EXHIBIT M

DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT APPLICATIONS - OAR 345-21-015(m); PROJECT ORDER, PARAGRAPHS 17 AND 18

Applicant must obtain the following permits from the Oregon Department of Environmental Quality (DEQ) prior to the commencement of Project construction and/or operation:

Air Contaminant Discharge Permit
Water Pollution Control Facilities Permit
General Stormwater Discharge Permit for Construction Activities

Applicant hereby provides copies of the Application for Air Contaminant Discharge Permit, along with the Prevention of Significant Deterioration (PSD) and Best Available Control Technology (BACT) analyses required for New Source Review, which was submitted to the DEQ on December 22, 1992, and which complies with the "Requirements for Air Quality Modeling Submittals."

Applicant also hereby provides a copy of the Cooling Water Reuse Land Application System Management Plan that it submitted to DEQ on December 14, 1992 as a request for the issuance of a Water Pollution Control Facility (WPCF) permit, consistent with DEQ's practice. This management plan complies with the "Checklist for Land Application of Industrial Wastewaters" prepared by DEQ.

A General Stormwater Discharge Permit for Construction is required to address erosion control for construction activity for the Project. Under DEQ rules, a Stormwater Discharge Permit is required for stormwater leaving an operating industrial site as a point source which can discharge to surface waters either directly or through a drainage system or storm sewer. Based on conversations with DEQ, no Stormwater Discharge Permit is required for plant operation because stormwater from the Project site will not discharge to surface water at a point source. A copy of the application for the General Stormwater Discharge Permit for Construction is hereby provided, along with a letter to DEQ confirming that no Stormwater Discharge Permit is required for operation of the Project.

December 21, 1992

U.S. Generating Company

Larry Miller
DEQ-AQ/PO
811 S.W. Sixth Avenue
Portland, OR 97204

Dear Larry,

Please find enclosed two (2) copies of the Application for Air Contaminant Discharge Permit for the Hermiston Generating Project, along with a check for $4,375 as the application fee for a natural gas-fired electric power generation facility of greater than 25 MW capacity. Also enclosed are ten (10) copies each of the Prevention of Significant Deterioration of Air Quality (PSD) analysis and the Best Available Control Technology (BACT) analysis required under Oregon's New Source Review program.

The Hermiston Generating Project is an energy facility subject to the Energy Facility Siting Council's (EFSC) site certificate review process. In that process, county jurisdiction is pre-empted by EFSC under ORS 469 and the subsequent opinion of the Attorney General. Attached is a copy of a letter from the Umatilla County Board of Commissioners confirming the deferral of permitting authority to EFSC and indicating that a Conditional Use Permit will not be required for the project. A land use compatibility statement has, therefore, not been prepared. Land use compatibility of the project will be considered by EFSC under OAR 345-22-030.

The PSD analysis evaluates two possible configurations for the facility, a nominal 468 MW plant and a nominal 232 MW plant. The two configurations are based multiples of identical gas turbines, and the results of the BACT analysis apply to either configuration. It is our intent to establish the final configuration of the project prior to the issuance of the permit, but to request that your review proceed based on the information provided here.

If there are any questions about this application, please feel free to contact me at (415)291-6417 or Roy Skinner at (916)983-7868. I look forward to working with you and the members of your staff on this project.

Sincerely,

Peter B. Evans

Peter B. Evans
Project Developer

Enclosures

[illegible] Market Street, Suite [illegible] · San [illegible], [illegible]

MAIL 2 COPIES OF THIS APPLICATION TO:
DEQ-AQ/PO
811 S.W. Sixth Avenue
Portland, OR 97204
Phone: (503) 229-5057 or 1-800-452-4011

DEQ USE ONLY
Permit No. ______
Appl. No. ______
Date Rec'd ______

RNW NEW MOD EXT

APPLICATION FOR AIR CONTAMINANT DISCHARGE PERMIT

(Cover sheet - see accompanying data sheets)

1. Official Application Identification:

HERMISTON GENERATING COMPANY, L.P.
Firm Name: This name will appear on the permit and must be the legal Oregon corporate name (i.e., Acme Products) or the legal representative of the company if the company operates under an assumed business name (i.e., John Smith, dba Acme Products).

444 Market Street, - 19th Floor
Mailing Address

San Francisco, Ca. 94111
City State Zip

(415) 291-6481
Phone

2. Source Site Description:

HERMISTON GENERATING PROJECT
Company Name Used at Site Location

Umatilla
Division County

705 Westland Road
Plant Site Address

Hermiston, Oregon 97838
City State Zip

Peter B. Evans
Contact Person at Plant Site

(415) 291-6417
Phone

3. Air contaminant source(s) and fees are shown below.

Air Contaminant Source (from Table 1)	SIC No.	Application Processing Fee	Compliance Determination Fee
Electric power generation c) Oil or Natural Gas Fired, 25 MW or more	4911	1800	2500
Standard Filing Fee		$ 75	
Total Amount Due:		$ 4375	

Please submit with this application a check payable to DEQ for the total amount due.

4. Is this application subject to: X New Source Review
X Prevention of Significant Deterioration

I hereby apply for permission to discharge air contaminants in the State of Oregon as stated or described in this application and certify that the information contained in this application, and the schedules and exhibits appended hereto are true and correct to the best of my knowledge and belief.

Francis X. DeRosa
(Name of owner or legally authorized representative)

F. X. DeRosa
(Signature)

Vice President
(Title)

12/21/92
(Date)

MISC\PMTFRM .55c

Engineers
Planners
Economists
Scientists

Portland Office

December 14, 1992

PDX35036.A0

Department of Environmental Quality (DEQ)
Water Quality Division
811 S.W. 6th Avenue
Portland, Oregon 97204-1390

Attention: Renato C. Dulay/DEQ/Manager Industrial & Onsite Waste
Joni Hammond/DEQ/Eastern Region

Subject: Hermiston Generating Company, L.P.
Cooling Water Reuse Land Application System Management Plan

Enclosed for your review are two copies of the final report on the Cooling Water Reuse Land Application System Management Plan prepared for Hermiston Generating Company. We have also sent a copy of the report to the Regional office. This report has been prepared and submitted to obtain a Water Pollution Control Facility (WPCF) permit for beneficial reuse of cooling water from the cogeneration facility being considered in the Hermiston area.

At your earliest convenience, we would like to schedule a meeting to go over the management plan with you. I will call to schedule a time. If you have any questions, please do not hesitate to call.

Sincerely,

CH2M HILL

Mark Madison

Mark Madison
Project Manager

jln/usgen.ltr
Enclosures (2)

cc: Roy Skinner/EnviroDynamics
Peter Evans/U.S. Generating
Al Williams/U.S. Generating
Jean Hopkins/U.S. Generating
Emmit Walker/Lamb-Weston
Dick Sandvik/Mosey Hunt
Nancy Craven/Ball, Janik & Novak
Kent Madison/Madison Ranches
Mike Henderson/Lamb-Weston
Walt McDevitt/Bud-Rich

Serving Oregon and Southwest Washington from two locations:

Portland Office	825 N.E. Multnomah, Suite 1300, Portland, OR 97232-2146	503.235.5000	503.235.2445 FAX
Corvallis Office	2300 N.W. Walnut Blvd., Corvallis, OR 97330-3538	503.752.4271	503.752.0276 FAX

Cooling Water Reuse Land Application System Management Plan

Hermiston Generating Company, L.P.
Cogeneration Facility
Hermiston, Oregon

Prepared by
CH2M HILL
Portland, Oregon

December 1992
PDX35036.A0

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Chapter 1
INTRODUCTION

OVERVIEW

Hermiston Generating Company, Limited Partners (L.P.), is proposing to construct a cogeneration facility adjacent to the Lamb-Weston potato processing plant in Hermiston, Oregon. The facility will be a combined cycle, 468-megawatt power plant that will use natural gas and low sulfur fuel oil as primary and backup fuel sources, respectively, for steam generation. Two gas turbines and two heat recovery steam generators will be used to generate electricity, and process steam will be supplied to the Lamb-Weston plant to offset the use of their existing boilers. A site plan for the facility is shown in Appendix A.

The cogeneration facility will require approximately 4 million gallons per day (mgd) of water for steam generation and process purposes. The water supply will be obtained from wells owned by Lamb-Weston or from the Columbia River through one of the following: the proposed Regional Water Supply Project of the Hermiston Development Corporation, industrial water rights held by the Port of Umatilla, or existing water rights held by Madison Ranches, Inc. Most of the water supply will be used by the heat recovery steam generators; generated steam will be condensed and pumped to cooling towers to provide water for the power plant cooling system. Evaporation through the cooling towers will account for much of the water, but about 1 mgd will require disposal.

Hermiston Generating Company, L.P., is proposing to provide a distribution system that will convey the power plant cooling water effluent to Madison Ranches for beneficial reuse. The cooling water, in which constituents become concentrated during facility usage, will be diluted with water from the Columbia River so that it can be used for crop irrigation. Madison Ranches has an approximately 875-acre site on its property that it plans to put into crop production through installation of an irrigation system consisting of seven center pivots. This site would be available for application of the cooling water to supplement or replace other irrigation sources currently used by Madison Ranches. In addition, other fields on the property that have already been permitted for application of potato processing water from the Lamb-Weston plant could receive the cooling water. Madison Ranches will also construct a storage reservoir to be used in conjunction with its irrigation systems to hold diluted cooling water or other irrigation water when supply exceeds application usages. The availability of reservoir storage will assist Madison Ranches in meeting peak irrigation requirements for application fields.

Before cooling water is used for irrigation of growing crops, it will be combined with Columbia River water to obtain constituent concentrations equal to or better than local groundwater for storage in the reservoir and/or to provide a suitable flow rate for sprinkler operation. The rate of water application will be carefully matched to crop water requirements to encourage root growth and avoid surface ponding or infiltration into local groundwater. During the winter, the cooling water may continue to be applied to the seven-pivot site at rates that will not exceed the water storage capacity of the site soils. The water stored in the soils will be used when crops begin to grow in the spring. Additional cooling water may be stored in the unlined reservoir after being diluted so that its infiltration into local groundwater will not have adverse impacts. Reservoir water will be used for irrigation as needed.

PURPOSE

This management plan has been prepared as part of an application for a permit from the Oregon Department of Environmental Quality (DEQ) for the proposed cooling water reuse land application system at the Madison Ranches site. The plan provides information on the two potential water sources for the cogeneration facility and the discharged cooling water that will result from each; general characteristics of the region in which the seven-pivot site is located with specific details on the site pertinent to land application; an analysis of the crop, loading, and storage requirements for the reuse system; a preliminary description of the facilities to be provided by Hermiston Generating Company, L.P., and by Madison Ranches; and plans for site operations and monitoring. Field data that will supplement or verify the information provided in the management plan will be provided to DEQ when available.

Chapter 2
WATER CHARACTERISTICS

SOURCE WATER

The cogeneration facility as proposed will require a water supply of approximately 4 mgd. One potential source for this supply is the Columbia River. Madison Ranches and the Port of Umatilla have existing water rights, and Hermiston Development Corporation has applied for rights, that would allow for the anticipated withdrawal. Water quality data for the river are shown in Table 2-1.

Another possible source for cogeneration facility process water is groundwater from three production wells on the Lamb-Weston potato processing plant site. The three wells are screened in the shallow alluvial aquifer with maximum depths of about 90 feet below ground surface. The wells are located in the Ordnance Critical Groundwater Area, which has been so designated by the Oregon Water Resources Department (OWRD) because of declining water levels attributed primarily to pumping rates that exceed those of natural recharge. The designation restricts groundwater use and prohibits additional pumping without artificial recharge. Water use by the cogeneration facility would replace existing uses and would not result in additional pumping of the aquifer.

Pertinent water quality data for the three production wells at the Lamb-Weston potato processing plant were not available during preparation of this report. Pending the receipt of data for these wells, information was obtained for a Lamb-Weston monitoring well designated as MW-4 and located on Madison Ranches property approximately 2.5 miles southwest of the Lamb-Weston plant. MW-4, which is also within the Ordnance Critical Groundwater Area, is screened in an elastic silt between 50 and 60 feet below ground surface and showed a static water level of 58 feet below ground surface in October 1991. Although the production wells for Lamb-Weston are likely screened in coarser materials, MW-4 is the nearest well to the cogeneration facility site that can be assumed to be representative of the potential groundwater source. Therefore, water quality data for MW-4 are included in Table 2-1. If groundwater is selected as the source water for the cogeneration facility, samples from the production wells will be collected and analyzed for standard inorganic parameters.

DISCHARGED COOLING WATER

Approximately 1 mgd of cooling water will be discharged from the cogeneration facility during normal operations, which are expected to be conducted year-round except for brief periods of forced outages or required maintenance. The constituent concentrations of the discharged water are expected to be up to six times those of the original source water. The potential concentrations of discharged cooling water for both groundwater and Columbia River water sources are shown in Table 2-1. The results indicate that among pollutant parameters for which numerical groundwater quality reference levels have been established in Oregon, the limiting factor for land application of cooling water effluent from the cogeneration plant may be total dissolved solids (TDS), as nitrate concentrations are minimal with either source. The secondary maximum contaminant level (MCL) for TDS in Oregon groundwater is 500 milligrams per liter (mg/L).

Table 2-1
Water Quality Data for the Cogeneration Facility Source and Discharge Waters

Constituent	Unit	Source Water: Columbia River at Boardman	Source Water: Groundwater at Lamb-Weston (MW-4) (a)	Potential Discharged Cooling Water (b): For Columbia River Water Source	Potential Discharged Cooling Water (b): For Groundwater Source
Alkalinity ($CaCO_3$)	mg/L	63	177	378	1062
Calcium	mg/L	19.4	43.8	116	263
Carbonate	mg/L	0	0	0	0
Iron	mg/L	0.109	0.344	0.65	2.06
Hardness ($CaCO_3$)	mg/L	69.9	176	419	1056
Bicarbonate	mg/L	77	216	462	1296
Chloride	mg/L	2.91	12.2	17.5	73.2
Nitrate and Nitrite	mg/L	0.137	0.741	0.82	4.45
Sulfate	mg/L	14.1	30	85	180
Potassium	mg/L	1.16	6.37	7.0	38.2
Magnesium	mg/L	5.24	16.2	31.4	97.2
Sodium	mg/L	5.64	20.4	33.8	122.4
Ammonia	mg/L	<0.06	0.14	0.36	0.84
Total Dissolved Solids	mg/L	107	366	642	2196

(a) Nearest well to facility site for which data are available; assumed to be representative of Lamb-Weston production wells.
(b) Assumes cooling water will be discharged when concentrations are six times those of the source water.

Chapter 3
SITE CHARACTERISTICS

The Madison Ranches property is located in Umatilla and Morrow Counties south of Interstate 84 (I-84), approximately 6 miles southwest of the city of Hermiston and 8 miles west of the city of Echo (see Figure 3-1). The approximately 4,600 acres of the property that would be available for land application of the cooling water are either wholly or partly located in sections 1, 2, 11-16, 23-26, and 34-36 of Township 3 North, Range 27 East and sections 6, 7, 17, 18, 19, 20, 30, and 31 of Township 3 North, Range 28 East. The seven-pivot site is located in sections 23, 26, 34, and 35 of Township 3 North, Range 27 East, in the southwest quarter of the property. Two potential reservoir sites have also been identified in Township 3 North, Range 27 East, one in sections 23 and 14 (the south site) and one in sections 14 and 11 (the north site). Both reservoir sites and the seven-pivot site are shown in Figure 3-2.

LAND USE AND CROP SELECTION

The acreage intended for land application is either in current agricultural use or planned for such usage in the near future. The 875 acres of the seven-pivot site were farmed with non-irrigated wheat for about 20 years (1966-1986) and are now planted in grass. Once an irrigation system has been installed, Madison Ranches plans to plant five of the center pivot fields in winter wheat and two in late/middle potatoes and will maintain that allocation when crops are rotated. The other 3,750 acres of fields that will be available for application of diluted cooling water during the growing season are planned for the following crops:

- Winter wheat, 2,000 acres
- Late potatoes, 750 acres
- Winter canola, 750 acres
- Corn and turnips, 250 acres

Irrigation water for the fields is currently obtained from surface water (canals connected to the Columbia and Umatilla Rivers and Butter Creek), groundwater, and process water from the Lamb-Weston plant. Under a separate management plan the Lamb Weston process water is managed as a separate source and is neither diluted nor mixed with other irrigation water except in the soil. Application rates for the Lamb-Weston process water are based on meeting crop fertilizer requirements; other irrigation sources are used to satisfy that portion of the crop water requirement not met at the process water application rate.

All the acreage used for land application now or in the future is wholly owned by Madison Ranches and members of the Madison family, who occupy dwellings on the property. Several ranch employees and occupants of rental houses are also residents. An 80-acre parcel of land surrounded by the Madison Ranches property is farmed and occupied by its owners, the Pedros. The Bureau of Land Management (BLM) also owns land within the Madison

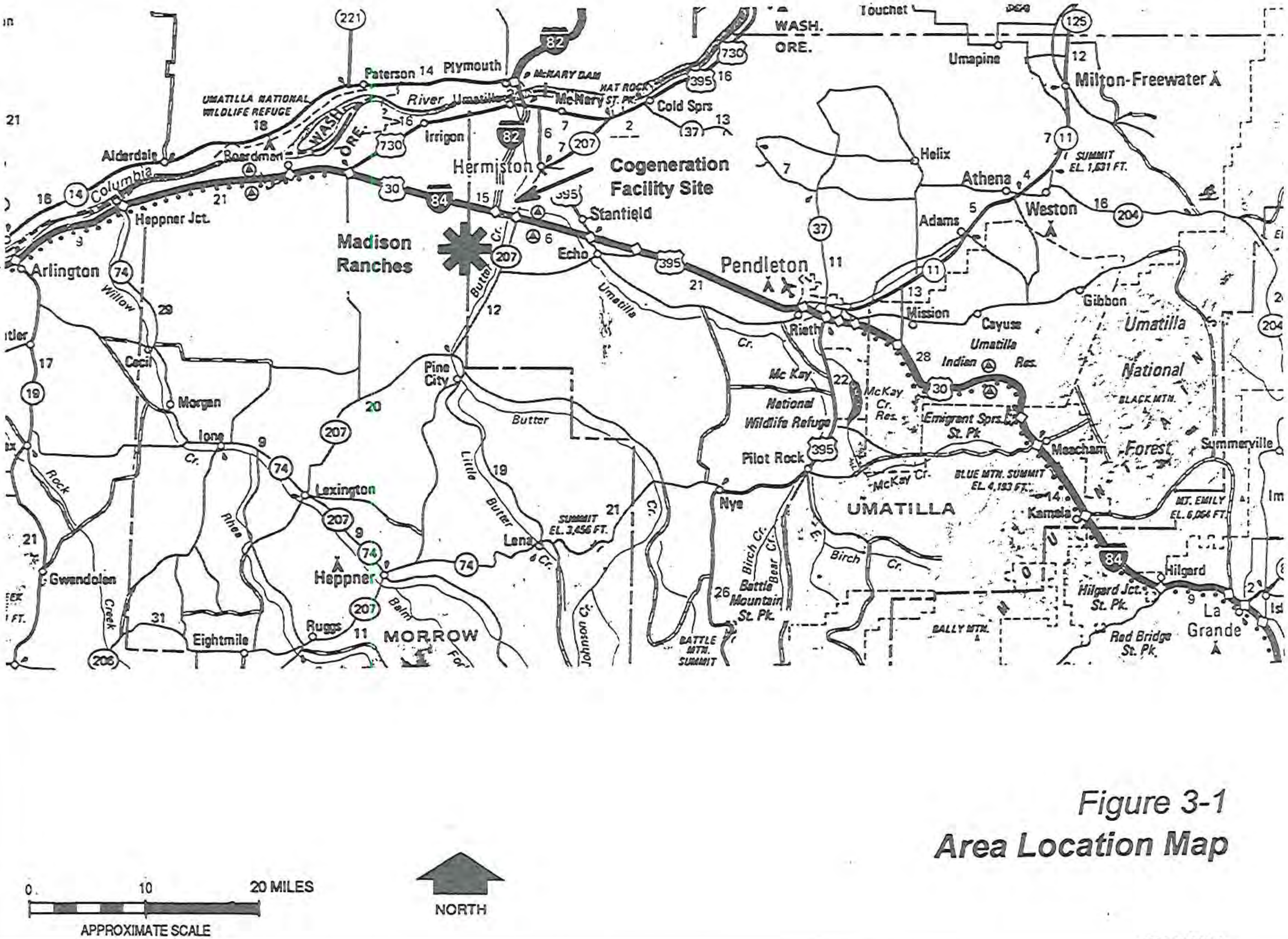


Figure 3-1
Area Location Map

CH2M HILL

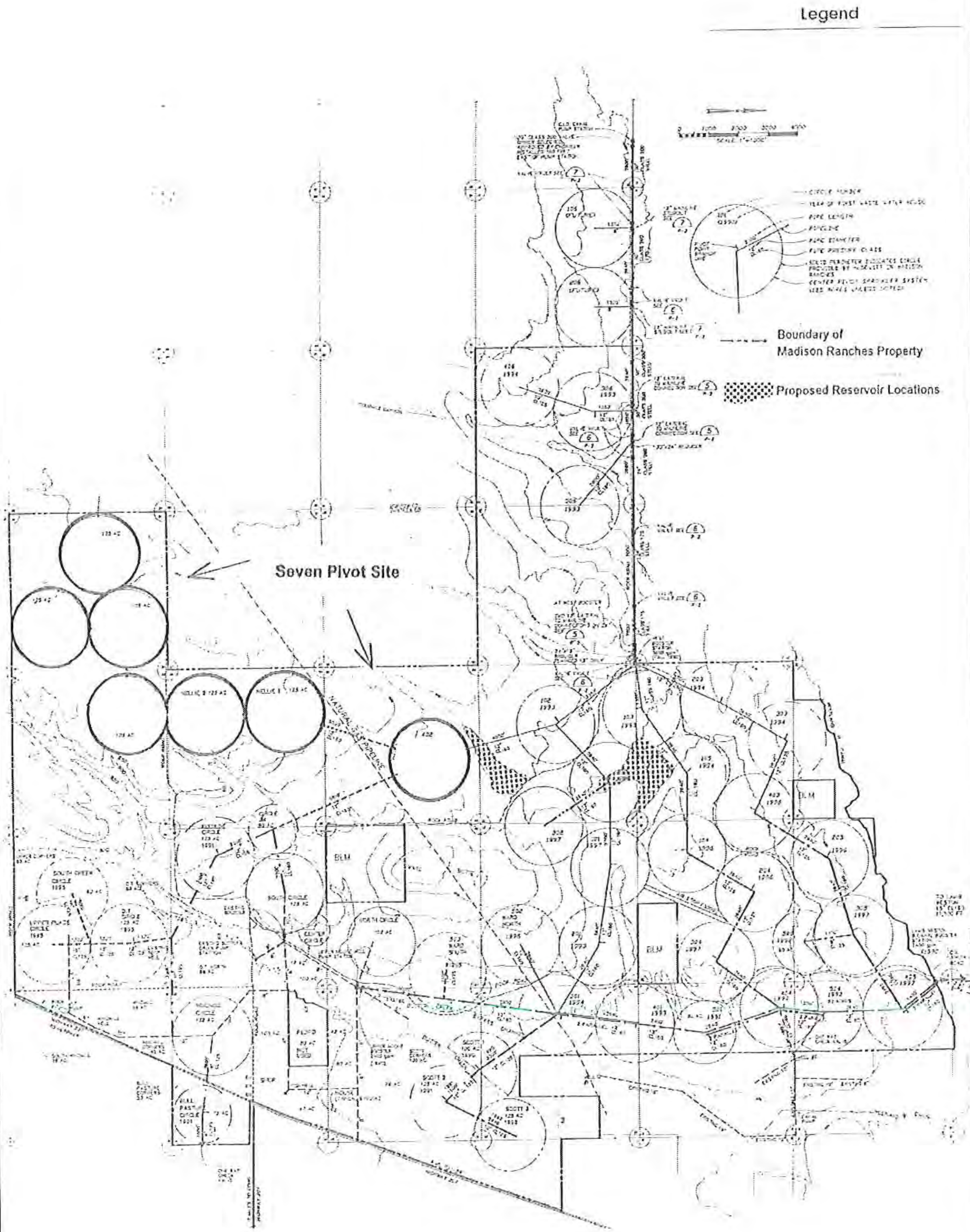


Figure 3-2
Site Location Map

property, as shown in Figure 3-2. The BLM land is leased by Madison Ranches for grazing and is not irrigated. Properties adjacent to the Madison property are sparsely populated, with residences spaced an average of 1 mile apart.

