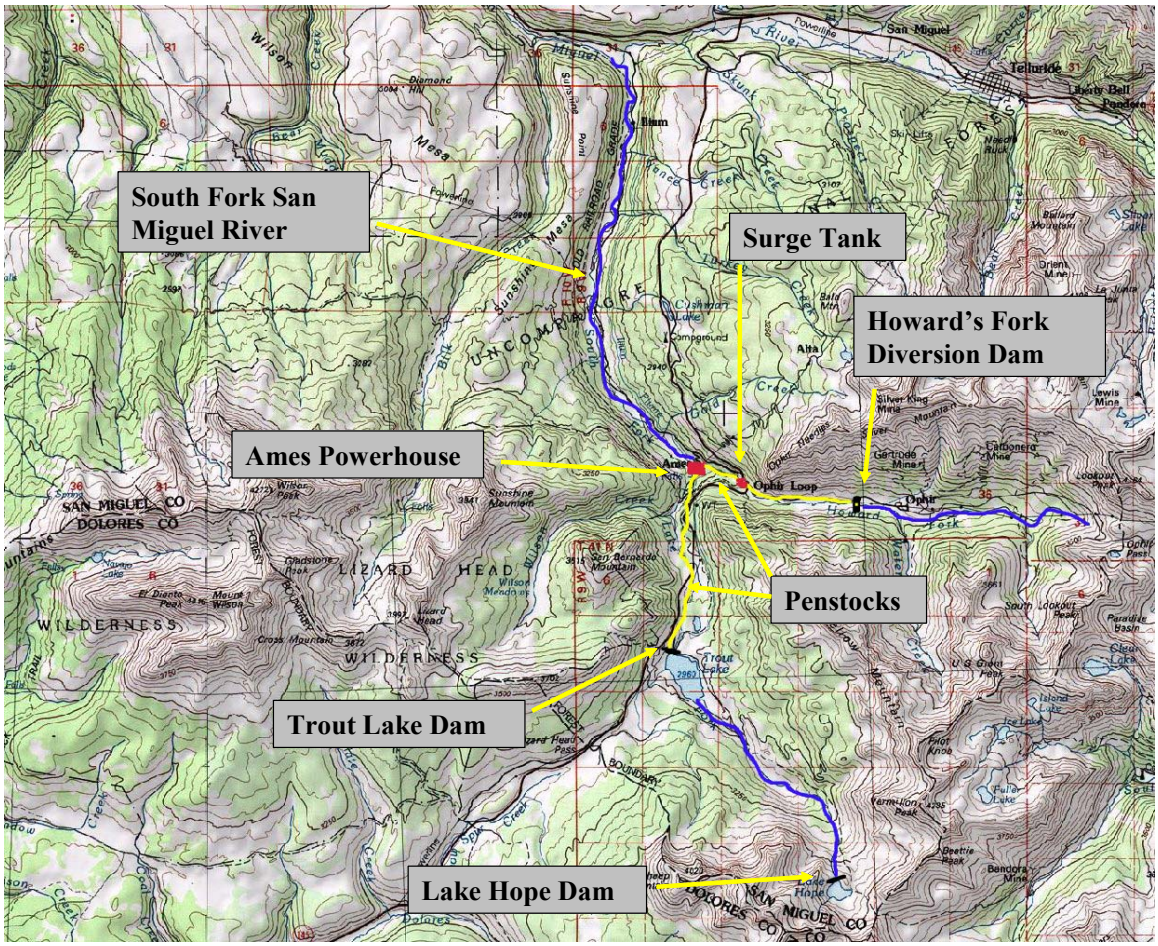

Figure 2
Ames Project

The Ames Project obtains its water supply from two separate sources, the Lake Fork and the Howards Fork of the San Miguel River. The primary source of project water supply constructed on the Lake Fork of the San Miguel River. Spring snowmelt runoff is stored in Lake Hope (Elevation 11,910 ft), which is located on United States Forest Service lands in an alpine basin above timberline, and in Trout Lake (Elevation 9707 ft), which is located private property. In late fall and winter, Lake Hope storage is released into the Lake Fork natural channel and flows through Forest Service lands approximately 3.25 miles to Trout Lake. Water is released from Trout Lake into a steel pipeline (penstock) that roughly parallels the Lake Fork and extends to the Ames powerhouse. This penstock traverses both Forest Service lands and private property, including the San Bernardo Subdivision and the Pathfinder gravel pit. The estimated static head between Trout Lake and the powerhouse is 1008 feet.

The secondary source of water for the Ames Project is the Howards Fork of the San Miguel River. The Howards Fork Diversion Dam is located on private property and conveys streamflows from the Howards Fork, into a steel pipeline (penstock) that extends to the Ames Powerhouse. This penstock traverses mostly Forest Service lands with pockets of private property. The Howards Fork Diversion Dam is located near the community of Ophir. The total static head between the Howards Fork diversion and the Ames powerhouse is 658 feet.

A. Project Dams

Lake Hope Dam

Lake Hope Dam is located about 5.5 miles southeast of the Ames powerhouse. In the early 1900s, the concrete, masonry and timber dam was constructed to augment storage in a natural lake. The dam is approximately 150 feet in length, with a maximum height of about 20 feet. Lake Hope has a reported capacity of approximately 2,300 acre-feet and a maximum surface area of about 44 acres. When the lake is full, natural streamflows are bypassed around the facility through an overflow spillway approximately 9 feet in width, located in the right abutment. The spillway is protected with timber planking placed over a bedrock foundation.