Primary access is provided by State Highway 207, which first encounters the Madison Ranches property about 2.5 miles south of I-84 and continues south along most of its eastern border for about 4 miles. Three gravel roads run from Highway 207 to various portions of the property. The property can also be reached by exiting I-84 at Westland Road/Colonel Jordan Road and traveling south approximately 1 mile. The site of the Lamb-Weston processing plant and the proposed cogeneration facility can be accessed by traveling north on Westland Road from I-84. The Madison Ranches property is completely fenced to control outside access.

A subsurface natural gas pipeline owned by Pacific Gas Transmission crosses the central portion of the Madison Ranches property from the northeast to the southwest.

TOPOGRAPHY

The Madison Ranches property lies in the central portion of the Umatilla Plateau of northeastern Oregon and along the southern flank of an east-west trending trough that has its axis defined by the course of the Columbia River. The land in this area slopes gently north from the Blue Mountains toward the Columbia River, which lies about 6 to 12 miles to the north of the property. The ground surface becomes increasingly flat to the north. The consistent gradient is occasionally interrupted by knolls and modest ravines formed by small drainage pathways that drain the hills toward the north. On average, the surface gradient on the property is 3 feet per 1,000 feet, or 0.3 percent, with a mean elevation of 820 feet above mean sea level (amsl). Topographic features include erosional remnant hills, such as Ward Butte, and the down-cut surface water channel of Butter Creek. Locally, Ward Butte acts as a small drainage divide.

The generally level topography in the area is favorable for land application, as it facilitates irrigation and high-yield farming while minimizing runoff potential.

SURFACE WATER

Surface water in the region drains from the Blue Mountains northward toward the Columbia River. The two primary drainages in the vicinity of the Madison Ranches property are the Umatilla River and Butter Creek, a tributary of the Umatilla River that flows through the southeastern portion of the property. The Umatilla River, at its closest point, passes the property approximately 2 miles to the north. Butter Creek, the principal recipient of drainage on the property, is a perennial stream that has its greatest flow during the winter and spring months. Flow diminishes through the summer and even ceases by autumn during dry years.

Various other ephemeral drainages traverse the property and trend northward. Their extent is limited, and all terminate before reaching the northern boundary of the property. The Westland Irrigation District B canal spans this boundary and partially diverts flow from the McKay Reservoir on the Umatilla River into Lost Lake, which is located on adjacent property to the northwest. Operational spills from the canal provide the primary water supply for Lost Lake, which contains water year-round.

CLIMATE

The Umatilla Plateau region is characterized by hot, dry summers and mild winters; it can be considered semiarid and classified as modified continental. The average annual temperature in the region is 53°F, based on average daily temperatures of 36°F and 71°F for winter and summer months, respectively (see Table 3-1). Diurnal temperature fluctuations of 20°F are common during the winter. The average number of frost-free days varies from 158 to 184, and the average length of the growing season is 191 days. The mean annual pan evaporation rate for the area is 56 inches (National Oceanic and Atmospheric Administration, 1990).

As shown in Table 3-1, average annual precipitation is 8.95 inches. Most precipitation occurs in the winter and spring (November to May), and the average total winter snowfall depth is 11 inches. The seven-pivot site is usually covered with at least 1 inch of snow for about 10 days during the winter months. The area has a maximum of 53 days of intermittently frozen surface soils in an average year (50 percent probability of occurrence, 2-year return period), typically occurring between November 15 and March 15 for durations of a few days to a few weeks (Zuzel et al., 1985).

The low levels of precipitation characteristic of the region are favorable for land application of cooling water, as precipitation will not be a limiting factor for irrigation during any part of the year. The potential for nutrient and salt leaching is also lessened by the small amount of natural moisture available to serve as a transport mechanism.

SOILS

In terms of soil characterization, the Madison Ranches property includes two fairly distinct areas: the bottomland that lies primarily to the east of Butter Creek and the higher uplands to the west of the creek. The bottomland generally encompasses a band of land approximately 1 mile wide that lies approximately 2 miles south of I-84 to 6.5 miles south of I-84 near the Echo junction on Highway 207 (approximately 1,800 acres). The uplands consist of an approximately 2-mile swath of land at higher elevations from about 1 mile south of I-84 and bordering the south bank of the Westland B Canal to 6.5 miles south of I-84 (approximately 4,600 acres). This area includes the 875-acre seven-pivot site, which will be further characterized in this section. Information about soils on other parts of the property has already been reported in the *Site Characterization of Soils: Lamb-Weston Proposed Land Application Program* prepared for Lamb-Weston by CH2M HILL in December 1991.

Table 3-1
Regional Temperature and Precipitation Data[a]

Month	Temperature (°F) Average Daily Maximum	Average Daily Minimum	Average	Average Number of Growing Degree Days	Average Precipitation (inches)
January	40.0	24.4	32.2	109	1.35
February	48.3	29.5	38.9	85	0.83
March	56.7	32.7	44.7	163	0.70
April	64.8	38.4	51.6	348	0.60
May	73.7	45.8	59.8	614	0.71
June	81.5	53.0	67.3	819	0.51
July	89.6	57.7	73.7	1045	0.20
August	87.6	56.3	72.0	992	0.38
September	79.4	47.9	63.7	711	0.39
October	66.2	37.9	52.1	375	0.71
November	50.3	31.1	40.7	119	1.19
December	42.8	27.3	35.1	46	1.38
Yearly:					
Average	65.1	40.2	52.7	--	--
Extreme	--	--	--	--	--
Total	--	--	--	5,426	8.95

[a]From National Oceanic and Atmospheric Administration (1990).

Soils data presented in this section were obtained from the *Soil Survey of Umatilla County Area, Oregon*, published by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in 1988. Evaluations of soil properties based on the data are conservative, to account for possible inaccuracies in the SCS soil mapping. An onsite soils investigation will be conducted to obtain data suitable for design of a land application system.

Table 3-2 provides an overview of the SCS soil mapping units delineated in the area of the seven-pivot site; Appendix B includes copies from the soil survey showing the locations of the units. The three main soil series mapped are the Shano, Burke, and Sagehill. The various mapping units of each respective soil series, with the exception of mapping unit 89B, are separated on the basis of a slope phase (e.g., 15B Burke silt loam, 1- to 7-percent slopes, is further delineated to mapping unit 15C, which is the Burke silt loam soils with steeper slopes ranging from 7 to 12 percent).

Most of the site soils are of the Shano series, which includes deep, well drained soils formed in loess over lake bed sediments. Shano soils are generally located on terraces in the Umatilla Plateau region. Typically, the surface layer of the soil is a grayish brown, very fine sandy loam about 2 inches thick over a brown coarse silt loam about 16 inches thick. The surface layer may also be a silt loam. From 18 inches to a depth of 60 inches or more is a light gray and brown silt loam. In some areas, a hardpan layer is found at depths ranging from 40 to 60 inches.

The Shano soils are moderately permeable and have an effective rooting depth of 60 inches or more, a medium runoff potential, and moderate erosion potential for both wind and water. Available water capacity (AWC) ranges from 10 to 13 inches, but will often increase when organic matter is added through such activities as plowing under crops. A tillage hardpan can form if this soil is tilled when wet and can be broken up by chiseling or subsoiling. On soil mapping unit 89B (Shano silt loam, 2- to 7-percent slopes), soil inclusions make up about 20 percent of the total acreage and include Adkins, Burke, Quincy, Sagehill, and small areas of Shano soils with 7- to 12-percent slopes.

The SCS data indicate that, on the Madison Ranches property, soil mapping unit 15B is underlain by an indurated hardpan at 26 inches. This hardpan has been modified by ripping to a maximum depth of 60 inches in most of the fields. Where ripping has occurred, the result has been increases in root depth and the soil water-holding capacity.

Because the proposed cogeneration facility will be discharging cooling water year-round, Madison Ranches may want to continue to apply the water during winter months when crop irrigation is not required at the seven-pivot site. During those months, the water-holding capacity of the site soils can be put to use for storage of the cooling water. Table 3-3 presents soil moisture storage data for the seven fields on the site based on the SCS soil mapping units, associated information from the SCS soil survey, and laboratory-derived data for similar soils on the Madison Ranches property. Additional physical and chemical data for each respective soil mapping unit can be found in Appendix B. Total AWC was estimated by multiplying the mean AWC by soil thickness. The residual volumetric moisture in October

Table 3-2
Soils Data for the 875-Acre Site

Mapping Unit No./Name		Soil Depth (inches) and Soil Texture	Available Water Capacity (inch/inch)	Total for 60-inch Soil Profile
15B 15C	Burke silt loam 1 to 7% slopes 7 to 12% slopes	0-8 coarse silt loam 8-26 coarse silt loam/silt loam 26 (duripan)	0.19-0.21 0.19-0.21 —	5 to 5.5 inches
87B 87C	Sagehill fine sandy loam 2 to 5% slopes 5 to 12% slopes	0-8 fine sandy loam 8-27 fine to very fine sandy loam 27-60 silt loam	0.18-0.20 0.18-0.20 0.18-0.20	10.8 to 12.0 inches
88B 88C 88D	Shano very fine sandy loam 2 to 7% slopes 7 to 12% slopes 12 to 25% slopes	0-13 very fine sandy loam 13-28 silt loam 28-60 silt loam	0.16-0.18 0.18-0.20 0.18-0.20	10.5 to 11.7 inches
89B	Shano silt loam 2 to 7% slopes	0-6 silt loam 6-18 silt loam 18-60 silt loam	0.18-0.20 0.18-0.20 0.18-0.20	10.8 to 12.0 inches

The following is a classification of these soils:

Adkins—coarse-loamy, mixed, mesic Xerollic Camborthids
Burke—coarse-silty, mixed, mesic Xerollic Durorthids
Quincy—mixed, mesic Xeric Torripsamments
Sagehill—coarse-loamy, mixed, mesic Xerollic Camborthids
Shano—coarse-silty, mixed, mesic, Xerollic Camborthids
Taunton—coarse-loamy, mixed, mesic, Xerollic Durorthids

was calculated by taking a ratio of ⅓- and 15-bar water (representing field capacity and wilting point conditions, respectively), multiplied by AWC times soil thickness. Therefore, the resulting AWC for October is derived by taking the total AWC and subtracting that residual water already present in the soil.

Table 3-4 summarizes the available soil moisture winter storage estimated for each of the seven fields. The first winter storage volume column is based on the assumption that the hardpan is not ripped and rooting depth is limited to 26 inches on all soils mapped as 15B. The second storage column assumes all soil depths are limited to 48 inches, which is the rooting depth of potatoes. The third column evaluates storage based upon the hardpan being ripped to 60 inches, two fields planted in potatoes, and five fields planted in wheat (at a rooting depth of 60 inches). This last scheme is considered the most likely, as this is the crop selection planned by Madison Ranches for the site and any hardpan that does occur has probably been ripped in the past or will be ripped before planting. The result for the final scheme is a winter storage volume of 232 acre-feet, based on the conservative values used. This storage potential will be maximized for the winter, because the root zones of these fields will be depleted of soil moisture in preparation for crop harvest.

Application of cooling water or other irrigation water at the site will be determined by the actual soil series, its associated AWC, and the crop grown. To assure conservative results, the soil series with the lowest water-holding capacity in each soil mapping unit will be the basis for water-holding capacity and water storage calculations. Winter storage capacity can also be assessed more accurately once an onsite soils investigation has been completed. This investigation will include determination of actual in-situ field capacities by one of the following methods:

- Field saturating the soil to 5 feet, allowing 2 to 3 days for gravity drainage, collecting soil samples from each soil horizon, and oven drying to determine a gravimetric moisture content. A water truck or cattle water tank could be used to saturate the soil adjacent to the soil pit. The gravimetric moisture content data will be converted into volumetric values using SCS-derived soil bulk density estimates.

- Field saturating the soil profile, allowing 2 to 3 days for gravity drainage, and using time domain reflectometry (TDR) to first determine percent volumetric soil moisture and then field capacity. The permanent wilting point (15-bar) water could then be determined by establishing specific plants adjacent to the soil pit, allowing the soil to dry to the permanent wilting point, and taking TDR soil moisture readings.

Table 3-3
Soil Moisture Storage Data for the 875-Acre Site

Field Number/ Soil Mapping Unit Number	Soil Mapping Unit Description	Approximate % and Acreage of Soil Mapping Unit in Field	Soil Depth (inches)/ Soil Texture[a]	Permeability (inches per hour)	Mean Available Water Capacity[b] (inch/inch)	Mean Bulk Density[b] (g/cm^3)	Total Available Water Capacity (inches)	Total Soil Water Storage[c] (acre/feet) 48" profile/60" profile	Estimate of Percent Residual Volumetric Soil Moisture in October[d] (inches of water)	Estimate of Initial Available Water Capacity in October
Nellie 1 Circle /15B	Burke silt loam, 1 to 7% slopes	80% (100 acres)	0-8—cosil 8-26—cosil/sil 26—duripan	0.6 - 2.0	0.20 0.20	1.22 1.45 -	5.2" (26" soil) 9.6" (48" soil) 12" (60" soil)	80/100	0-48" (assume 15% at 15 bars; 45% at 1/3 bar) $\Sigma = 3.2$ for 48" $\Sigma = 4.0$" for 60"	6.4"/8.0" - 15B
/88D	Shano very fine sandy loam, 12 to 25% slopes	20% (25 acres)	0-13—vfsl 13-28—sil 28-60—sil	0.6 - 2.0	0.17 0.19 0.19	1.27 1.37 1.37	8.9" (48" soil) 11.1" (60" soil)	18.5/23.1	0-13" (assume 10% 15 bar; 30% 1/3 bar) 13-60" (assume 15% at 15 bar and 45% at 1/3 bar) $\Sigma = 2.9$" for 48" $\Sigma = 3.7$" for 60"	6.0/7.4" - 88B
Nellie 2 Circle /88B	Shano,2 to 7% slopes	60% (75 acres)	See above	See above	See above	See above	See above	55.6/69.4	See above	See above
/88D	Shano,12 to 25% slopes	10% (10 acres)						8.9/11.1		
/15B	Burke silt loam	30% (40 acres)						30.4/38		
Sec. 35 Circle /88B	Shano very fine sandy loam, 2 to 7% slope)	100% (125 acres)	See above	See above	See above	See above	See above	92.7/115.6	See above	See above
Sec. 34 (SE 1/4)/88B Circle	Shano very fine sandy laom, 2 to 7% slope	100% (125 acres)	See above	See above	See above	See above	See above	9.27/115.6	See above	See above
Sec. 34 (West 1/2)88B Circle	Shano, 2 to 7%	70% (88 acres)	See above	See above	See above	See above	See above	65.3/81.4	See above	See above
/88C	Shano, 7 to 12%	20% (25 acres)						18.5/23.1		
/15C	Shano, 7 to 12%	10% (12 acres)						9.6/12.0		
Sec. 34 (NE 1/4) /88B Circle	Shano, 2 to 7%	90% (113 acres)	See above	See above	See above	See above	See above	83.8/104.5	See above	See above
/15C	Burke, 7 to 12%	10% (12 acres)						9.6/12.0		
S20 Circle /87B	Sagehill	40% (50 acres)	See above	See above	See above	See above	See above	52/65.6 for 87B and C	See above	See above
/87C	Sagehill	15% (19 acres)								
/15B	Burke	25% (31 acres)						24.8/31 for 15B		
/89B	Shano, 2 to 7% slopes	20% (25 acres)	0-6—sil 6-18—sil 18-60—sil	0.6 - 2.0 0.6 - 2.0 0.6 - 2.0	0.19 0.19 0.19	1.22 1.37 1.37	$\Sigma = 9.1$ (for 48" soil) $\Sigma = 11.4$" (for 60" soil)	19/23.8	0-60" (assume 15% 15 bar; 45% at 1/3 bar) $\Sigma = 3.0$ for 48" soil $\Sigma = 3.8$ for 60" soil	6.1/7.6 for 89B
								$\Sigma = 661.4/826.2$		

[a]Cosil= coarse silt loam; sil=silt loam, vfsl=very fine sandy loam.
[b]Information derived from Soil Survey of Umatilla County Area, Oregon (SCS, 1988).
[c]Based on Soil Survey AWC multiplied by soil thickness (e.g., 0.20 inch/inch x 60 inches = 12 inches of water in 60-inch soil profile).
[d]Estimates of initial volumetric moisture in October based on estimated 1/3- and 15-bar moisture (derived from laboratory data for similar textured soils on Madison Ranches property) taken as a percentage of total water or available water capacity times soil thickness (e.g., 0.08 inch/.25 inch) x (0.19 inch) x (27 inches) = 1.95 inches.

Table 3-4
Estimated Winter Storage Volumes for Soils at the 875-Acre Site

Field Number	Soil Mapping Unit Number	Approximate Area (Acres)	Available Water Capacity in October for 48-inch Soil Profile (inches)	Available Water Capacity in October for 60-inch Soil Profile (inches)	Mean[a] Precipitation for November, December, and January (inches)	Remaining[b] Soil Storage Volume with Unripped Hardpan (acre-feet)	Remaining Soil Storage Volume with Hardpan Ripped to 48 inches (acre-feet)	Remaining Soil Storage Volume for Two Fields in Potatoes (48-inch Rooting Depth) and Five Fields in Wheat (60-inch Rooting Depth) (acre-feet)
Nellie 1 Circle	15B	100	3.5 (6.4 inches if hardpan ripped)	8.0	3.9	—	21.0	21.0
	88D	25	6.0	7.4	3.9	4.4	4.4	4.4 Crop: potatoes
Nellie 2 Circle	88B	75	6.0	7.4	3.9	13.0	13.0	13.0
	88D	12	6.0	7.4	3.9	2.1	2.1	2.1
	15B	38	3.5 (6.4 inches if hardpan ripped)	8.0	3.9	—	7.9	7.9 Crop: potatoes
Sec. 35 Circle	88B	125	6.0	7.4	3.9	21.9	21.9	36.5 Crop: wheat
Sec. 34 Circle (SE ¼)	88B	125	6.0	7.4	3.9	21.9	21.9	18.7 Crop: wheat
Sec. 34 Circle (West ½)	88B	88	6.0	7.4	3.9	15.4	15.4	25.7
	88C	25	6.0	7.4	3.9	4.4	4.4	7.3
	15C	12	3.5 (6.4 inches for 48 inches)	8.0	3.9	—	2.5	4.1 Crop: wheat

Table 3-4
Estimated Winter Storage Volumes for Soils at the 875-Acre Site

Field Number	Soil Mapping Unit Number	Approx-imate Area (Acres)	Available Water Capacity in October for 48-inch Soil Profile (inches)	Available Water Capacity in October for 60-inch Soil Profile (inches)	Mean[a] Precipitation for November, December, and January (inches)	Remaining[b] Soil Storage Volume with Unripped Hardpan (acre-feet)	Remaining Soil Storage Volume with Hardpan Ripped to 48 inches (acre-feet)	Remaining Soil Storage Volume for Two Fields in Potatoes (48-inch Rooting Depth) and Five Fields in Wheat (60-inch Rooting Depth) (acre-feet)
Sec. 34 Circle (NE ¼)	88B	113	6.0	7.4	3.9	19.8	19.8	33.0
	15C	12	3.5 (6.4 inches for 48 inches)	8.0	3.9	---	2.5	4.1 Crop: wheat
S20 Circle	87B	50	5.6	7.0	3.9	9.8	9.8	17.8
	87C	19	5.6	7.0	3.9	9.8	9.8	17.8
	15B	31	3.5 (6.4 inches for 48 inches)	8.0	3.9	---	6.5	10.6
	89B	25	6.1	7.6	3.9	4.6	4.6	7.7 Crop: wheat
						Σ = 117.3	Σ = 157.7	Σ = 231.7

[a] Precipitation for February, also a nongrowing season month, was omitted from this column to approximately account for the total evaporation losses during the nongrowing season.
[b] Assumes the rooting depth of soil mapping unit 15B is 26 inches, the depth to the indurated hardpan.

GEOLOGY

STRATIGRAPHY

The Umatilla Basin in which the Madison Ranches property is located consists generally of unconsolidated fluvial and glacio-fluvial sediments and an underlying sequence of Miocene basalt flows of the Columbia River Formation (Hogenson, 1964), as illustrated in Figure 3-3. The sedimentary deposits include the following geologic units (from upper to lower):

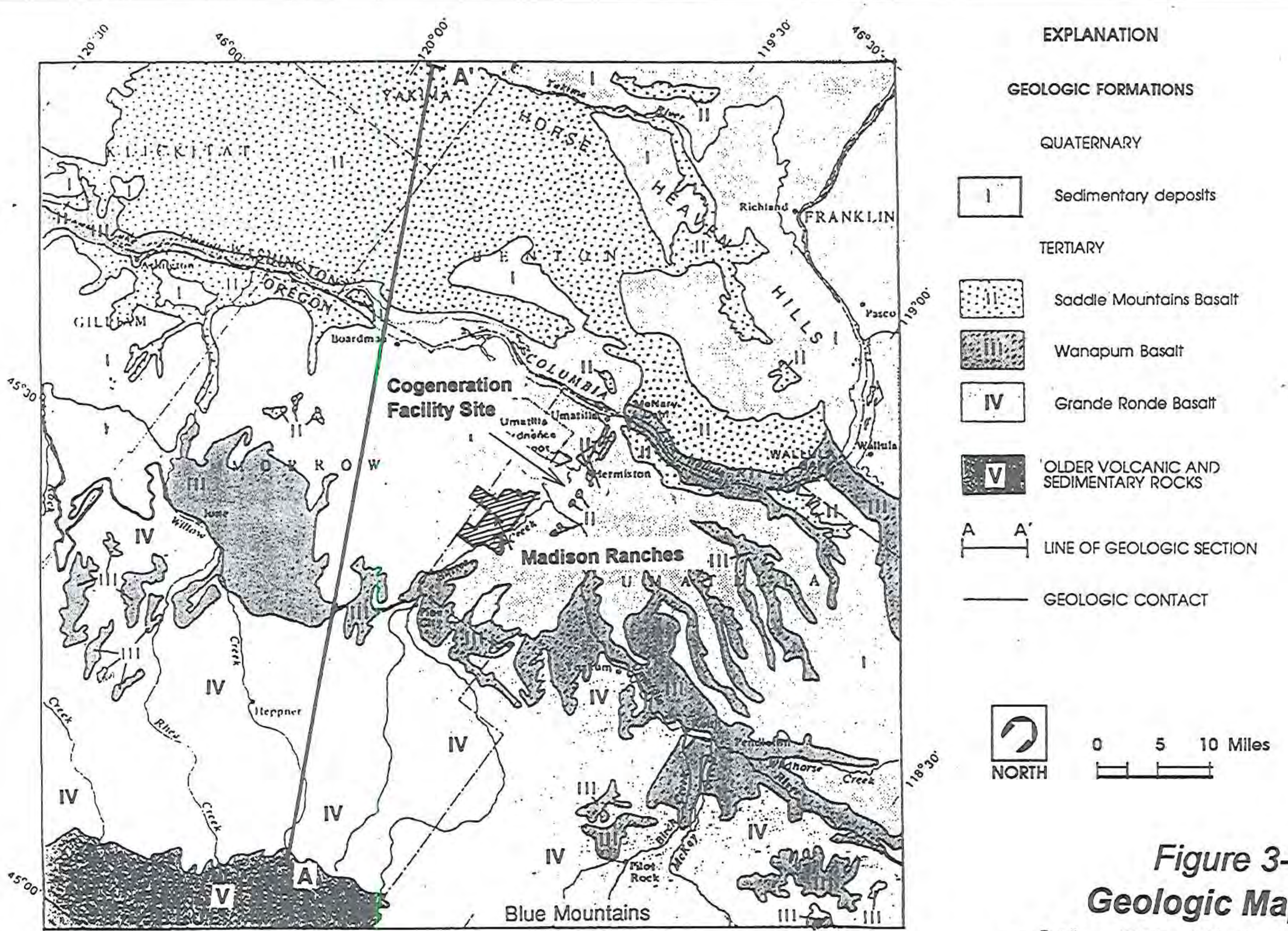
- The recent alluvium of Holocene age, which consists of poorly sorted, medium-grained sand and gravels that cover the Butter Creek flood plain. Where saturated, this material may yield quantities of water adequate for domestic wells (Robison, 1971).

- The older alluvium, which is composed of coarse sand and gravel sediments laid down by the Columbia River during flood stages in Pleistocene time. The sand and gravels (maximum thickness about 200 feet) were deposited in a shallow lake and stream environment on the underlying basalt surface. These deposits are poorly sorted and become progressively thinner to the south. At an elevation of approximately 750 feet, the gravel lens pinches out against the underlying fanglomerate. Coarse facies within this unit yield moderate to large quantities of water to wells where saturated (Robison, 1971).

- The fanglomerate of Pliocene age, which is a heterogeneous mixture of poorly sorted rock chips, sand, silt, and clay commingled with slope-washed debris derived from the weathered surface of the Columbia River basalt. In most places, these deposits are tightly cemented. Hogenson (1964) notes that, in addition to poor permeability, this formation generally stands above the regional water table and is not an important source of groundwater.

Additional sediments include loess deposits that cap the upland areas and a discontinuous clay and clayey gravel layer present along Butter Creek Valley at a depth of approximately 22 feet.

The depth to the interface of the sedimentary deposits with the basalt unit varies greatly in this area, ranging from approximately 20 to 275 feet according to Robison (1971). This unit, the Miocene flood basalts of the Columbia River Formation, comprises gray-to-black, dense, fine-grained, low-olivine basalt, locally porphyritic, deeply weathered, and laterized. Characteristically, the basalt flows have a dense center with minor vertical jointing and a scoriaceous or brecciated zone at the top and bottom (Davies-Smith et al., 1988). The upper surface may be weathered, and the base of the flow may show evidence of having been cooled in water. The individual basalt flows range in thickness from a few feet to as much as 300 feet, with the thickness of the entire basalt sequence as much as 10,000 feet (Davies-Smith et al., 1988).



SOURCE: U.S. Geological Survey

Figure 3-3
Geologic Map of the Site Vicinity

CH2M HILL

Porous zones between basalt flows, or interflows, consist of weathered basalt, flow-top breccia, and scoria. The interflows contain sedimentary interbeds ranging from a few feet to 200 feet in thickness that are composed most commonly of clay in the site vicinity. Deposits of silt, sand, and gravel are also found. The interflow zones provide the majority of groundwater for irrigation and domestic use in the Umatilla Basin and surrounding areas (Norton and Bartholomew, 1984).

STRUCTURE

The geologic structure of the area parallels the topographic expression of the ground surface, with the basalt zones and sedimentary deposits dipping northward toward the Columbia River. Structural features include a series of anticline-syncline pairs in the vicinity of the Madison Ranches property, as shown in Figure 3-4 and described below.

Basalt on both sides of the Columbia River dips gently toward the river in the Dalles-Umatilla syncline described by Newcomb (1967). For most of the length of the syncline, the axis lies along the Columbia River and diverges toward the Umatilla River valley near Hermiston (Davies-Smith et al., 1988). This structural feature is located approximately 10 to 12 miles north-northwest of the Madison Ranches property.

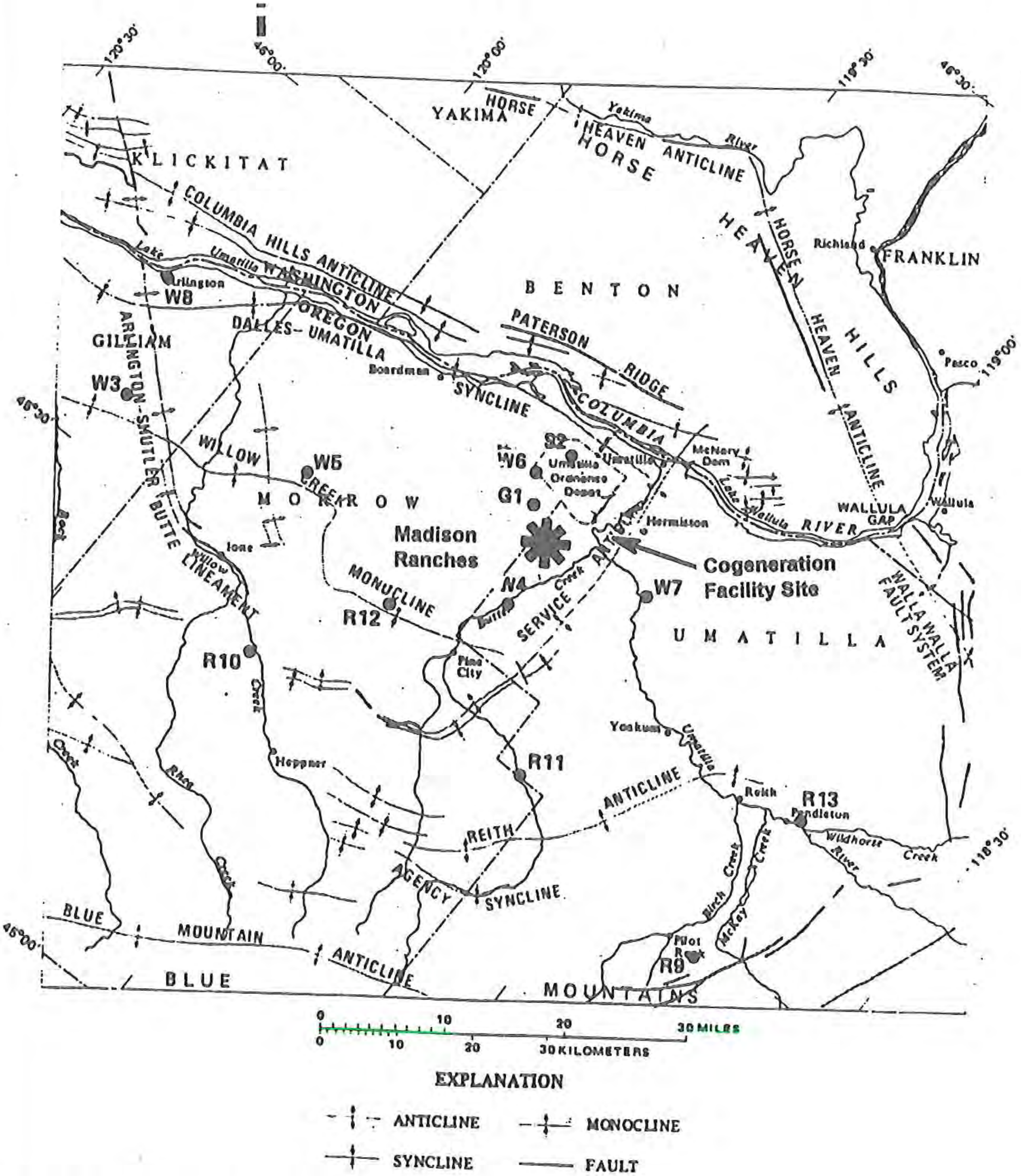
The property is bounded on the east by the Service anticline, a tight anticline-syncline pair faulted at some points along its length (Davies-Smith et al., 1988). The pair swings westward, as marked by thrust faulting and some normal faults, and extends as far west as Rock Creek (Swanson et al., 1981).

Approximately 10 to 15 miles south of the property is an arcuate topographic feature that extends east-west from south of Arlington to north of Pine City. This feature is called the Willow Creek monocline (Bela, 1982; Shannon and Wilson, Inc., 1973) and is noted as a hydrogeologic barrier for deeper basalt aquifers in the region (Davies-Smith et al., 1988).

Folding and faulting of sediments after initial basalt flow deposition are common in the region but have not been observed in the vicinity of the Madison Ranches property. Where folding occurs, it will cause dipping interflow contacts and may influence groundwater gradients, leading to unsaturated updip flow zones. Faulting can potentially offset water-bearing zones, possibly leading to groundwater boundaries (Newcomb, 1969).

HYDROGEOLOGY

Information on the hydrogeology of the region was derived primarily from a literature review. Additional data relevant to the 875-acre seven-pivot site were obtained from the results of monitoring well installation at the Madison Ranches property conducted for the Lamb-Weston land application system. An inventory of wells within the Madison property and a 1/2-mile radius of its boundary was prepared for the Lamb-Weston land application site and can be found in the report entitled *Wastewater Reuse Land Application System Management Plan* (CH2M HILL, December 1990).



Adapted from Davies-Smith, 1988.

Figure 3-4
Major Structural Features of the Region

LITERATURE REVIEW

Shallow Aquifer

The shallow aquifer in the site vicinity is located within the unconsolidated and unconfined sand and gravel deposits of the alluvial units that overlie the basalt (Robison, 1971). Northwest of the Madison Ranches property (near Lost Lake), permeable gravel beds supply groundwater to several high-yielding wells (McCall, 1975). The gravel interbeds are described as moderately thick with well capacities ranging from 400 to 3,000 gallons per minute (gpm). The saturated portion of this 100- to 125-foot thick section of alluvial material is approximately 25 feet thick, although local bedrock topography may cause the saturation thickness to vary from 15 to 125 feet.

In many areas of the property, the sedimentary deposits are of insufficient thickness and extent to serve as major groundwater reservoirs. The water table in these zones is in equilibrium with local stream levels and cannot be sustained during summer months by the base flow of streams such as Butter Creek. As a result, wells that are perforated within these sediments produce water only during winter, spring, and early summer months.

Static water levels in the shallow aquifer are generally around 55 feet below ground surface (Bartholomew, 1975). Water levels have been declining at an average of 1.6 feet per year since the early 1960s; near Lost Lake, water levels declined 12 to 29 feet from 1965 to 1975 (McCall, 1975). Less than 25 percent of the total annual precipitation (7 to 9 inches per year average) is estimated to be available for recharging the alluvial sediments (McCall, 1975). Normal irrigation practices in the Hermiston area also provide some recharge, along with an approximately 15 percent leaching fraction. On Madison Ranches property, a neutron probe is used to monitor soil moisture to encourage deficit irrigation and control leaching to near zero.

Based on the topography of the region, shallow groundwater flow direction appears to be north-northwest, toward the Columbia River. Local variations may exist in response to topographic highs such as Ward Butte, where shallow groundwater is expected to flow eastward toward Butter Creek. This trend is repeated on the west side of Ward Butte, where shallow groundwater may flow slightly westward before assuming a northward direction.

In some bottomland areas near Butter Creek, stratigraphic observations and static water levels have indicated that fine-grained clay and clayey gravel horizons in the alluvial deposits can act as confining beds to the downward movement of water from precipitation and recharge. As a result, a perched water table exists within about 20 feet of the surface in areas where these layers are present (Robison, 1971). As with many of the sedimentary deposits in the region, this zone of saturation is expected to be in equilibrium with nearby Butter Creek and will, therefore, diminish in value as an irrigation source as flow in the creek decreases through the summer and into the fall. This type of zone does not occur in the upland area where the seven-pivot site is located.

Basalt Aquifer

Water-bearing zones of significant storage capacity are found within the interbeds of the basalt flows that lie beneath the sedimentary deposits in the region. Though poorly connected, these zones are routinely viewed as one system because of the large degree of vertical movement of water through joints in the basalt and the large number of uncased wells in the area, which have greatly increased the vertical movement of groundwater between interbeds. The confined and semiconfined nature of the units also means that changes in pressure in the system have far-reaching effects.

A geologic map prepared by Robison (1971) shows basalt depths ranging from 700 to 1,100 feet below ground surface across the Madison Ranches property. Static water levels in the main water-producing zones range from 200 to 300 feet below ground surface and have declined significantly for many years because of overpumping and slow recharge (Norton and Bartholomew, 1984). Groundwater recharge occurs several miles south of the site in the Blue Mountains (Norton and Bartholomew, 1984), while natural groundwater discharge is into the Columbia River and its tributaries.

Groundwater flow direction is north-northwest in the basalt interflow zones (Bartholomew, 1975). The Willow Creek monocline located south of the Madison Ranches property forms a barrier to groundwater flow (Davies-Smith et al., 1988). It appears that the continuity of interflow zones is interrupted across this feature or that the transmissivity of the zones is severely diminished. This structural feature is located upgradient of the property and would not inhibit flow from the seven-pivot site; however, it may decrease the availability of recharge flowing from higher elevations to the underlying basalt units.

ONSITE MONITORING WELLS

Five monitoring wells were installed on the Madison Ranches property (see Figure 3-5 for locations) during a field investigation conducted by CH2M HILL in October 1991 for the Lamb-Weston land application system. The wells were designed to monitor the first encountered groundwater in the shallow alluvial aquifer and varied in depth from 18 to 172 feet below ground surface. MW-2 and MW-3 are closest to the 875-acre seven-pivot site and the potential reservoir sites; MW-4 is the well for which water quality data were used in Chapter 2 to approximate conditions for the production wells on the site of the Lamb-Weston potato processing plant. A detailed description of the monitoring wells is provided in *Groundwater Investigation Results at Madison Ranch* (CH2M HILL, July 1992); the following information about site hydrogeology is summarized from that report:

- Drilling encountered typical fluvial and alluvial deposits consisting of interbedded silts, silty sands, sands, and gravels with clay. At MW-2, an occasional clay layer was encountered at depths greater than 115 feet below ground surface within a thick sequence of elastic silts with sand. This well encountered water at 165 feet and had a static water level of about 154 feet. At MW-4, the uppermost 9 feet of the borehole consisted of sands and clays of a stabilized dune overlying the typical silts. Individual beds of silt, sand, clay, or gravel are likely to be laterally discontinuous, although general lithologic characteristics appear to be relatively consistent across the site.

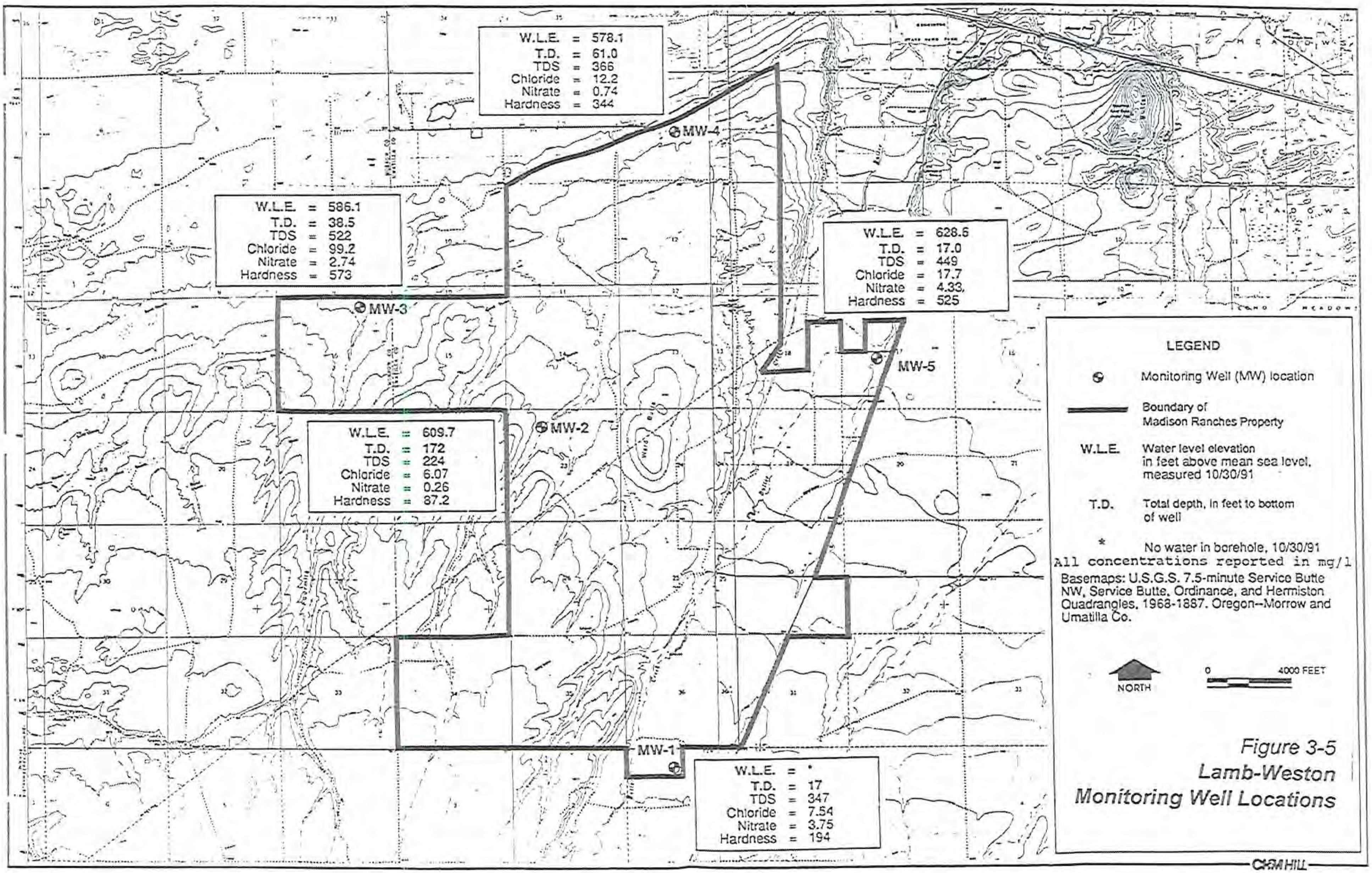


Figure 3-5
Lamb-Weston
Monitoring Well Locations

- In general, groundwater elevations indicate that groundwater flow is from south to north, toward the Columbia River. Local variations in flow direction are beyond the resolution of the monitoring well network installed. However, it is likely that the direction of groundwater flow in the shallow alluvial zone is locally influenced by topography and the Butter Creek drainage. Flow directions east of Ward Butte are likely to be locally toward Butter Creek and then north toward the Columbia River. West of Ward Butte, flow directions are likely to be locally toward the narrow surface drainages and then north toward Lost Lake and the Columbia River.