Water is released from Lake Hope into a 5-foot-wide by 6-foot-high unlined rock tunnel, which extends approximately 816 feet under the embankment and the reservoir. Water flows through fractured rock into the tunnel. Approximately 700 feet from its downstream end, the tunnel is sealed with a stone masonry bulkhead and flows from the reservoir are diverted into a pipe and valve assembly used to regulate releases. Releases are controlled by a 12-inch-diameter downstream butterfly valve. Three valves are located upstream of the control valve that can function as guard valves or backup control valves. These guard valves include a 12-in-diameter butterfly valve, a 10-inch-diameter Kennedy valve, and an 18-inch-diameter Ludlow valve.

Trout Lake Dam

Trout Lake Dam is a homogeneous earthfill embankment. The dam has a crest length of approximately 570 feet and a maximum height of about 30 feet. The dam crest is at Elevation 9716.9 ft. The downstream slope is 1.6H to 1.0V from the crest to a berm at Elevation 9700. Below the berm, the slope flattens to about 2.5H to 1V. An 8-inch-diameter slotted PVC toe drain is constructed at the toe of the berm. Another subsurface drainage feature includes approximately 70 feet of 8-inch-diameter slotted ADS drain pipe that was installed in 1987 when a wooden culvert was removed in this area. The crest width of the dam is 12 feet and the width of the berm is about 20 feet at its narrowest point. The berm accommodates a county road. The upstream slope of the dam is 2.75H to 1V and is protected by riprap. Trout Lake has a total storage capacity of approximately 3,200 acre-feet, but only about 2,500 acre-feet is active storage. The water surface area at the normal water surface (Elevation 9709.1 ft) is about 138 acres.

The outlet works at Trout Lake Dam consists of a 42-inch-diameter, concrete-encased steel pipe through the embankment. The outlet is connected directly to the Trout Lake penstock, which conveys water for hydroelectric generation to the Ames powerhouse. The outlet works intake includes a steel trash rack. A 36-inch-diameter, motor-operated, slide-gate serves as a guard gate at the outlet works intake. The motor operator is housed in a small timber-frame building mounted above the intake structure. Access to the valve house from the dam crest is via a steel truss footbridge.