- Analysis of two slug tests and one pumping test indicate that hydraulic conductivities in the shallow alluvial zone range from approximately 2×10^{-4} to 1×10^{-3} centimeters per second or 0.5 to 4.0 feet per day.

BACKGROUND GROUNDWATER QUALITY

Analysis results for groundwater samples collected from the Lamb-Weston monitoring wells on the Madison Ranches property are shown in Table 3-5. Groundwater quality is generally good, although constituent concentrations in the samples are variable and appear to be controlled by proximity to Lost Lake and the Butter Creek drainage, residence time in the subsurface, and the quality of groundwater migrating onsite from upgradient locations. The reported TDS concentration for MW-2, the well nearest the 875-acre seven-pivot site, was 224 mg/L and the lowest of the five wells. However, the TDS concentration reported for MW-3 was 522 mg/L, which may be more representative of conditions in the vicinity of the potential reservoir sites. This concentration exceeds the secondary MCL of 500 mg/L.

Table 3-5
Groundwater Quality Data for Lamb-Weston Monitoring Wells

Well No.	Date	Chloride	TDS	TKN	Nitrate	Hardness
MW-1	3/25/92	7.54	347	0.73	3.75	194
MW-2	10/30/91	6.07	224	1.53	0.26	87.2
MW-3	10/30/91	99.2	522	0.64	2.74	239
MW-4	10/30/91	12.2	366	0.74	0.74	176
MW-5	10/30/91	17.7	449	0.60	4.33	196
Detection Limit	--	0.017	3	0.10	.002	1.0
DEQ R.L.	--	250	500	--	10	--

All results are reported in mg/L.
TDS = Total dissolved solids.
TKN = Total Kjeldahl nitrogen.
DEQ R.L. = Oregon Department of Environmental Quality reference level based on state drinking water standards.
Nitrate is reported as nitrogen.
Hardness is reported as $CaCO_3$.

Chapter 4
SYSTEM REQUIREMENTS

CROP IRRIGATION

The proposed crops for the fields that may be included in the land application system are wheat, potatoes, corn, canola, and turnips. Data on the consumptive use and net irrigation requirement for wheat, potatoes, and field corn were obtained from the Oregon State University (OSU) *Report on Consumptive Use and Net Irrigation Requirement for the State of Oregon*, June 1991 (draft form). Net irrigation requirements for canola and turnips were obtained from records for the OSU research farm at Hermiston. Table 4-1 summarizes the estimates of the gross irrigation requirement for the selected crops based upon a 5-out-of-10-year probability level, which represents the average consumptive use and net irrigation required for the crop. Actual water use will vary from year to year depending on the climatic conditions during the growing season. The irrigation efficiency for the application system was assumed to be 85 percent in determining the gross irrigation requirements.

The crop gross irrigation requirements were compared to the proposed cropping pattern for the application fields at Madison Ranches to develop the estimated schedule for water application shown in Table 4-2. The schedule separates results for the seven pivots on the 875-acre site, because this area will receive undiluted cooling water applications during the winter for storage in the soil profile. The additional center pivots included in the table represent the 3,750 acres of fields that may also be used for application of diluted cooling water. Some of these fields will be double cropped in some seasons, with turnips planted in the winter and harvested in the spring to allow corn to be planted for harvest in the fall. Corn and turnips have been combined in Table 4-2, therefore, because the irrigation requirement is cumulative when two crops are planted in the same year. It should be noted that if the additional center pivot fields receive winter applications of potato process water from the Lamb-Weston plant, the application schedule will differ from that shown in Table 4-2.

The total irrigation demand for the crops expected to be planted on the combined acreage is estimated at 10,177 acre-feet. This amount includes the 232 feet of winter soil storage that was estimated in Chapter 3 as being available at the seven-pivot site. This storage volume will be used in November and December, when cooling water will be applied without the dilution required to meet background groundwater quality. The cooling water will be held in the soil profile until crops are planted in the spring, when it will be used by the crops to meet water requirements and, as a result, delay or reduce initial applications of irrigation water for the growing season. This effect is reflected in the schedule shown in Table 4-2.

Table 4-1

Crop Irrigation Requirements for a Probability Based on the 5-out-of-10 year Average

		Late Potatoes			Winter Wheat			Winter Canola		Field Corn			Fall Turnips	
Month	Average Precipi-tation (a) (inches)	Con-sumptive Use (inches)	Net Irri-gation (inches)	Gross Irri-gation (inches)	Con-sumptive Use (inches)	Net Irri-gation (inches)	Gross Irri-gation (inches)	Net Irri-gation (inches)	Gross Irri-gation (inches)	Con-sumptive Use (inches)	Net Irri-gation (inches)	Gross Irri-gation (inches)	Net Irri-gation (inches)	Gross Irri-gation (inches)
January	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
February	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0.7	0.0	0.0	0.0	1.3	0.8	1.0	4.5	5.3	0.0	0.0	0.0	0.0	0.0
April	0.6	0.3	0.2	0.3	4.2	3.5	4.2	5.0	5.9	0.0	0.0	0.0	0.0	0.0
May	0.7	2.3	1.8	2.1	6.4	5.9	7.0	2.0	2.4	2.5	2.1	2.5	0.0	0.0
June	0.5	4.5	4.0	4.7	7.2	6.7	7.8	0.5	0.6	5.4	4.9	5.7	0.0	0.0
July	0.2	8.3	8.2	9.6	4.2	4.1	4.8	0.0	0.0	8.5	8.3	9.8	0.0	0.0
August	0.4	7.3	7.2	8.4	0.0	0.0	0.0	0.5	0.6	7.3	7.1	8.3	1.5	1.8
September	0.4	4.6	4.3	5.1	0.0	0.0	0.0	1.5	1.8	3.7	3.4	3.9	4.0	4.7
October	0.7	1.1	0.8	1.0	0.0	0.0	0.0	2.5	2.9	0.0	0.0	0.0	5.0	5.9
November	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	0.0	0.0	0.0	1.5	1.8
December	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	9.0	28.3	26.5	31.2	23.4	21.0	24.7	17.0	20.0	27.4	25.8	30.3	12.0	14.1

(a) Precipitation data for 1950-1980 from Climatological Data, Annual Summary, Oregon 1990, Volume 96, Number 13 (National Oceanic and Atmospheric Administration,1990).

Notes:
1. Consumptive use and net irrigation data for potato, wheat, and field corn are from the Oregon State University Report on Consumptive Use and Net Irrigation Requirements for the State of Oregon (June1991, draft).
2. Net irrigation data for canola and turnips are from records of the Oregon State University research farm at Hermiston, Oregon.
3. Gross irrigation is calculated as net irrigation divided by irrigation efficiency, estimated at 85 percent for the proposed system.

Table 4-2

Estimated Applied Water Schedule for Pivots at Madison Ranches

	Seven Center Pivots								Additional Center Pivots									Total
	Irrigation Requirement					Winter Soil		Applied	Irrigation Requirement								Applied	Applied
	Late Potatoes		Winter Wheat		Subtotal	Storage (a)		Water (a)	Winter Wheat		Potatoes		Corn & Turnips		Canola		Water	Water
Month	(in)	(ac-ft)	(in)	(ac-ft)	(ac-ft)	(in)	(ac-ft)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(ac-ft)	(ac-ft)
January	0.0	0	0.0	0	0	0.0	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0
February	0.0	0	0.0	0	0	0.0	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0
March	0.0	0	1.0	51	51	0.0	0	0	1.0	163	0.0	0	0.0	0	5.3	331	494	494
April	0.3	6	4.2	217	223	0.0	0	42	4.2	694	0.3	18	0.0	0	5.9	368	1079	1121
May	2.1	44	7.0	362	406	0.0	0	406	7.0	1159	2.1	133	2.5	52	2.4	147	1491	1898
June	4.7	98	7.8	407	505	0.0	0	505	7.8	1304	4.7	293	5.7	120	0.6	37	1753	2258
July	9.6	200	4.8	249	449	0.0	0	449	4.8	796	9.6	599	9.8	204	0.0	0	1599	2048
August	8.4	176	0.0	0	176	0.0	0	176	0.0	0	8.4	527	10.1	211	0.6	37	775	950
September	5.1	106	0.0	0	106	0.0	0	106	0.0	0	5.1	318	8.6	180	1.8	110	609	715
October	1.0	20	0.0	0	20	0.0	0	20	0.0	0	1.0	61	5.9	123	2.9	184	367	388
November	0.0	0	0.0	0	0	1.8	133	133	0.0	0	0.0	0	1.8	37	0.6	37	74	207
December	0.0	0	0.0	0	0	1.4	99	99	0.0	0	0.0	0	0.0	0	0.0	0	0	99
Total	31.2	650	24.7	1286	1936	3.2	232	1936	24.7	4116	31.2	1949	44.4	925	20.0	1250	8240	10177

Seven pivot fields (potatoes)	250 acres	2	Center pivots (125 acres/pivot)
Seven pivot fields (wheat)	625 acres	5	Center pivots
Additional fields (winter wheat)	2000 acres	16	Center pivots
Additional fields (potatoes)	750 acres	6	Center pivots
Additional fields (corn and turnips)	250 acres	2	Center pivots
Additional fields (winter canola)	750 acres	6	Center pivots
Totals	4625 acres	37	Center pivots

(a) Soil moisture storage data in Chapter 3 indicate 232 acre-feet of cooling water could be applied to seven pivots during November and December for winter storage in the soil profile. This is an average of 3.2 inches per acre for the 875 acres. This water will be available for crop uptake in the spring, reducing the spring irrigation requirement by 3.2 inches, but maintaining the same total irrigation requirement for the year.

COOLING WATER DILUTION

The discharged cooling water will require dilution before it can be stored in the unlined reservoir on the Madison Ranches property. The goal for dilution is to reduce the TDS concentration in the water to a level equal to or better than that of background groundwater quality near the reservoir, so that any cooling water that infiltrates to the groundwater will have minimal effects. In lieu of site-specific data at this point in the project, Lamb-Weston well MW-3 has been assumed to offer representative background groundwater quality, as it is in the vicinity of the proposed reservoir sites. Water quality data for this well are shown in Table 4-3 and indicate that the TDS concentration in groundwater from this well equals or exceeds the secondary MCL of 500 mg/L.

The cooling water from the cogeneration facility will be diluted with Columbia River water to achieve the desired TDS level for reservoir storage. The minimum dilution required depends on whether the Columbia River or Lamb-Weston production wells are the facility water source. With a Columbia River source, the required dilution factor is 1.3, as shown in Table 4-3. This factor increases to 4.4 if groundwater is used to supply the cogeneration facility. The higher dilution factors seen in Table 4-3 for other constituents are not pertinent to this project; alkalinity, hardness, and bicarbonate should not adversely affect crop production, and potassium and magnesium should not leach through the soil and will be immobilized through precipitation and fixation/cation exchange.

WATER BALANCE AND STORAGE VOLUME

Estimated water balances have been prepared using the two different water sources: the Columbia River (see Table 4-4) and groundwater from Lamb-Weston production wells (see Table 4-5). Each water balance shows the monthly volume of cooling water available from the cogeneration facility, as calculated from the estimated 1-mgd discharge flow. The appropriate dilution factor is then applied to this volume to obtain the required amount of dilution water each month. The factor used for each month accounts for both the amount of dilution required to meet background groundwater quality and the amount necessary to provide an adequate flow rate for planned operation of the center pivot sprinkler systems. For example, the 695-gpm flow rate of cooling water from the cogeneration facility (based on 1 mgd) is less than the minimum 1,000-gpm rate needed to operate one center pivot. Therefore, the daily flow of cooling water intended for winter soil storage on the seven-pivot site will need to be diluted by a factor of 1.4 to provide 1,000 gpm at the center pivot, even though dilution to background water quality will not be required. In other months, dilution above the required factor will be necessary to obtain higher flow rates for operation of multiple center pivots.

The total water supply is compared in the water balances to the total amount of all waters applied to the pivots to estimate the reservoir storage capacity required to store excess cooling water produced during the non-growing season. Reservoir storage volumes in Tables 4-4 and 4-5 account for precipitation, which is added to the balance, and evaporation from the reservoir surface, which is subtracted. The volume in the reservoir accumulates when there

Table 4-3
Dilution Required to Meet Background Groundwater Quality for Reservoir Storage

Constituent	Unit	Source Water Quality		Potential Discharged Cooling Water Quality (a)		Background Groundwater Quality (Lamb-Weston MW-3) (b)	Dilution Factor (c)	
		Columbia River at Boardman	Groundwater at Lamb-Weston (MW-4)	For Columbia River Water Source	For Groundwater Source		For Columbia River Water Source	For Groundwater Source
Alkalinity (CaCO3)	mg/L	63	177	378	1062	148	2.6	7.2
Calcium	mg/L	19.4	43.8	116	263	71	1.6	3.7
Carbonate	mg/L	0	0	0	0	0		
Iron	mg/L	0.109	0.344	0.65	2.06	0.573	1.1	3.6
Hardness (CaCO3)	mg/L	69.9	176	419	1056	239	1.8	4.4
Bicarbonate	mg/L	77	216	462	1296	180	2.6	7.2
Chloride	mg/L	2.91	12.2	17.5	73.2	99.2	0.2	0.7
Nitrate and Nitrite	mg/L	0.137	0.741	0.82	4.45	2.7	0.3	1.6
Sulfate	mg/L	14.1	30	85	180	87.0	1.0	2.1
Potassium	mg/L	1.16	6.37	7.0	38.2	3.5	2.0	10.9
Magnesium	mg/L	5.24	16.2	31.4	97.2	14.9	2.1	6.5
Sodium	mg/L	5.64	20.4	33.8	122.4	61.1	0.6	2.0
Ammonia	mg/L	<0.06	0.14	0.36	0.84	0.4	0.9	2.1
Total Dissolved Solids	mg/L	107	366	642	2196	500 (c)	1.3	4.4

(a) Assumes cooling water will be discharged when concentrations are six times those of the source water.

(b) Lamb-Weston MW-3 has been assumed to be representative of background groundwater quality near the potential reservoir sites. The actual concentration measured for TDS, the assumed limiting factor for the cooling water, was 522 mg/L, but 500 mg/L is the secondary maximum contaminant level used by DEQ.

(c) The TDS dilution factors will be the basis for determining the application system requirements. Alkalinity, hardness, and bicarbonate should not adversely affect crop production, and potassium and magnesium should not leach through the soil.

Table 4-4

Estimated Water Balance with Columbia River as the Cogeneration Facility Water Source

		Available Cooling Water Supply		Required Dilution Water		Water Dilution Factor (a)	Total Water Supply			Total Applied Water		Storage Reservoir (b) Precipitation into Reservoir (c)		Evaporative Losses From Reservoir (d)		To (+) From (-)	Cumu-lative	Additional Water Required (e)
Month	Days	(MG)	(ac-ft)	(MG)	(ac-ft)		(MG)	(ac-ft)	(gpm)	(MG)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(ac-ft)	(ac-ft)	(ac-ft)
January	31	31	95	9	29	1.3	40	124	903	0	0	1.4	5	0.0	0	129	173	0
February	28	28	86	8	26	1.3	36	112	903	0	0	0.8	3	0.0	0	115	288	0
March	31	31	95	148	453	5.8	179	548	4000	161	494	0.7	3	0.0	0	57	345	0
April	30	30	92	143	438	5.8	173	530	4000	365	1121	0.6	2	4.1	17	-605	0	261
May	31	31	95	148	453	5.8	179	548	4000	618	1898	0.7	3	5.2	21	-1368	0	1368
June	30	30	92	143	438	5.8	173	530	4000	736	2258	0.5	2	6.8	27	-1753	0	1753
July	31	31	95	148	453	5.8	179	548	4000	667	2048	0.2	1	7.7	31	-1530	0	1530
August	31	31	95	148	453	5.8	179	548	4000	310	950	0.4	2	6.1	24	-425	0	425
September	30	30	92	143	438	5.8	173	530	4000	233	715	0.4	2	4.4	18	-201	0	201
October	31	31	95	9	29	1.3	40	124	903	126	388	0.7	3	0.0	0	-261	0	261
November	30	30	92	13	41	1.4	43	133	1000	67	207	1.2	5	0.0	0	-69	0	69
December	31	31	95	14	42	1.4	45	137	1000	32	99	1.4	6	0.0	0	43	43	0
Total		365	1120	1072	3291		1437	4411		3317	10177	9.0	36	34.3	137			5867

(a) Water dilution factor is 1.3 when cooling water is sent to the reservoir or land applied on crops. The dilution factor changes from 1.4 to 5.8 depending on where and when the cooling water is land applied.

(b) Calculations for precipitation and evaporation are based on an estimated surface area of 48 acres for the storage reservoir.

(c) Data from the Hermiston, Oregon, weather station (National Oceanic and Atmospheric Administration, 1990).

(d) Evaporation estimated as 65% of reported evaporation from the Hermiston, Oregon weather station (National Oceanic and Atmospheric Administration, 1990).

(e) Additional water required would be supplied from existing sources, including Lamb-Weston process water, groundwater, and surface water.

Table 4-5

Estimated Water Balance with Groundwater as the Cogeneration Facility Water Source

		Available Cooling Water Supply		Required Dilution Water		Water Dilution Factor (a)	Total Water Supply			Total Applied Water		Storage Reservoir (b)						Additional Water Required (e)
												Precipitation into Reservoir (c)		Evaporative Losses From Reservoir (d)		To (+) From (-)	Cumu-lative	
Month	Days	(MG)	(ac-ft)	(MG)	(ac-ft)		(MG)	(ac-ft)	(gpm)	(MG)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(ac-ft)	(ac-ft)	(ac-ft)
January	31	31	95	105	323	4.4	136	419	3056	0	0	1.4	5	0.0	0	424	467	0
February	28	28	86	95	292	4.4	123	378	3056	0	0	0.8	3	0.0	0	381	849	0
March	31	31	95	105	323	4.4	136	419	3056	161	494	0.7	3	0.0	0	-72	776	0
April	30	30	92	143	438	5.8	173	530	4000	365	1121	0.6	2	4.1	17	-605	171	0
May	31	31	95	148	453	5.8	179	548	4000	618	1898	0.7	3	5.2	21	-1368	0	1196
June	30	30	92	143	438	5.8	173	530	4000	736	2258	0.5	2	6.8	27	-1753	0	1753
July	31	31	95	148	453	5.8	179	548	4000	667	2048	0.2	1	7.7	31	-1530	0	1530
August	31	31	95	148	453	5.8	179	548	4000	310	950	0.4	2	6.1	24	-425	0	425
September	30	30	92	143	438	5.8	173	530	4000	233	715	0.4	2	4.4	18	-201	0	201
October	31	31	95	105	323	4.4	136	419	3056	126	388	0.7	3	0.0	0	34	34	0
November	30	30	92	13	41	1.4	43	133	1000	67	207	1.2	5	0.0	0	-69	0	36
December	31	31	95	14	42	1.4	45	137	1000	32	99	1.4	6	0.0	0	43	43	0
Total	365	365	1120	1309	4018		1674	5138		3317	10177	9.0	36	34.3	137			5141

(a) Water dilution factor is 4.4 when cooling water is sent to the reservoir or land applied on crops. The dilution factor changes from 4.4 to 5.8 depending on where and when the cooling water is land applied.

(b) Calculations for precipitation and evaporation are based on an estimated surface area of 48 acres for the storage reservoir.

(c) Data from the Hermiston, Oregon, weather station (National Oceanic and Atmospheric Administration, 1990).

(d) Evaporation estimated as 65% of reported evaporation from the Hermiston, Oregon weather station (National Oceanic and Atmospheric Administration, 1990).

(e) Additional water required would be supplied from existing sources, including Lamb-Weston process water, groundwater, and surface water.

are two or more months of excess cooling water. The required reservoir size is determined by the largest cumulative monthly volume registered in the water balance. As shown in Table 4-4, the amount of reservoir storage required is approximately 345 acre-feet when the water source for the cogeneration facility is the Columbia River. If the water source is groundwater, the amount of reservoir storage required is approximately 849 acre-feet (see Table 4-5).

When the monthly amount of available cooling water is less than the total applied for that month, water is taken from the reservoir or supplied by other irrigation sources. The amount of additional water required is presented in the last column of the water balances. This water will be supplied from Lamb-Weston process water (except the seven-pivot site), surface water from the Columbia and Umatilla Rivers and Butter Creek, and groundwater. The volume of additional water does not equal the difference between the total water applied and the total water available because of evaporation losses and precipitation gains in the reservoir.

NUTRIENT LOADING

A typical loading analysis for a land application system examines the amount of nutrients applied to the site in the water and the nutrient uptake rates for the site. As seen in the water quality data presented in Chapter 2, nutrients are found in low concentrations in the two potential water sources for the cogeneration facility and in the cooling water produced by the facility. As a result, the projected nutrient loadings shown in Tables 4-6 (Columbia River water) and 4-7 (groundwater) are minimal, especially during the growing season months when the cooling water is most diluted. The loading rates indicate that the cooling water will not provide the key nutrients of nitrogen, potassium, and phosphorus required to maintain a healthy crop. Fertilization will be required to supply these nutrients, in amounts to be determined by annual soil tests. Fertilizer amounts will not exceed the agronomic rates for each crop as outlined in OSU fertilizer guides.