Releases from Trout Lake into the penstock are controlled by remote communication from the Ames powerhouse to an electrically operated slide gate located in a concrete and timber valve vault approximately 500 feet downstream from Trout Lake Dam. Under normal operations, the 36-inch diameter guard gate at the inlet to the pipeline is kept open.

Howards Fork Diversion Dam

The Howards Fork diversion dam is a low earthfill and timber crib embankment extending across the main channel of the Howards Fork of the San Miguel River. The diversion dam is approximately 260 feet in length with a maximum height of

approximately 6 feet. The structure includes an overflow spillway constructed of reinforced concrete.

The intake for the Howards Fork penstock is a concrete side inlet structure, which diverts water from a sluiceway constructed through the embankment. Diversions are controlled by raising and lowering a 9-foot steel slide gate across the downstream end of the sluiceway, using a manually operated hoist. An upstream trash rack is provided to prevent rock and debris from entering the side channel inlet to the penstock.

B. Spillways

The service spillway for Trout Lake Dam includes two true siphons constructed in 1954. They consist of twin 5-foot by 5-foot steel siphon intakes leading to twin 6-foot-diameter steel conduits through the embankment. The siphons discharge spillway flows to the Lake Fork about 200 feet downstream from the dam. The original design drawings indicate that the discharge capacity of each siphon is about 580 cubic feet per second (cfs). The inlet to the siphon spillway is protected by a steel trash rack.

The emergency spillway for Trout Lake Dam is an excavated, riprap-lined, open channel constructed in the left abutment of the dam. The spillway crest is 120 feet wide. The spillway control section is a 6-foot-deep, 12-inch-wide reinforced concrete wall with a crest at Elevation 9709.9 ft. The emergency spillway crest is about 0.8 feet higher than the elevation where the siphon spillway begins to operate (Elevation 9709.1 ft) and about 7.0 feet below the dam crest (nominal Elevation of 9716.9 ft). A second 6-foot-deep, 12-inch-wide reinforced concrete wall is located across the spillway channel, approximately 100 feet downstream of the dam centerline.

C. Ames Powerhouse

The Ames powerhouse contains one generating unit with a generating capacity of 3.6 megawatts (MW). Flows conveyed from Trout Lake and from the Howards Fork are not intermingled because of the different heads at the powerhouse. The static head from

Trout Lake Dam and the Howards Fork Diversion Dam is 1,008 and 658 feet, respectively. Each source is connected to a separate turbine, both of which are connected to the generator. The Howards Fork penstock is connected to a 1,200 HP Pelton impulse turbine, and the Trout Lake penstock is connected to a 5,000 HP Pelton impulse turbine.

The Ames powerhouse building, with exterior dimensions of about 44 feet by 54 feet, is of cut stone masonry and is approximately 30 feet high. The roof structure is a clear span supported on steel trusses and is protected with wood shingles. Three transformers are located in a pit along the eastern wall of the building. The operator's office and control room is completely enclosed at the southeast corner of the building. The building also houses a workshop and storage area in the southwest corner of the building. A 16-ton manually operated bridge crane is provided in the building. The tailrace from the Ames powerhouse is a cut-and-cover channel discharging to the Howards Fork of the San Miguel River.

D. Intakes and Outlet Works

Trout Lake Penstock

The Trout Lake penstock is a steel pipe extending about 12,650 feet northerly and roughly parallel to the Lake Fork channel to the Ames powerhouse. Records indicate that the penstock varies in diameter from 42 inches at the dam to approximately 26 inches at the powerhouse. A 2,300-foot-long section of the penstock was replaced in 1984 with a 30-inch-diameter, fiberglass-reinforced pipe. The majority of the Trout Lake penstock is buried, with the exception of stream crossings and at locations where the alignment traverses along steep talus slopes. At these locations, the pipeline is supported by steel and timber trusses on concrete foundations.