SALT LOADING

Concentrations of salts in soil-plant systems are a factor of plant uptake, precipitation, fixation/cation exchange, and leaching. Salts in the cooling water and soil water include the principal ions calcium, magnesium, sodium, potassium, chloride, sulfate, nitrate, and bicarbonate, as well as TDS. Sodium and chloride are the salts with the most potential to harm plants; however, expected average concentrations in the cooling water are only 34 and 122 mg/L for sodium for the Columbia river water and groundwater sources, respectively, and 17.5 and 73 mg/L for chloride for river water and groundwater, respectively (see Table 4-2). Expected average concentrations of TDS are higher: 642 mg/L for the river water source and 2,196 mg/L for the groundwater source.

These initial concentrations were used to estimate salt loadings for sodium, chloride, and TDS for the cooling water as it will be applied. The loadings are shown in Table 4-8 for the

Table 4-6

Projected Nutrient Loadings for Cooling Water with the Columbia River as the Cogeneration Facility Water Source

		Total Cooling Water Applied		Cooling Water Applied to 7 Pivots		Nitrate-Nitrite		Ammonia (a)		Potassium		Cooling Water Applied to Add. Pivots		Nitrate-Nitrite		Ammonia (a)		Potassium	
Month	Days	(MG)	(ac-ft)	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac
January	31	0	0	0	0	0.00	0.0	0.00	0.0	0.00	0.0	0	0	0.00	0.0	0.00	0.0	0.00	0.0
February	28	0	0	0	0	0.00	0.0	0.00	0.0	0.00	0.0	0	0	0.00	0.0	0.00	0.0	0.00	0.0
March	31	161	494	0	0	0.00	0.0	0.00	0.0	0.00	0.0	161	494	0.14	0.1	0.06	0.0	1.21	0.4
April	30	281	861	14	42	0.14	0.0	0.06	0.0	1.21	0.2	267	819	0.14	0.1	0.06	0.0	1.21	0.7
May	31	173	530	132	406	0.14	0.2	0.06	0.1	1.21	1.5	40	124	0.14	0.0	0.06	0.0	1.21	0.1
June	30	165	505	165	505	0.14	0.2	0.06	0.1	1.21	1.9	0	0	0.00	0.0	0.00	0.0	0.00	0.0
July	31	169	518	146	449	0.14	0.2	0.06	0.1	1.21	1.7	23	69	0.14	0.0	0.06	0.0	1.21	0.1
August	31	171	525	57	176	0.14	0.1	0.06	0.0	1.21	0.7	114	349	0.14	0.0	0.06	0.0	1.21	0.3
September	30	168	514	35	106	0.14	0.0	0.06	0.0	1.21	0.4	133	408	0.14	0.0	0.06	0.0	1.21	0.4
October	31	41	126	7	20	0.63	0.0	0.28	0.0	5.35	0.3	35	106	0.63	0.0	0.28	0.0	5.35	0.4
November	30	45	137	43	133	0.57	0.2	0.25	0.1	4.83	2.0	1	4	0.57	0.0	0.25	0.0	4.83	0.0
December	31	32	99	32	99	0.57	0.2	0.25	0.1	4.83	1.5	0	0	0.00	0.0	0.00	0.0	0.00	0.0
Total	365	1404	4309	631	1936		1.2		0.5		10.1	773	2373		0.3		0.1		2.4

(a) Ammonia is expected to be volatilized in the cooling towers, which will result in lower concentrations in the cooling water. The values given are, therefore, conservative.

Table 4-7

Projected Nutrient Loadings for Cooling Water with Groundwater as the Cogeneration Facility Water Source

		Total Cooling Water Applied		Cooling Water Applied to 7 Pivots		Nitrate-Nitrite		Ammonia (a)		Potassium		Cooling Water Applied to Add. Pivots		Nitrate-Nitrite		Ammonia (a)		Potassium	
Month	Days	(MG)	(ac-ft)	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac
January	31	0	0	0	0	0.00	0.0	0.00	0.0	0.00	0.0	0	0	0.00	0.0	0.00	0.0	0.00	0.0
February	28	0	0	0	0	0.00	0.0	0.00	0.0	0.00	0.0	0	0	0.00	0.0	0.00	0.0	0.00	0.0
March	31	161	494	0	0	0.00	0.0	0.00	0.0	0.00	0.0	161	494	1.01	0.4	0.19	0.1	8.69	3.1
April	30	365	1121	14	42	0.77	0.1	0.15	0.0	6.64	0.9	352	1079	0.77	0.6	0.15	0.1	6.64	5.2
May	31	173	530	132	406	0.77	1.0	0.15	0.2	6.64	8.4	40	124	0.77	0.1	0.15	0.0	6.64	0.6
June	30	165	505	165	505	0.77	1.2	0.15	0.2	6.64	10.4	0	0	0.00	0.0	0.00	0.0	0.00	0.0
July	31	169	518	146	449	0.77	1.1	0.15	0.2	6.64	9.2	23	69	0.77	0.0	0.15	0.0	6.64	0.3
August	31	171	525	57	176	0.77	0.4	0.15	0.1	6.64	3.6	114	349	0.77	0.2	0.15	0.0	6.64	1.7
September	30	168	514	35	106	0.77	0.3	0.15	0.0	6.64	2.2	133	408	0.77	0.2	0.15	0.0	6.64	2.0
October	31	126	388	7	20	1.01	0.1	0.19	0.0	8.69	0.5	120	367	1.01	0.3	0.19	0.1	8.69	2.3
November	30	67	207	43	133	3.09	1.3	0.58	0.2	26.54	11.0	24	74	3.09	0.2	0.58	0.0	26.54	1.4
December	31	32	99	32	99	3.09	0.9	0.58	0.2	26.54	8.2	0	0	0.00	0.0	0.00	0.0	0.00	0.0
Total	365	1597	4900	631	1936		6.3		1.2		54.4	966	2964		1.9		0.4		16.6

(a) Ammonia is expected to be volatilized in the cooling towers, which will result in lower concentrations in the cooling water. The values given are, therefore, conservative.

Table 4-8

Projected Salt Loadings for Cooling Water with the Columbia River as the Cogeneration Facility Water Source

		Total Cooling Water Applied		Cooling Water Applied to 7 Pivots		Total Dissolved Solids		Sodium		Chloride		Cooling Water Applied to Add. Pivots		Total Dissolved Solids		Sodium		Chloride	
Month	Days	(MG)	(ac-ft)	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac	(MG)	(ac-ft)	(mg/L)	lb/ac	(mg/L)	lb/ac	(mg/L)	lb/ac
January	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
February	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
March	31	161	494	0	0	0	0	0	0	0	0	161	494	111	40	6	2	3	1
April	30	365	1121	14	42	111	15	6	1	4	0	352	1079	111	87	6	5	3	2
May	31	173	530	132	406	111	141	6	7	4	5	40	124	111	10	6	1	3	0
June	30	165	505	165	505	111	175	6	9	4	6	0	0	0	0	0	0	0	0
July	31	169	518	146	449	111	155	6	8	4	5	23	69	111	6	6	0	3	0
August	31	171	525	57	176	111	61	6	3	4	2	114	349	111	28	6	1	3	1
September	30	168	514	35	106	111	37	6	2	4	1	133	408	111	33	6	2	3	1
October	31	126	388	7	20	494	31	26	2	13	1	120	367	494	132	26	7	13	4
November	30	67	207	43	133	446	184	24	10	17	7	24	74	446	24	24	1	12	1
December	31	32	99	32	99	446	137	24	7	17	5	0	0	0	0	0	0	0	0
Total	365	1597	4900	631	1936		936		49		32	966	2964		359		19		10

Table 4-9

Projected Salt Loadings for Cooling Water with Groundwater as the Cogeneration Facility Water Source

Month	Days	Total Cooling Water Applied		Cooling Water Applied to 7 Pivots		Total Dissolved Solids		Sodium		Chloride		Cooling Water Applied to Add. Pivots		Total Dissolved Solids		Sodium		Chloride	
		(MG)	(ac-ft)	(MG)	(ac-ft)	(mg/l)	lb/ac	(mg/l)	lb/ac	(mg/l)	lb/ac	(MG)	(ac-ft)	(mg/l)	lb/ac	(mg/l)	lb/ac	(mg/l)	lb/ac
January	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
February	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
March	31	161	494	0	0	0	0	0	0	0	0	161	494	499	179	28	10	17	6
April	30	365	1121	14	42	381	50	21	3	13	2	352	1079	381	298	21	17	13	10
May	31	173	530	132	406	381	481	21	27	13	16	40	124	381	34	21	2	13	1
June	30	165	505	165	505	381	598	21	33	13	20	0	0	0	0	0	0	0	0
July	31	169	518	146	449	381	531	21	30	13	18	23	69	381	19	21	1	13	1
August	31	171	525	57	176	381	208	21	12	13	7	114	349	381	97	21	5	13	3
September	30	168	514	35	106	381	126	21	7	13	4	133	408	381	113	21	6	13	4
October	31	126	388	7	20	499	32	28	2	17	1	120	367	499	133	28	7	17	4
November	30	67	207	43	133	1525	630	85	35	51	21	24	74	1525	81	85	5	51	3
December	31	32	99	32	99	1525	469	122	38	51	16	0	0	0	0	122	0	51	0
Total	365	1597	4900	631	1936		3125		186		104	966	2964		954		53		32

cooling water with the Columbia River source and Table 4-9 for cooling water with the groundwater source. With the dilution factors required to meet background groundwater quality and/or properly operate the center pivots, sodium and chloride loadings are not a concern. TDS loadings will fluctuate throughout the year with the amount of dilution used, with the highest loadings occurring in November and December when cooling water is applied to the seven pivots for storage in the soil profile. As seen in Table 4-8, the total annual TDS loading for cooling water with the Columbia River source is estimated at 936 lb/acre/year on the seven pivots and 359 lb/acre/year on the additional pivot fields that may receive cooling water. With the groundwater source, the total estimated TDS loadings are 3,125 lb/acre/year for the seven pivots and 954 lb/acre/year for the additional pivots (see Table 4-9).

Chapter 5
SYSTEM DESCRIPTION

A layout of the proposed cooling water land application system is provided in Figure 5-1. Hermiston Generating Company, L.P., will be providing the components of the system that will convey water from the cogeneration facility to the edge of the Madison Ranches property, including a pump station at the facility and buried transmission pipelines. Madison Ranches will provide components required to use the water on its property, including three booster pump stations, the unlined storage reservoir, buried distribution laterals within the property, and the seven center pivots on the 875-acre site. All system components were selected and sized through a hydraulic analysis based on information from the existing Lamb-Weston land application facilities on Madison Ranches property, site-specific information from previous studies, and meetings and input from the staff of Hermiston Generating Company, L.P. Components will be refined when additional site-specific information is obtained during soils and hydrogeologic investigations.

Madison Ranches property is currently served by pump stations, distribution pipelines, and various types of sprinkler systems that provide irrigation water to 3,750 acres. This existing system will be connected to the new components so that the cooling water can be distributed to fields throughout the property at the discretion of Madison Ranches, but in compliance with this plan.

NEW PUMP STATIONS

Four pump stations are proposed to move water from the cogeneration facility to the reservoir and application fields on the property. The pump stations will lift the cooling water from elevation 560 to 1,000 feet and deliver the water to the center pivots at a pressure of 35 pounds per square inch (psi). Pump station discharge pressures will be limited to about 320 feet (150 psi) so that polyvinyl chloride (PVC) pipe can be used for the transmission and distribution lateral piping. Higher pump pressures would reduce the number of pump stations, but would require use of more expensive ductile iron or steel pipe and larger pumps.

Pump station sizes were selected to allow for different flow rates to the seven-pivot site. During the growing season, the pump stations will convey up to 4,000 gpm of diluted cooling water to the center pivots on the site, where a maximum of four pivots will be operated at any one time. In the winter, undiluted cooling water will be pumped at 1,000 gpm to one pivot at a time for storage in the soil profile. Pump station sizing will also allow for suitable flow rates to convey diluted cooling water to other application fields on the Madison Ranches property or to the storage reservoir. A data summary for the four proposed pump stations is provided in Table 5-1.

Table 5-1 Data Summary for the Proposed Pump Stations			
Pump Station	Pump Flow Rate (gpm)	Pump Lift (feet)	Pump Size (horsepower)
Cogeneration facility	1,000 3,000	280 280	95 285
"B" canal booster	1,000 3,000	200 200	70 210
Reservoir booster	1,000 1,000 3,000 3,000	170 170 170 170	60 60 180 180
Pivot booster	1,000 3,000	320 320	110 330

Pump station locations were selected to provide flexibility for irrigation operations, to split the pump lift, and for proximity to existing and proposed facilities. One pump station will be located at the cogeneration facility to pump cooling water to a new booster pump station at the Madison Ranches property. The facility pump station will have one 1,000-gpm pump to handle undiluted cooling water and one 3,000-gpm pump to be used in combination with the low-flow pump when the cooling water is diluted and flows range from 1,000 to 4,000 gpm. This pump station will be constructed and controlled by Hermiston Generating Company, L.P.

A new booster pump station will be provided by Madison Ranches near Westland Canal B at the northern edge of the property, adjacent to an existing Lamb-Weston booster pump station. The "B" canal booster pump station will be used by Madison Ranches to move cooling water directly to the storage reservoir, to a new booster pump station at the reservoir, or into irrigation systems for existing application fields in the vicinity. To accommodate the latter use, discharge pressure for the "B" canal booster pump station will match the Lamb-Weston station. The new booster pump station will have one 1,000-gpm and one 3,000-gpm pump.

A new booster pump station will be provided by Madison Ranches next to the storage reservoir once its site has been determined. This station will be able to receive water from the storage reservoir, the "B" canal booster pump station, or both, and will pump it to a new booster pump station at the seven-pivot site or into an existing irrigation lateral for distribution to application fields near the reservoir. The reservoir booster pump station will have two 1,000-gpm pumps and two 3,000-gpm pumps that can be used individually or in

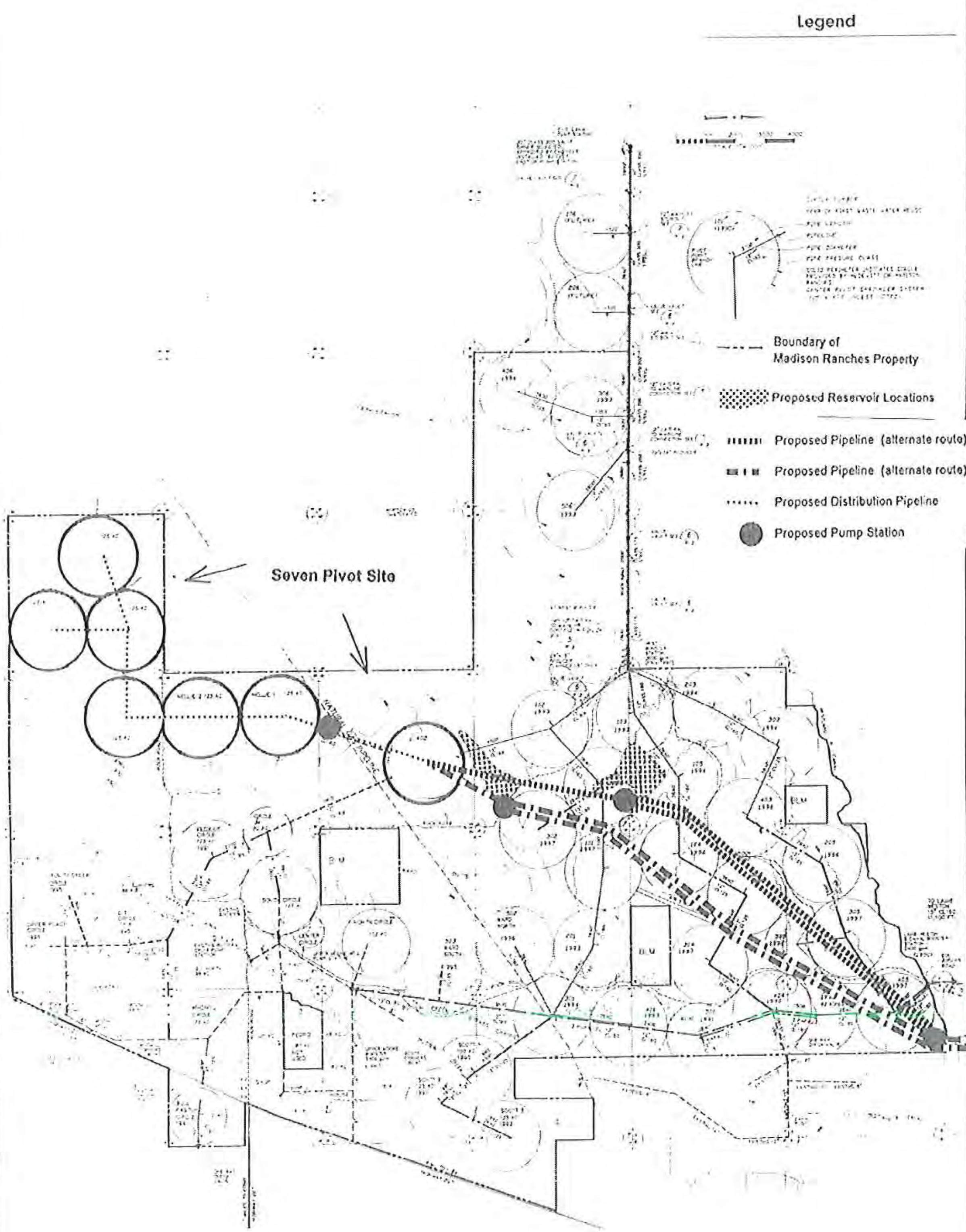


Figure 5-1
Proposed System Layout

combinations to deliver up to 4,000 gpm to the seven pivots and up to an additional 4,000 gpm to other pivots on the property.

A new booster pump station will be provided by Madison Ranches at the seven-pivot site to pressurize the cooling water to meet the design pressure of 35 psi for the pivots. The pivot booster pump station will lift water from the reservoir booster pump station to the pivots using one 1,000-gpm pump and one 3,000-gpm pump. The 1,000-gpm pump will be used to send undiluted or diluted cooling water to one center pivot at a time. Both pumps will be used to send diluted cooling water to two to four pivots at flows ranging from 2,000 to 4,000 gpm.

NEW TRANSMISSION AND DISTRIBUTION PIPELINES

Parallel transmission pipelines will connect the cogeneration facility pump station, the "B" canal booster pump station, and the reservoir booster pump station. The parallel pipelines will be 12-inch Class 160 PVC pipe rated for 160-psi operating pressures. Distribution pipelines will connect the reservoir booster pump station, the pivot booster pump station, and the pivots. These pipelines will consist of single 8- to 16-inch class 160 PVC pipes.

Hermiston Generating Company, L.P., will install two, parallel, 14,000-foot, 12-inch transmission pipelines along the same route as the existing pipelines from the Lamb-Weston processing plant to the Madison Ranches property. The new pipelines will connect the cogeneration facility's pump station, the Madison Ranches' "B" canal booster pump station, and the existing Lamb-Weston canal booster pump station. Control valves will be used to route the cooling water to the reservoir booster pump station or into existing irrigation systems.

Madison Ranches will provide two, parallel, 13,000-foot, 12-inch transmission pipelines to connect the "B" canal booster pump station to the reservoir booster pump station. These pipelines will also connect to the existing Madison Ranches irrigation system about half-way between the two pump stations. The length of these pipelines and the connection point to the existing irrigation system will be determined by selection of the final reservoir site.

Madison Ranches will provide a single, 8,500-foot, 16-inch pipeline from the reservoir booster pump station that will connect to the pivot booster pump station and the Madison Ranches irrigation system. Distribution pipelines from the pivot booster pump station to the pivots will include about 9,000 feet of 16-inch pipe, 2,700 feet of 14-inch pipe, 2,700 feet of 10-inch pipe, and 2,700 feet of 8-inch pipe.

Cooling water will be pumped to the seven pivots during the winter months for storage in the soil profile. One of the parallel 12-inch pipelines and a 1,000-gpm pump at each of the pump stations will be used to deliver the water to one pivot at a time. The other 12-inch pipeline will be available to provide backup distribution during these months.

Diluted cooling water can be pumped to the reservoir, to the seven pivots, or to other irrigation systems on the Madison Ranches property. Both 12-inch transmission pipelines will be needed to carry the diluted flow (4,000 gpm) from the cogeneration facility to the "B" canal booster pump station. The water can then be pumped to the reservoir or into the existing irrigation system at the canal. Both 12-inch transmission pipelines from the "B" canal booster pump station to the reservoir booster pump station will be needed to carry the diluted flow to the reservoir. Water pumped through these lines can be routed to the reservoir, into the reservoir booster pump station, or into the irrigation system.

STORAGE RESERVOIR

Two potential reservoir sites, as shown in Figure 5-1, were identified and evaluated for capacity and preliminary suitability. The south site is a relatively steep-sided, long, narrow canyon that would require a 40-foot deep pool to store 712 acre-feet. This volume is limiting for the purpose of meeting peak irrigation requirements, which may reach 1,500 acre-feet. It would also be insufficient for the volume of diluted cooling water that will require storage if groundwater is used as the source water for the cogeneration facility. Reservoir area-capacity curves for this site are shown in Figure 5-2.

The north reservoir site is in a low, wide area near the mouth of the canyon considered for the south reservoir. Reservoir area-capacity curves for this site are shown in Figure 5-3. This site is preferred as the additional width of the canyon would allow for a 19-foot deep pool to store over 700 acre-feet, a 22-foot deep pool to store over 1,000 acre-feet, or a 25-foot deep pool to store about 1,500 acre-feet. Additional advantages of this site are the lower height required for the impoundment, which reduces the risk of failure, and the availability of near-surface soils that appear to be suitable for construction of the impoundment. One disadvantage is that this reservoir would flood portions of three existing center pivot fields, thereby decreasing the available crop area by about 100 acres.

The reservoir impoundment will consist of earth fill with 3-to-1 side slopes on both faces and a 20-foot top width. Field investigations will be necessary to determine if near-surface or excavated onsite soils will be suitable for impoundment construction and to estimate reservoir leakage rates.

NEW CENTER PIVOTS

Each of the new center pivot sprinklers will be nozzled to deliver 1,000 gpm. The sprinklers will have flow control nozzles or pressure regulators to maintain application uniformity as the machines move across variable topography. The sprinklers will be low pressure, energy efficient spray heads or rotators designed to operate with 35 psi at the pivot.

The center pivots will have the following two modifications to increase their flexibility and operability during winter months:

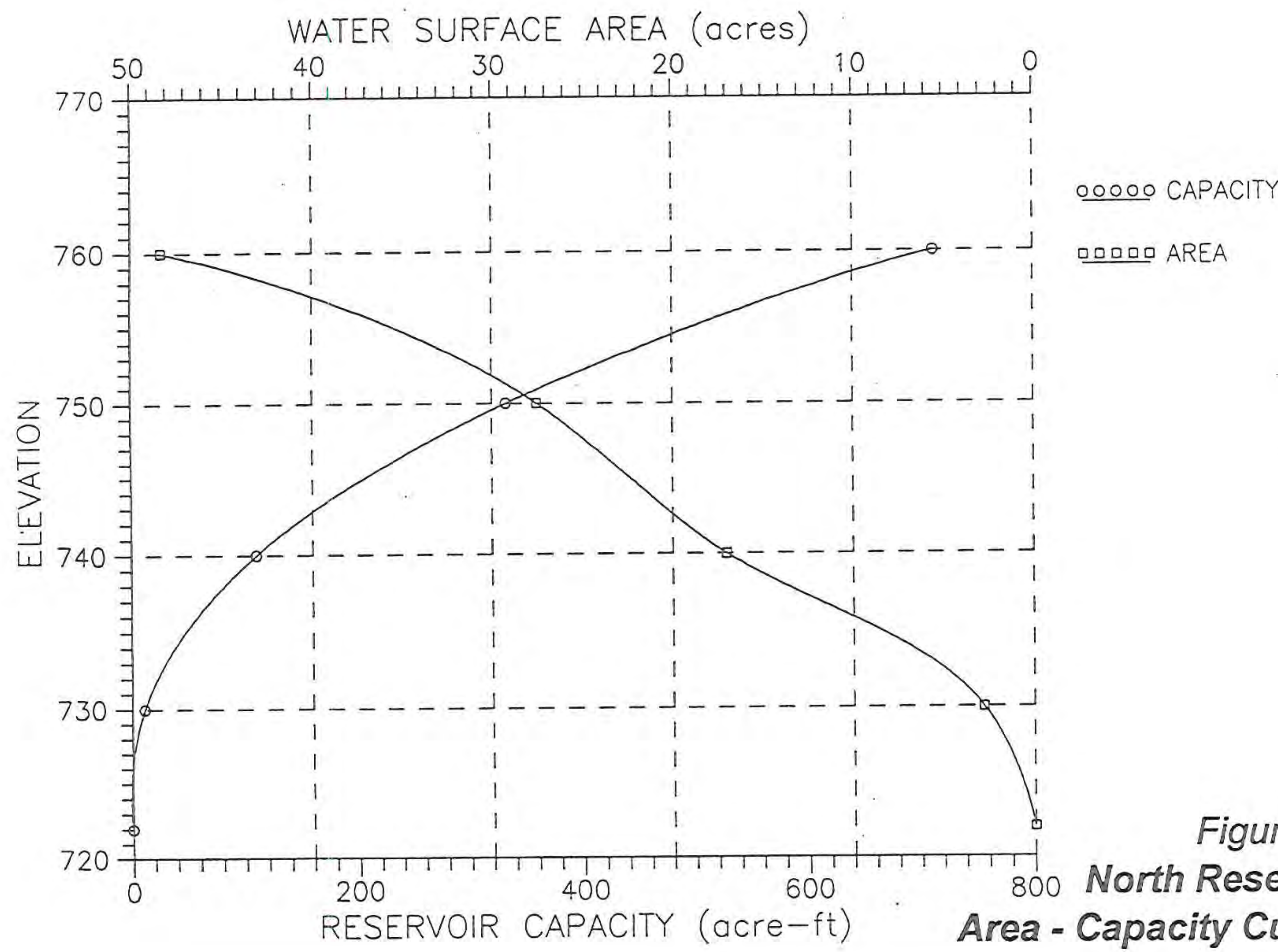


Figure 5-2
North Reservoir
Area - Capacity Curves

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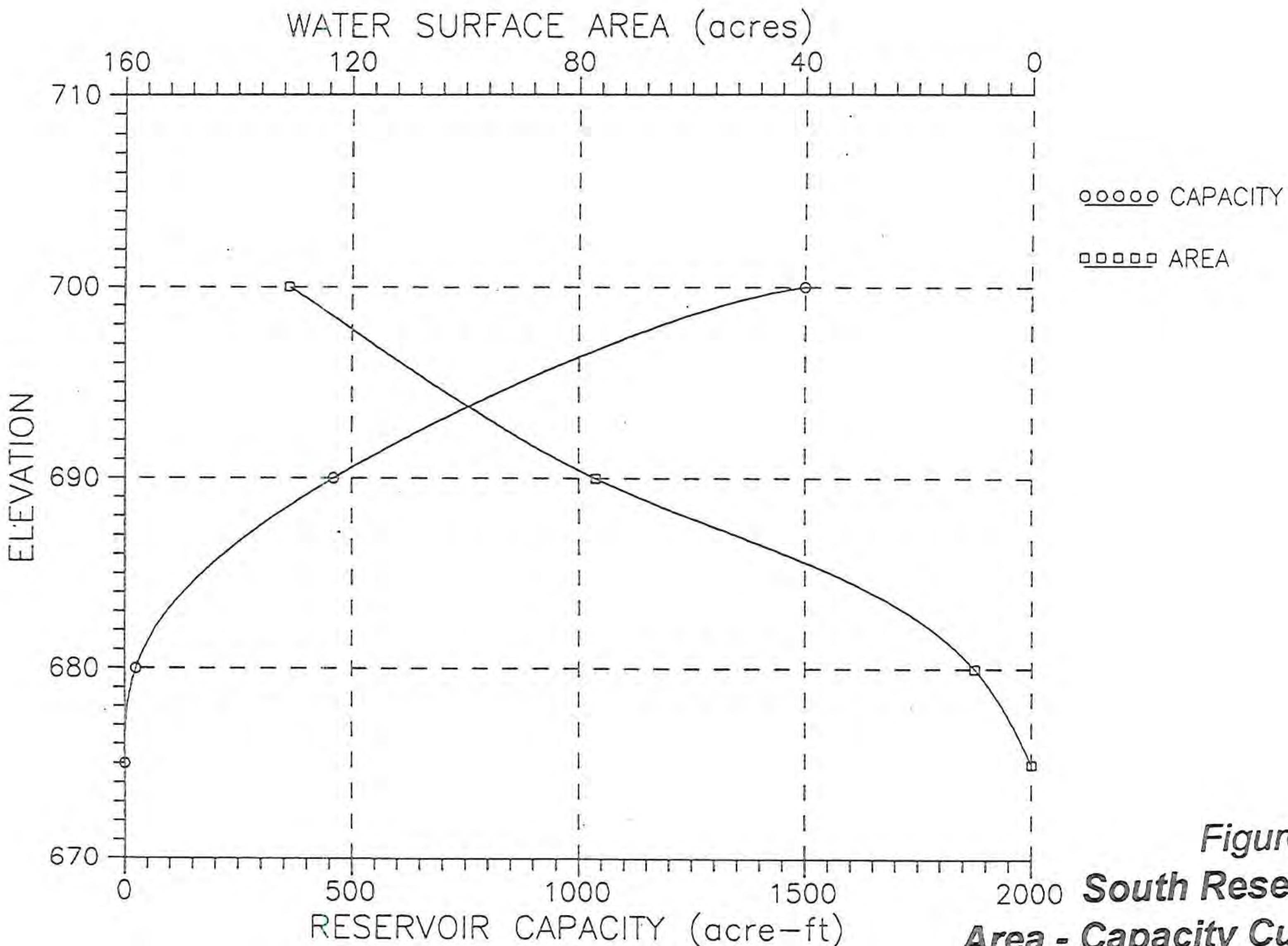

Figure 5-3
South Reservoir
Area - Capacity Curves

CH2M HILL

- The pivots will automatically drain whenever the pivot is deactivated or system pressure is lost. Valves for water control will be underground.

- Low pressure spray heads or rotator heads will be mounted on long offset drop tubes to minimize drift and water contact with the sprinkler machine. Sprinklers near towers will be removed in freezing weather.

The following features will also be provided with the pivots:

- Elapsed time indicator
- Pressure loss shutdown to prevent movement without water application
- Automatic restart mechanism to move the machine when water is available
- Automatic reverse on all partial cycle machines
- High speed, 1-1/2-hp motors for greater application rate adjustment
- Tower alignment and safety control
- Automatic drain valves on each tower and pivot

Chapter 6
SITE MANAGEMENT AND OPERATION

The primary goal of the cooling water land application system is to provide supplemental water for crop production on the designated fields at Madison Ranches. Maintaining the vitality of the crop is, therefore, the foremost management priority, as the crop provides the primary function of using the applied water. The root and organic matter produced by the crop are also essential for maintaining good soil stability and infiltration.

OWNERSHIP AND CONTROL

The property to be used for land application of cooling water is owned by Madison Ranches, Inc., in the names of John and Nellie Madison, Kent Madison, and Scott Madison. Hermiston Generating Company, L.P., will own and operate the new pump station at the cogeneration facility and the transmission pipelines that convey the cooling water to the edge of the Madison Ranches property. Madison Ranches will own and operate the new booster pump stations, transmission and distribution pipelines, storage reservoir, and center pivot sprinkler systems that will be constructed on its property. The design and operation of the facilities will be consistent with the cooling water reuse plant pursuant to an agreement with Hermiston Generating Company.

COOLING WATER APPLICATION

The current practice for many fields on Madison Ranches property is to use deficit irrigation, in which water is applied at less than the commonly accepted agronomic rate (the rate accounts for effective precipitation, crop evapotranspiration, and a leaching fraction). With deficit irrigation, less water is applied more frequently in an attempt to optimize soil moisture throughout the crop root zone and to lessen deep percolation. Deficit irrigation also encourages the development of deep-rooted crops. This practice will be continued for irrigation with cooling water on the Madison Ranches property.

Fields will typically receive several light applications of cooling water throughout the year, so that the available water content of the root zone soils will more nearly match the crop requirements. The volume of cooling water that can be applied to each crop will be limited by the availability of the water. Other irrigation sources available to Madison Ranches will be used to meet the water requirements of each crop when the cooling water supply is insufficient. These irrigation sources include potato processing water from the Lamb-Weston plant, which will not be used on the fields that receive undiluted cooling water or on fields planted in potatoes.

The combination of cooling water and freshwater used for irrigation will be scheduled to meet crop needs and system operating constraints. The freshwater irrigation system currently operates every month of the year because of the uncertain availability of the Butter Creek water source. Butter Creek water may be available only in winter and spring some years and is applied any time that it is available. The cooling water could reduce the need for winter irrigation with Butter Creek water and provide a reliable scheduled water supply.

The cooling water loading per field will be determined from the volume delivered to the field and the acreage. The volume applied through the center pivot sprinklers will be measured with hour meters and calibrated orifice sprinkler nozzles. Flow delivered to wheel lines, hand lines, and solid set sprinklers will be determined from time of operation recorded by the irrigation manager and the discharge through the sprinkler nozzle orifices. The sprinkler nozzles will be calibrated periodically to adjust for wear.

To minimize runoff and ponding, the cooling water will be applied to each field through sprinklers at a uniform rate consistent with good agronomic practice. The existing sprinkler irrigation systems do not cause ponding or runoff of irrigation water, and the same systems will supply cooling water. New irrigation systems will be designed with similar water application rates.

Seven center pivots will be available for cooling water application throughout the year. All of the new center pivot sprinklers will be designed to be used when freezing conditions occur, which is usually intermittent during the period from December through February. Cooling water produced during a freezing period would be applied to any of the seven center pivots where it could best be managed. Only these pivots will be used for application of cooling water during the winter months. The winter applications will be at lower loadings than would be used during the growing season. If necessary, the flow could be distributed over all of the available acreage at very low loading rates. Cooling water applied after crop water uptake has stopped because of cold weather will be held in the soil for plant use during the following spring.

A dammer-diker farm implement will also be used to produce "micro-reservoirs" throughout the seven center pivot fields. During the winter months, the applied cooling water will freeze within these reservoirs; when the ground thaws in spring, the water will melt in place. During the winter storage months of November and December, irrigation scheduling should be adjusted not to exceed field capacity.

The principal factor limiting the application of the cooling water, other than the seasonal limitations placed on the availability of the fields, is its TDS content. The plan for application provides for nearly uniform distribution of TDS and other constituents without overloading any particular site. Proper management of water application to avoid exceeding the intake rate of the soil and to allow resting or drying periods between irrigations will mitigate concerns about TDS concentrations.

The seven center pivots that will receive undiluted cooling water have the most potential for a problem with TDS loadings. If salt accumulation is noted in these fields, it can be mitigated through periodic gypsum applications and subsequent controlled leaching, which will transport salts well below the root zone. The potential for groundwater contamination from the leaching is expected to be low, as the depth to groundwater in the Lamb-Weston monitoring well closest to this site, MW-2, was measured at 165 feet below ground surface. Groundwater will be monitored at the seven-pivot site, as described in Chapter 7.

The following typical guidelines are expected to apply to irrigation with the cooling water:

- Cooling water will not be applied to land with slopes that will cause runoff (generally greater than 15 percent on sandy soils).
- Cooling water will be applied to land where a crop will be grown, according to a cooling water management plan. Cooling water will not be allowed to run off to land that has not been approved for cooling water reuse.
- The amount of cooling water applied per acre will not exceed the quantity approved by DEQ.
- Cooling water will be applied as evenly as practicable to the entire application site, averaged on an annual basis and considering crop requirements.
- Ponding of cooling water will not occur. Land leveling will be performed where necessary to minimize runoff or ponding.
- Public access to the site will be controlled.

SYSTEM CONTROL

A local control system is provided for the pivots to encourage operator visits and inspections of the pivots. The pivots are automated, however, so that they will restart themselves after a pump shutdown or power failure is corrected. The water applied to each field will stop and start in response to the movement of the pivots.

The pump station at the cogeneration facility will be automated to cycle pumps to match the flow rate from the cooling towers. The new booster pump stations on the Madison Ranches property will have high and low pressure switches to automatically match pump operations to system demands and pressures. The pivot booster pump station will use at least two centrifugal pumps capable of operating over a wide range of flows to coordinate the cooling water flow and pressure with the demands of the irrigation system.

The cooling water distribution system will be isolated from each of the freshwater sources with at least a backflow preventer and one gate or butterfly valve. Backflow preventer valves at each freshwater source will provide confidence that cooling water will not enter the freshwater sources, even if manually operated isolation valves are accidentally left open. A vent valve will be installed on a tap between isolation valves, so that the vent will drip if an isolation valve leaks. This will help the leak to be detected and repaired. The cooling water and freshwater irrigation distribution system will not interconnect to any domestic water systems.

MAINTENANCE

Regular maintenance must be performed on all parts of the land application system to promote dependable service. Madison Ranches will establish and conduct the maintenance program for all system components on their property. Hermiston Generating Company, L.P., will maintain the system from the cogeneration facility to the Madison Ranches property.

Sprinkler systems will receive the regular maintenance recommended by the manufacturer. Sprinkler nozzles will be checked periodically for excessive wear and replaced as needed for uniform application. Pumps will be inspected regularly and properly maintained. Systems that do not provide uniform and proper rate of water application will be repaired or replaced.

The perennial crop stands will require periodic renovation or reestablishment. Proper planning will keep adequate fields available for application purposes at any particular time. When a field is reworked in preparation for a new crop, all necessary leveling and land-forming practices will be performed. Closed depressions can cause water to pond and will be filled where feasible. At the seven-pivot site, which has not been irrigated, appropriate earthwork will be conducted so that the fields will be level to promote uniform irrigation.

CROP SCHEDULE

The crop schedule Madison Ranches has indicated it will be using on its irrigated fields is as follows:

Crop	Plant Dates	Harvest Dates
Canola	April 1 to Aug. 30	June 1 to Aug. 15
Alfalfa hay	Feb. 15 to Oct. 15	May 1 to Oct. 30
Wheat, barley, pasture[a]	Sept. 1 to April 15	June to Aug.
Field corn	April 1 to July 31	Oct. 1 to Dec. 30
Turnips	July 15 to Aug. 30	Oct. 15 to Apr.15
Potatoes	Feb. 15 to April 30	Oct. 1 to Nov. 30

[a]Pasture may be grazed year-round.

Other crops may be raised at the sole discretion of Madison Ranches and may receive cooling water at agronomic rates as recommended in OSU irrigation guides. Crop rotation will be practiced as determined by Madison Ranches.

HARVESTING

Harvesting is an important aspect in the management of the crops and provides effective removal of nutrients in the forage or grain portions of the crop. Harvesting by grazing animals is less efficient because some of the nutrient content of the forage is recycled. However, these recycled nutrients, largely in organic form, are less available for immediate plant uptake and leaching.

Most of the sites will have crops harvested and also have the crop stubble used for fall and winter grazing of cattle, to maximize nutrient removal. Crops that are grazed after harvesting may use more nutrients than is recommended in OSU fertilization guides, which allow for some nutrient recycling when the crop stubble is plowed back into the ground.

The time and frequency of harvesting will depend on the productivity and development of each individual crop. When the available cooling water is insufficient to meet the crop irrigation requirements, supplemental irrigation water will be used for optimum production. Therefore, the number of harvests and the yields should not vary from those typically expected for well-managed irrigated crops.

The forage grasses are generally harvested year-round by grazing. Harvesting alfalfa in three to four cuttings at early flower (first flower to 1/10 bloom) will produce hay of good quality without a significant decline in the stand. Barley, corn, canola, and wheat usually mature and are harvested in mid-July to August, depending on the time of planting and other factors affecting rate of development. Turnips are planted in late summer and harvested by grazing from fall through spring.

Chapter 7
SITE MONITORING

A monitoring program is recommended to evaluate the performance of the land application system. In addition to meeting documentation requirements, this program will provide Madison Ranches with the information necessary to operate the system in an environmentally sound manner. Items to be monitored include the volume and quantity of cooling water discharged at the cogeneration facility, the diluted cooling water stored in the reservoir, and the soils and groundwater at the seven-pivot site.

COOLING WATER

The cooling water should be sampled quarterly and analyses made for biochemical oxygen demand, chemical oxygen demand, pH, suspended solids, total Kjeldahl nitrogen, ammonia nitrogen, nitrate, phosphorus, TDS, electrical conductivity, calcium, magnesium, chloride, and sodium.

RESERVOIR CONTENTS

Cooling water from the cogeneration facility and fresh water from the Columbia River will be mixed to produce a reservoir water quality equal to or better than background water quality. Background groundwater quality will be determined by installing a piezometer downgradient of the selected reservoir site. Once background groundwater quality has been determined, the piezometer will function primarily as a monitoring device to evaluate the impacts on static water levels from reservoir leakage. Monitoring of reservoir surface water quality should be conducted on the same frequency selected for groundwater monitoring.

SOILS

An annual soil sampling program will be implemented to evaluate soils for nutrient carryover or deficiency at each field on the seven-pivot site. The program will also help to characterize the site's nitrogen cycle by indicating the annual nitrogen loss and carryover and the salt buildup from application of water with high TDS concentrations. Madison Ranches currently collects soil samples from every irrigated field for annual analysis for nitrogen, phosphorus, potassium, boron, zinc, and pH. Future testing should include electrical conductivity to provide data for evaluating the long-term impacts of salt accumulation in the soils and the potential for hardpan formation.

Distribution of moisture within the soil profile on the seven-pivot site will be monitored throughout the year with a neutron probe. From one to three neutron access tubes will be installed to a depth of at least 10 feet in each major soil series in each field, with a maximum of three access tubes per field. Approximate locations for the tubes are shown in Figure 7-1. Rain gauges will be installed adjacent to each neutron access tube to determine moisture input from both irrigation and precipitation.

The soil moisture data will be used primarily for irrigation scheduling and to monitor moisture movement during the periodic leaching process, when enough water is applied to move salts below the root zone without infiltrating groundwater. They will also assist in quantifying evapotranspiration during the active crop growing season and evaporation during the nongrowing season. In addition, the data will help in making appropriate adjustments to prevent degradation of background groundwater quality (e.g., increasing direct discharge to the reservoir or decreasing hydraulic loading rates).

GROUNDWATER

Hermiston Generating Company will provide a groundwater monitoring plan that will present the rationale and methodologies for conducting routine monitoring of groundwater quality at the seven-pivot site. The groundwater monitoring plan will be developed to comply with the requirements specified in DEQ's minimum site characterization of a land application facility and meetings with DEQ personnel. Specifics concerning well construction, well installation, groundwater sampling protocol, and analysis parameters will be covered in future groundwater monitoring and sampling and analysis plans.

The goal of the sampling program will be to collect samples that are physically and chemically representative of subsurface water beneath the site prior to and during application system operation. Based on spatial and hydrogeologic interpretations of existing well logs (as seen in the *Minimum Site Characterization Report*, prepared by CH2M HILL in July 1991 for Lamb-Weston), three monitoring well locations have been preliminarily identified for long-term groundwater monitoring, as shown in Figure 7-1. Information regarding groundwater flow direction and groundwater chemistry in the Butter Creek area should be obtained from the OWRD and DEQ prior to determination of the exact well locations. Previously drilled wells will be excluded from the monitoring program because several water-bearing zones are screened within each well and the wells are generally not screened in the uppermost water-bearing zone. All new wells will be screened in recent (Holocene) or older (Pleistocene) alluvium, whichever represents the uppermost water-bearing zone at the site.

Monitoring well MW-1 will be an upgradient well to provide information on background water quality not affected by site activities. The proposed monitoring well is located in Township 3 North, Range 27 East in the southwest 1\4 of the southwest 1\4 of the southwest 1\4 of section 34, at elevation benchmark 1012 feet amsl. Based on the depth to first encountered water at Lamb-Weston MW-2 (static water level of 600 amsl), depth to first encountered water is anticipated to be about 400 feet below ground surface. The Lamb-Weston MW-2 is approximately 2.5 miles northeast of the proposed monitoring well location.