At a location approximately 2,500 feet uphill from the powerhouse, the penstock was formerly connected to a surge line, consisting of an 11-foot-diameter steel pipe about 130 feet long and a 15-foot-diameter welded standpipe, 21 feet in height. In 1994, PSCo disconnected the Lake Fork surge tank from the penstock, based on a consulting engineer's recommendation. The high-pressure portion of the penstock was lined with

cement mortar in 1984. Cement mortar lining is provided in the 2,500 feet of penstock between the powerhouse and the surge tank wye and about 1,700 feet upstream of the surge tank wye.

Howards Fork Penstock

The Howards Fork penstock extends from the inlet structure at the Howards Fork diversion dam and flows westerly along the south bank of the Howards Fork to the Ames powerhouse. The penstock is approximately 6,500 feet in length. The first 4,500 feet of the penstock is constructed of 36-inch- diameter welded steel pipe, which terminates at a 20-foot-diameter by 30-foot-tall welded steel surge tank. At the surge tank, the Howards Fork penstock transitions to a 2,000-foot long, 18-inch- diameter steel pipe that is the high-head portion of the penstock.

E. Description of Project Operation

The operation of the project is impacted greatly by the amount of precipitation occurring during the winter months. Operations can also be impacted to a lesser degree by stream flows in previous years. The following is a description of project operation during a normal water year.

In late April to early May, the outlet valve of the Lake Hope Dam is closed to permit storage of the spring runoff in Lake Hope. The reservoir rarely fills completely to the point of spilling and is never filled completely during drought conditions. The water is retained in storage throughout the summer season. The dam outlet valve is opened in late October or early November to release the stored contents into the natural stream channel and into Trout Lake.

During normal water years, Trout Lake is filled by runoff during the spring and early summer. The lower siphon spillway typically operates for a brief period each summer. Runoff conditions typically exist from late April through July, with peak runoff flows occurring in mid-June. During the runoff period, the plant is operated at a constant daily output, otherwise known as a base load schedule. Over a number of weeks, the

output of the plant is increased gradually in order to maximize electric generation from the runoff flows while at the same time allowing Trout Lake to fill. During the peak runoff period, the plant is operated at maximum capacity. Beginning in August, the plant is operated at a reduced capacity in base load mode in order to maintain the level of Trout Lake to within several feet of the spillway crest. In August and September, the output of the plant is gradually reduced as stream flows subside and stabilize.

Following the end of the runoff season, the plant is operated on a peaking schedule from Monday through Friday. Under the peaking schedule, the plant is operated at a higher load on-peak from 10:00 a.m. to 10:00 p.m. and at a lower output off-peak from 10:00 p.m. to 10:00 a.m. The plant output during the on-peak and off-peak periods is adjusted occasionally to maintain the water level in Trout Lake within several feet of the normal maximum elevation. Beginning in late November to early December, the output of the plant is increased during the on-peak and off-peak periods to gradually draw down the water level in the reservoir during the winter months. The output of the plant is further increased at the end of the winter to reach the minimum normal operating pool level as runoff approaches. The plant operation reverts to the base load mode in mid-April. The maximum reservoir elevation corresponds to a staff gauge reading of 34 feet and the minimum normal operating level occurs at a staff gauge reading of 12-14 feet. The staff gauge reading indicates the vertical distance from the water surface elevation to the top of the reservoir outlet pipe.

The Howards Fork Diversion Dam is operated in a run-of-river mode. Available flows are diverted to the plant up to the maximum capacity of the penstock.

F. Recreational Opportunities

The primary recreational opportunities associated with the Ames Project are fishing, picnicking, and boating at Trout Lake and fishing at Lake Hope. Other opportunities include those allowed in the surrounding Forest Service lands such as hiking and cross-country skiing.

H. Cultural Resources

The Ames project has significant historical value. It was the first hydroelectric project in the world to generate, transmit, and provide for use A.C. power. Its design involved the work of pioneers in the design and transmission of electricity generation, including Tesla and Nunn. The powerhouse is the original building designed and constructed for the project.