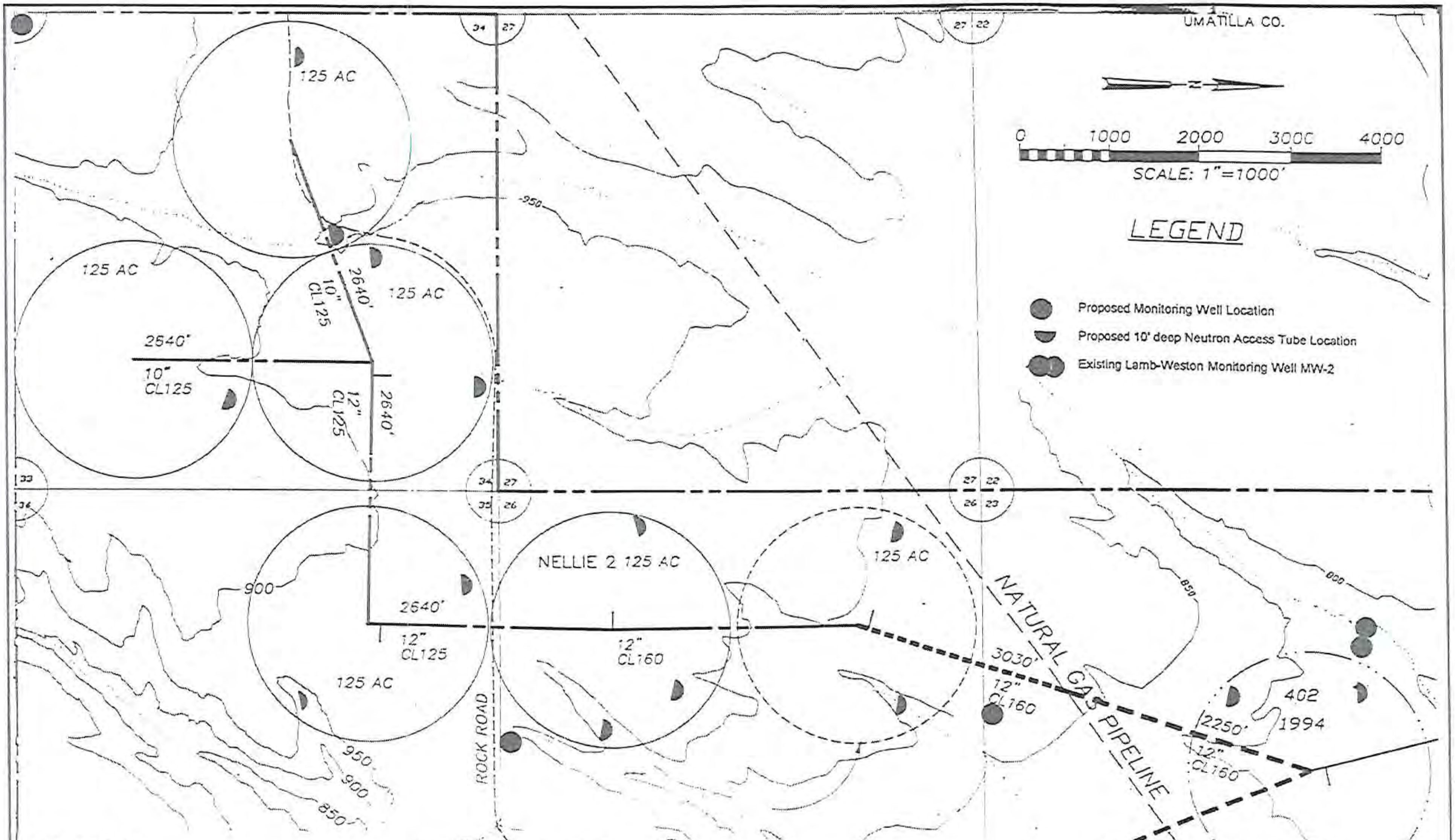

Figure 7-1
Proposed Monitoring Locations

Proposed monitoring wells MW-2 and MW-3 are located in areas expected to provide the most representative data for groundwater quality downgradient of the site. MW-2 is located in Township 3 North, Range 27 East in the southwest 1\4 of the southeast 1\4 of section 26; just east of the proposed Nellie 2 irrigated circle, west of an old gravel pit, and southwest of John Madison's domestic well. MW-3 is located in Township 3 North, Range 27 East in the southeast 1\4 of the southwest 1\4 of section 23, just north of the proposed Nellie 1 irrigated circle. Based upon Lamb Weston's MW-2 well, depth to first encountered water is anticipated to be 370 and 330 feet below ground surface for the proposed MW-2 and MW-3 wells, respectively. Extrapolated depths to first encountered water for all three proposed monitoring well locations are estimates based entirely on the depth to first encountered water at Lamb-Weston's MW-2 well. It is possible that water-bearing zones may be encountered at shallower depths.

The existing Lamb-Weston MW-2 may be used as a downgradient monitoring well for the proposed S20 circle located in section 20, Township 3 North, Range 27 East; its suitability for this purpose will be determined in the field. A field evaluation will be conducted to determine the exact location of the proposed S20 irrigated circle, relative topography, and the exact location of Lamb-Weston's MW-2 well in relation to the proposed circle. In any case, Lamb-Weston will use the proposed MW-1 as an upgradient monitoring well in the future.

One piezometer should be installed downgradient of the selected reservoir site to establish a compliance point for initial background groundwater quality. Further use of the piezometer will be limited primarily to monitoring the effects of reservoir leakage on static water levels. Monitoring wells should not have to be installed at the reservoir site, because cooling water stored in the reservoir will have been mixed with Columbia River water to meet groundwater quality goals.

The proposed monitoring wells and piezometer will be constructed in accordance with OWRD Administrative Rules (Chapter 690, Division 240), effective January 1991 and DEQ guidelines (November 20, 1990). The basic design recommendations will be reviewed by the DEQ prior to well construction. Furthermore, if possible, the exact location of each monitoring well will be determined, in the field, by both a representative of the DEQ and the applicant. Well construction will proceed after DEQ verbal approval. All wells will be constructed and completed by a contractor licensed in Oregon.

REPORTING

Hermiston Generating Company, L.P., will submit a quarterly Operational Report Form to DEQ to provide information on the amount of cooling water applied to each field, results of laboratory analysis performed during that time period, and agricultural operations such as crop rotation and harvesting. A map showing the areas where cooling water has been applied up to the time of the report submittal will also be included. The report will be submitted by the 20th day of the first month of each quarter and will contain information regarding the activities of the previous quarter.

The irrigation manager for the Madison property sites will record the volume of cooling water applied to the seven-pivot site quarterly. He will coordinate the reuse of cooling water with other agronomic practices, including additional irrigation with other water supplies.

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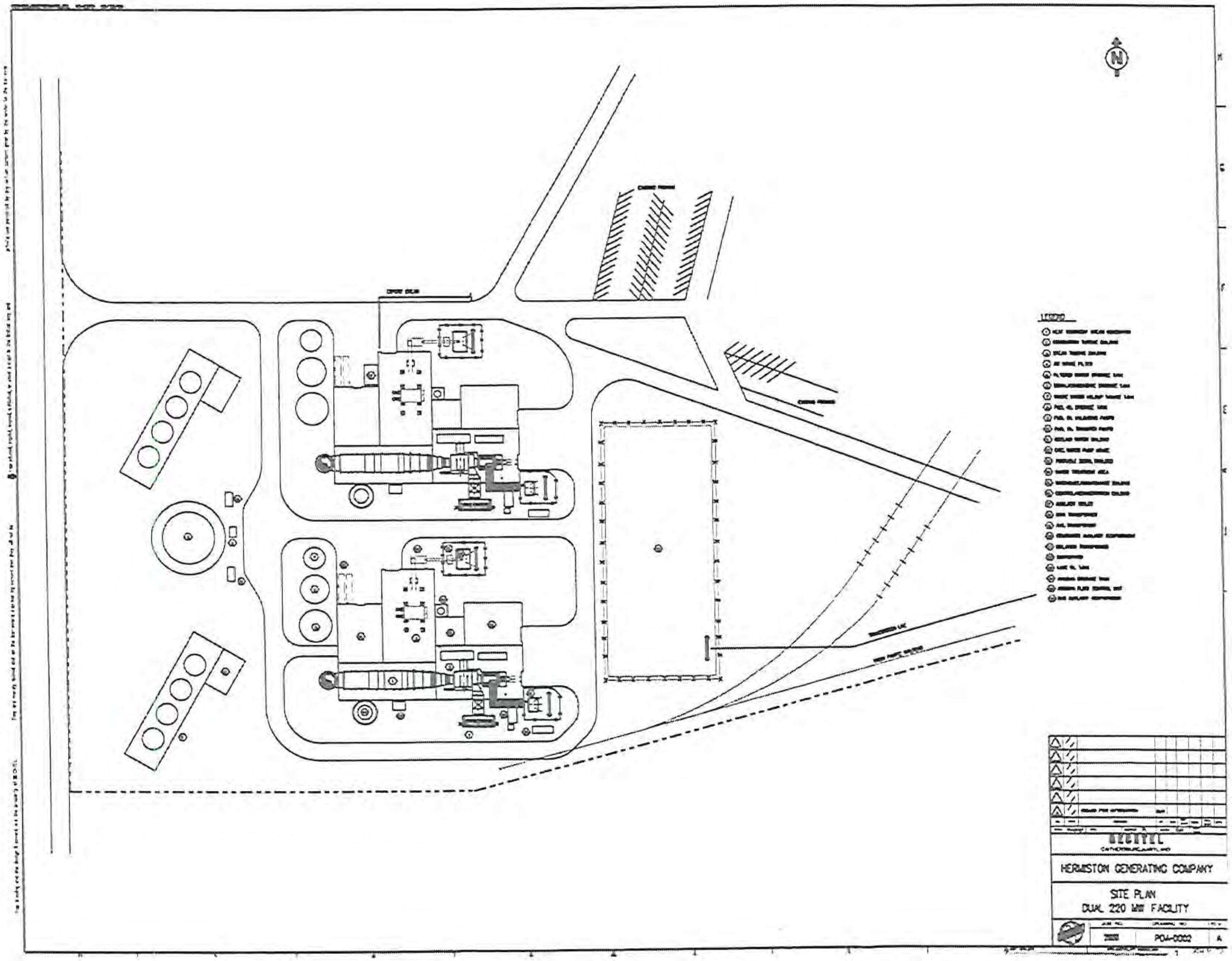
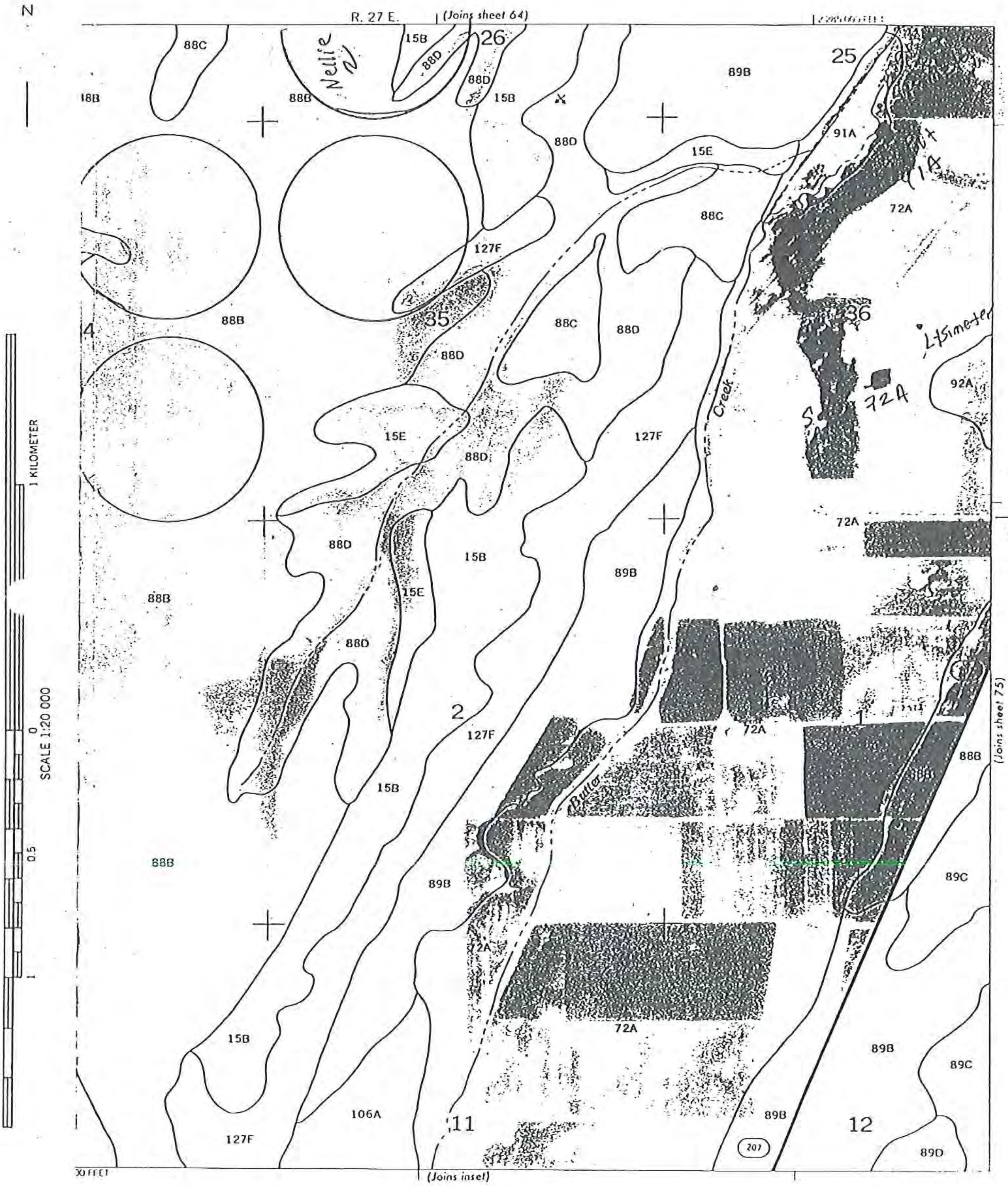
Appendix A
Cogeneration Facility Site Plan


N
LEGEND
HERMISTON GENERATING COMPANY
SITE PLAN
DUAL 220 MW FACILITY
P04-0002
A

Appendix B
SCS Soils Maps and Data

IBER 74

73



N
R. 27 E.
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36
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12
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Nellie
Butler
Creek
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1A
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88B
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15B
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91A
15E
127F
92A
89C
89D
106A
207

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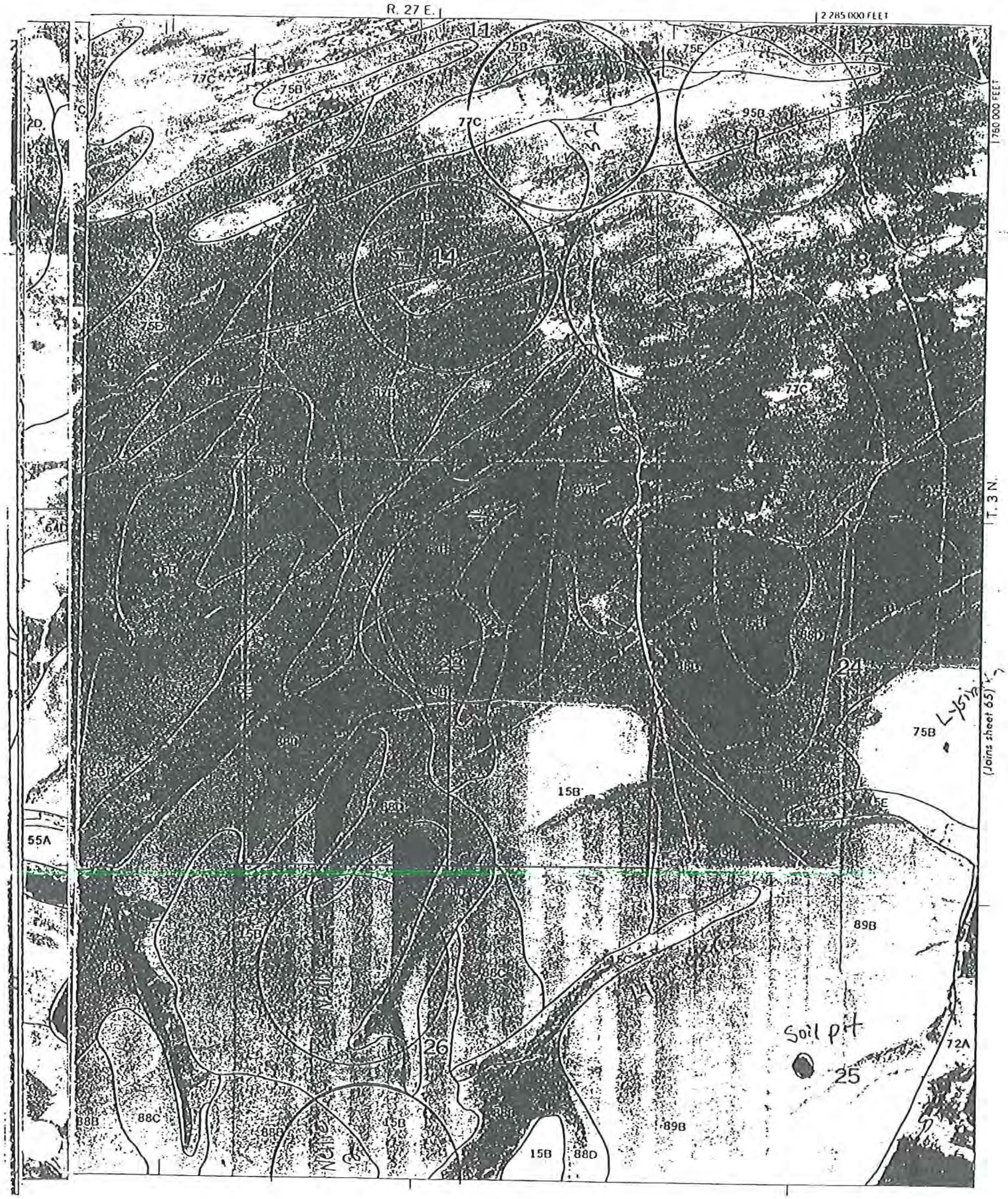
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77C
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89B
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55A
88B
Soil pit
Lysim

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm					Pct
11F*:												
Bowlus----------	0-19	20-27	1.10-1.20	0.6-2.0	0.21-0.23	6.1-7.3	<2	Low--------	0.28	5	6	4-8
	19-42	20-35	1.10-1.30	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.43			
	42-60	28-35	1.20-1.35	0.6-2.0	0.11-0.23	5.6-7.3	<2	Moderate	0.20			
Buckcreek--------	0-11	15-27	1.20-1.40	0.6-2.0	0.18-0.22	6.1-7.3	<2	Low--------	0.32	2	6	3-5
	11-23	20-30	1.25-1.40	0.6-2.0	0.15-0.21	6.1-7.3	<2	Moderate	0.28			
	23-36	30-35	1.30-1.40	0.6-2.0	0.10-0.16	6.1-7.3	<2	Moderate	0.10			
	36	---	---	---	---	---	---	-----------	----			
12C, 12E---------- Bridgecreek	0-16	20-27	1.20-1.40	0.6-2.0	0.19-0.23	6.1-7.3	<2	Low--------	0.43	2	6	1-3
	16-26	30-40	1.35-1.45	0.2-0.6	0.18-0.22	5.6-7.3	<2	Moderate	0.43			
	26-32	45-60	1.30-1.40	<0.06	0.14-0.17	6.1-7.3	<2	High-------	0.32			
	32	---	---	---	---	---	---	-----------	----			
13F*:												
Buckcreek--------	0-11	15-27	1.20-1.40	0.6-2.0	0.18-0.22	6.1-7.3	<2	Low--------	0.32	2	6	3-5
	11-23	20-30	1.25-1.40	0.6-2.0	0.15-0.21	6.1-7.3	<2	Moderate	0.28			
	23-36	30-35	1.30-1.40	0.6-2.0	0.10-0.16	6.1-7.3	<2	Moderate	0.10			
	36	---	---	---	---	---	---	-----------	----			
Gwin-------------	0-7	5-12	1.20-1.30	0.6-2.0	0.08-0.11	6.6-7.3	<2	Low--------	0.10	1	8	2-3
	7-13	27-35	1.20-1.40	0.2-0.6	0.07-0.11	6.6-7.3	<2	Low--------	0.05			
	13	---	---	---	---	---	---	-----------	----			
14B--------------- Burbank	0-6	0-5	1.50-1.60	6.0-20	0.07-0.11	7.4-8.4	<2	Low--------	0.24	2	2	.5-1
	6-25	0-5	1.50-1.65	6.0-20	0.07-0.11	7.4-8.4	<2	Low--------	0.24			
	25-30	0-4	1.50-1.65	6.0-20	0.04-0.07	7.4-8.4	<2	Low--------	0.10			
	30-60	0-2	1.50-1.65	>20	0.01-0.03	7.4-8.4	<2	Low--------	0.05			
15B, 15C, 15E---- Burke	0-8	5-15	1.10-1.35	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low--------	0.43	2	4L	1-2
	8-26	5-15	1.30-1.60	0.6-2.0	0.19-0.21	7.4-9.0	<2	Low--------	0.49			
	26	---	---	---	---	---	---	-----------	----			
16B, 16C, 16D, 16E--------------- Cantala	0-18	15-25	1.25-1.35	0.6-2.0	0.20-0.25	6.6-7.3	<2	Low--------	0.43	5	5	1-3
	18-54	18-25	1.30-1.40	0.6-2.0	0.20-0.25	6.6-7.3	<2	Low--------	0.49			
	54-60	18-27	1.30-1.40	0.6-2.0	0.18-0.25	7.4-7.8	<2	Low--------	0.49			
17A*:												
Catherine Variant---------	0-25	18-27	1.10-1.30	0.6-2.0	0.20-0.23	6.6-7.8	<2	Low--------	0.37	5	6	1-4
	25-60	18-25	1.30-1.50	0.6-2.0	0.07-0.10	6.6-7.3	<2	Low--------	0.37			
Catherine--------	0-25	18-27	1.25-1.35	0.6-2.0	0.19-0.21	6.1-7.3	<2	Low--------	0.28	5	---	4-10
	25-60	18-35	1.25-1.40	0.6-2.0	0.19-0.21	7.4-7.8	<2	Low--------	0.37			
18B, 18C, 18E, 19D, 20D--------- Condon	0-8	15-25	1.25-1.35	0.6-2.0	0.20-0.25	6.1-7.3	<2	Low--------	0.43	2	5	2-3
	8-30	18-27	1.30-1.40	0.6-2.0	0.19-0.21	6.1-7.8	<2	Low--------	0.43			
	30	---	---	---	---	---	---	-----------	----			
21D*:												
Condon-----------	0-8	15-25	1.25-1.35	0.6-2.0	0.20-0.25	6.1-7.3	<2	Low--------	0.43	2	5	2-3
	8-30	18-27	1.30-1.40	0.6-2.0	0.19-0.21	6.1-7.8	<2	Low--------	0.43			
	30	---	---	---	---	---	---	-----------	----			
Bakeoven---------	0-3	15-25	1.25-1.35	0.2-0.6	0.06-0.09	6.1-7.8	<2	Low--------	0.15	1	---	1-3
	3-8	18-33	1.30-1.40	0.2-0.6	0.05-0.14	6.6-7.8	<2	Low--------	0.20			
	8	---	---	---	---	---	---	-----------	----			
[illegible], 22D---------- [illegible]wsly	0-5	14-27	1.00-1.20	0.6-2.0	0.19-0.21	6.1-7.3	<2	Low--------	0.43	5	---	1-2
	5-19	20-35	1.15-1.35	0.2-2.0	0.19-0.21	6.1-7.3	<2	Moderate	0.43			
	19-42	40-60	1.20-1.40	<0.06	0.14-0.16	6.1-7.3	<2	High-------	0.28			
	42-60	27-45	1.25-1.45	0.2-0.6	0.09-0.15	6.1-7.3	<2	Moderate	0.20			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm					Pct
79B, 79C, 79D, 79E----------- Ritzville	0-9	5-10	1.15-1.35	0.6-2.0	0.15-0.18	6.6-7.8	<2	Low--------	0.49	5	3	1-2
	9-36	5-10	1.20-1.40	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43			
	36-60	5-10	1.30-1.45	0.6-2.0	0.19-0.21	7.9-9.0	<2	Low--------	0.43			
80B, 80C, 80D, 81E, 82E-------- Ritzville	0-5	5-10	1.10-1.30	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43	5	5	1-2
	5-36	5-10	1.20-1.40	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43			
	36-60	5-10	1.30-1.45	0.6-2.0	0.19-0.21	7.9-9.0	<2	Low--------	0.43			
83C*: Ritzville--------	0-5	5-10	1.10-1.30	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43	5	5	1-2
	5-36	5-10	1.20-1.40	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43			
	36-60	5-10	1.30-1.45	0.6-2.0	0.19-0.21	7.9-9.0	<2	Low--------	0.43			
Rock outcrop.												
84*. Riverwash												
85F*: Rock outcrop.												
Xeric Torriorthents.												
86D-------------- kly	0-6	20-27	1.25-1.35	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low--------	0.10	1	---	1-3
	6	---	---	---	---	---	---	-----------	----			
8/B, 87C----------- Sagehill	0-8	2-8	1.20-1.40	2.0-6.0	0.18-0.20	6.6-8.4	<2	Low--------	0.32	5	3	.5-1
	8-27	2-8	1.30-1.55	2.0-6.0	0.18-0.20	6.6-8.4	<2	Low--------	0.49			
	27-60	2-8	1.30-1.60	0.6-2.0	0.18-0.20	7.9-9.0	<2	Low--------	0.55			
88B, 88C, 88D----- Shano	0-13	5-10	1.20-1.35	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.55	5	3	1-2
	13-28	5-10	1.30-1.45	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.49			
	28-60	5-10	1.30-1.45	0.6-2.0	0.18-0.20	7.4-9.0	<2	Low--------	0.49			
89B, 89C, 89D, 89E------------ Shano	0-6	5-10	1.15-1.30	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low--------	0.43	5	5	1-2
	6-18	5-10	1.30-1.45	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.49			
	18-65	5-10	1.30-1.45	0.6-2.0	0.18-0.20	7.4-9.0	<2	Low--------	0.49			
90A*: Silvies----------	0-15	18-27	1.00-1.10	0.6-2.0	0.21-0.23	6.6-7.3	<2	Moderate	0.17	---	---	---
	15-35	35-60	1.10-1.30	0.06-0.2	0.13-0.21	6.6-7.3	<2	High------	0.20			
	35-60	45-60	1.10-1.30	0.06-0.2	0.13-0.16	6.6-7.3	<2	High------	0.24			
Winom-----------	0-13	30-40	1.20-1.30	0.2-0.6	0.20-0.23	6.1-7.3	<2	Moderate	0.37	5	7	3-5
	13-28	45-60	1.10-1.30	<0.06	0.15-0.18	6.6-7.3	<2	High------	0.28			
	28-60	35-60	1.10-1.30	<0.06	0.15-0.17	6.6-8.4	<2	High------	0.37			
91A------------- Stanfield	0-6	10-18	1.25-1.35	0.6-2.0	0.13-0.17	>7.8	<4	Low--------	0.43	3	4L	.8-2
	6-22	10-18	1.30-1.50	0.6-2.0	0.13-0.21	>7.8	<4	Low--------	0.37			
	22-70	---	---	<0.06	---	>7.8	<4	Low--------	----			
	70-86	10-18	1.30-1.40	0.6-2.0	0.13-0.21	>7.3	<4	Low--------	0.43			
92A-------------- Stanfield	0-6	10-15	1.25-1.35	0.6-2.0	0.23-0.29	7.9-8.4	<2	Low--------	0.55	2	4L	1-2
	6-30	10-15	1.30-1.50	0.6-2.0	0.22-0.28	7.9-9.0	<4	Low--------	0.64			
	30	---	---	---	---	---	---	-----------	----			
93B-------------- rbuck	0-10	5-10	1.20-1.35	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.43	1	3	.5-1
	10-18	5-15	1.30-1.45	0.6-2.0	0.12-0.15	6.6-7.8	<2	Low--------	0.28			
	18	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

December 29, 1992

U.S. Generating Company

Pamela L. Fink, P.E.
Storm Water Engineer
Industrial & On-Site Waste Section
Oregon Department of Environmental Quality
Water Quality Division
811 S.W. Sixth Avenue
Portland, OR 97204

Dear Pam,

Please find enclosed an original Registration Application for Coverage by General Permit 1200-C to Construct and Operate Stormwater Erosion Control Facilities for the Hermiston Generating Project, along with a check for $400 as the application fee.

As we have discussed with you previously, we do not expect to discharge stormwater from the project site to surface water at a point source, thus no Stormwater Discharge Permit is required for plant operation.

If there are any questions about this application, please feel free to contact me at (415)291-6417 or Roy Skinner at (916)983-7868. I look forward to working with you and the members of your staff on this project.

Sincerely,

Peter B. Evans

Peter B. Evans
Project Developer

Enclosures

444 Market Street, Suite 1900 • San Francisco, California 94111 • 415-[illegible] • Fax [illegible]

SUBMIT APPLICATION TO:
DEPARTMENT OF ENVIRONMENTAL QUALITY Business Office 811 S.W. Sixth Avenue Portland, OR 97204 (503) 229-5309

REGISTRATION APPLICATION

FOR

COVERAGE BY GENERAL PERMIT 1200-C*

STATE OF OREGON

(Attach additional sheets if necessary.)

OFFICIAL DEQ USE ONLY	
Date Received:	
Amount Received:	
Application No.:	
File No.:	

*TO CONSTRUCT AND OPERATE STORM WATER EROSION CONTROL FACILITIES AND TO DISCHARGE TREATED STORM WATER TO WATERS OF THE STATE

1. Name and Address of Owner or Contractor:
Hermiston Generating Company, L.P.
444 Market Street, 19th Floor
San Francisco, California 94111

2. Location of Construction site if different than 1:
Northwest quarter of the northwest quarter of Section 30; Township 4 North, Range 28 East

(Please include a map of site.)

Contact Name Peter Evans
Contact Phone # (415) 291-6417

3. Describe the nature of the construction activity:

The construction activity will be construction of the Hermiston Generating Project which consists of a 468 megawatt dual unit, combined cycle cogeneration facility and associated gas supply pipeline and electrical transmission line (see attached location map). The energy facility will consist of: turbine buildings, warehouse, heat recovery steam generator buildings, cooling towers, auxiliary boiler, air compressors, fuel and water storage tanks, electrical switchyard, and access road and parking (see attached Site Layout). The gas pipeline will be a buried line approximately 4½ miles in length and less than 16 inches in diameter. The electrical transmission line will be an upgrade of an existing 115 kV line to 230 kV by replacing existing wooden poles with steel towers and adding the 230 kV circuit.

Indicate the area of the site and the area that will undergo excavation or other soil disturbance during the life of the project:

Construction of the Project will require excavation of the energy facility site and gas pipeline, and pole replacement along the electrical transmission line route. Once constructed, no soil disturbance will occur unless maintenance of the gas pipeline or electrical power pole replacement is required. Excavation for the energy facility will involve approximately 7 acres of a 10 acre site. The length of the pipeline will be 4.7 miles and the width of the right-of-way will be about 50 feet, resulting in a surface impact of about 28 acres. The length of the transmission line will be approximately 12.1 miles and the right-of-way will be about 75 feet. The maximum disturbance will be 110 acres; however, the work will be concentrated at the pole location, and actual disturbance will be much less.

5. A brief description of those measures proposed to be used during the construction activity to control sediment in storm runoff: (The preparation of a more detailed Erosion Control Plan will be required prior to construction.)

A number of erosion control measures will be implemented for the project. The energy facility site is nearly level, with approximately a 1 percent slope toward the Umatilla River to the east. There are no defined drainage features on the site and runoff is primarily by sheet flow. Slopes along the gas pipeline and transmission line routes are generally less than 5 percent and most of the runoff occurs as sheet flow. Erosion control measures at the site may include: diversion of upslope runoff away from excavated areas; silt fencing, haybale dikes, or vegetation buffers downslope of the construction site and soil stockpiles; gravelling the access road; application of straw mulch or other cover on exposed surfaces and stockpiles during wet weather; and sediment traps or ponds to contain sediment. Existing vegetation will be preserved wherever practical to minimize erosion potential and disturbed areas will be revegetated as soon as possible following construction.

5. (Continued)

6. Identify the receiving waters (show drainage patterns on map):

The receiving water for the energy facility and the gas pipeline is the Umatilla River. Most of the transmission line route also drains to the Umatilla River with the exception of portions of the north end of the route. The receiving water for these areas is the Columbia River (see attached Location Map).

7. If treated storm water will be discharged to a municipally owned storm sewer, a letter of authorization from the municipality must accompany this application. (Letter attached.) No: X Yes: ___

NOTE:

Prior to construction, a detailed erosion control plan shall be prepared and submitted to the Department (or the local building department if acting as DEQ's authorized agent [illegible]) the General Permit describes the erosion control methodology to be considered in developing this plan. No land clearing or construction activities shall occur until the erosion control plan has been prepared and implemented. This plan shall be submitted at least thirty (30) days prior to the start of construction.

Fees in the amount of $300 are required with this application.

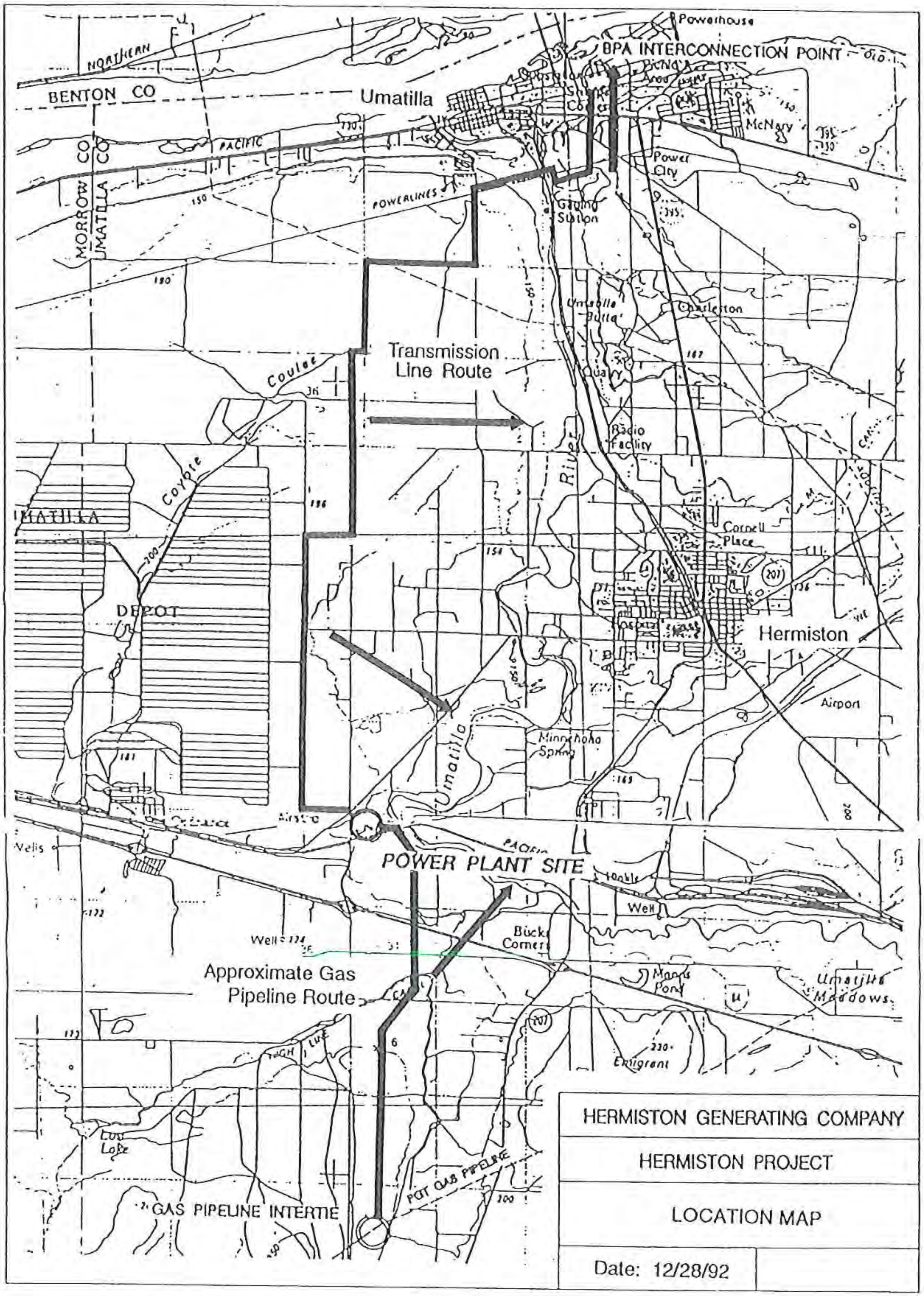
I HEREBY CERTIFY THAT THE INFORMATION THAT IS INCLUDED IN THIS APPLICATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE.

Francis X. DeRosa
Name of Owner
(Or Legally Authorized Representative)

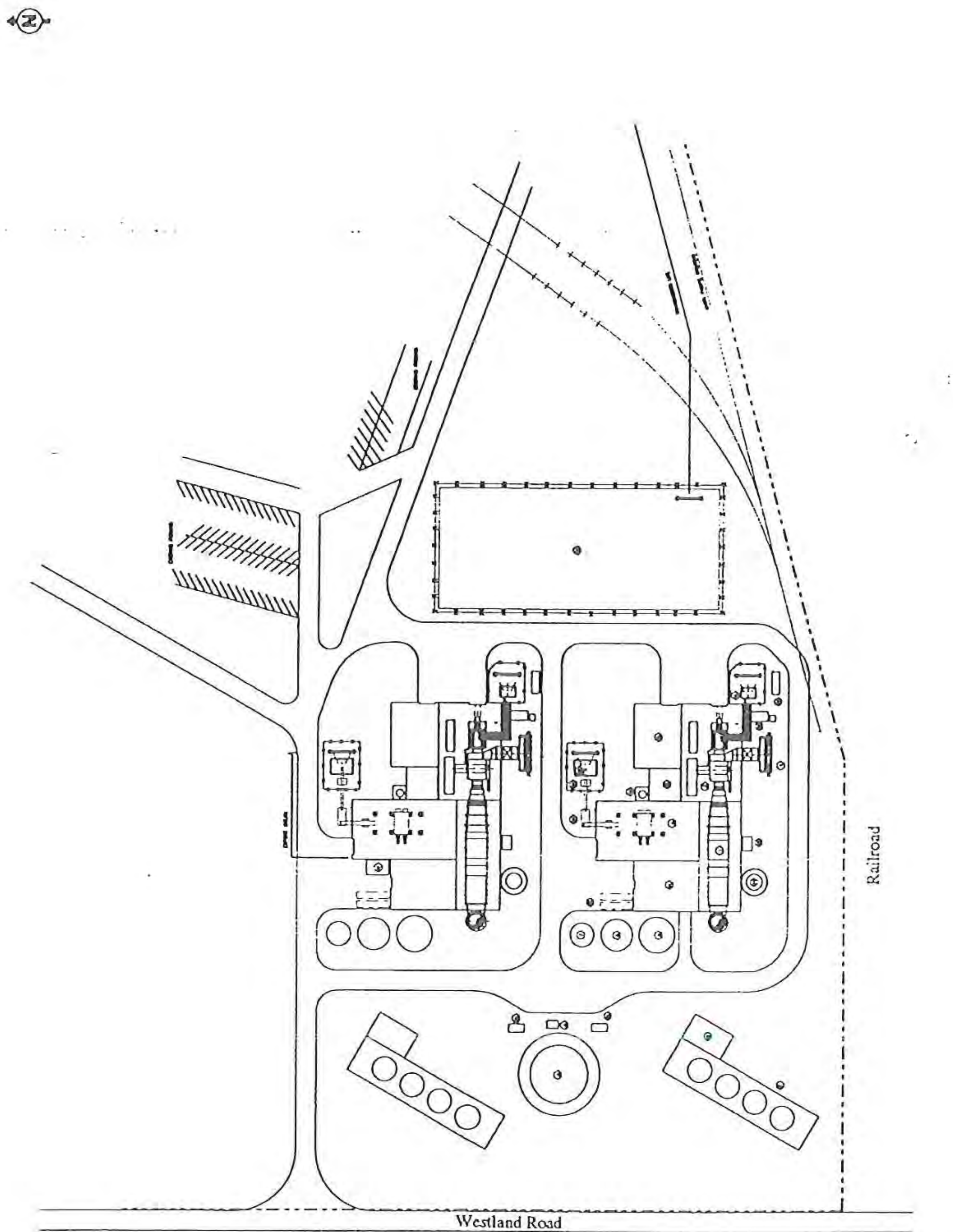
Vice President
Title

F. X. DeRosa
Signature

12/29/92
Date



Drainage Direction



Hermiston Generating Company

HERMISTON PROJECT

SITE LAYOUT

Date: 12/28/92

92-43456.009/rs/0
12-24-92

EXHIBIT N

NATIVE VEGETATION AND SOIL COVER

INTRODUCTION

This Exhibit discusses native vegetative cover types and soil types. Vegetation and soil characteristics affect fish and wildlife habitat, and are therefore relevant to fish and wildlife standards set forth in OAR 345-22-060 and to the structural standard of OAR 345-22-020(2). Because the impact of the Project on native vegetation and soil cover will be greatest during construction, Applicant has examined vegetation and soil cover within the site boundary of the energy facility and within five hundred feet on either side of the rights-of-way for the gas line and transmission line.

VEGETATION

Native vegetation only occurs within the Umatilla Ordnance Depot, and will not be affected by the Project. Native species are present, but not dominant along portions of the transmission line and gas pipeline routes.

Prior to the introduction of grazing, this part of the Columbia Basin was dominated by bunchgrasses such as bluebunch wheatgrass and Idaho fescue, and shrubs such as big sagebrush and antelope bitterbrush. Most of the native grassland and shrub-steppe communities no longer exist in the study area. Native bunchgrasses and shrubs have been replaced by cheatgrass and other weedy herbs and shrubs. The largest remaining remnants of native bunchgrass prairie in eastern Oregon are inside the boundaries of the Umatilla Ordnance Depot, where they have been protected from livestock grazing.

Normally after disturbance, there is a successional return to a given climax community when the disturbance (e.g., grazing) is eliminated. However, the introduction of cheatgrass to the drier zones of Oregon has altered this natural successional pattern. A stand of cheatgrass apparently has the ability to maintain itself indefinitely, even if the disturbance is removed. Daubenmire (1975) found no evidence that cheatgrass will ever give way to native grasses, even after 50 years of protection from grazing.

The following sections provide descriptions of the vegetation types within the study area. A complete list of all species observed is presented in the Table N-1.

Uplands

Large areas adjacent to the transmission line and gas corridors are under cultivation, most frequently under center-pivot irrigation systems. The rest of the land within the vicinity of the Project is dominated by cheatgrass and tarweed. The most common associated grasses are occasional patches of Sandberg's bluegrass and needle-and-thread grass. Frequently occurring forbs in addition to tarweed are tumblemustard, hairy golden aster, Russian thistle, and lance-leaf scurfpea.

Some locations also have a shrub layer overlaying the herbaceous community described above. Frequently the dominant shrub is gray rabbitbrush, another indicator of past grazing disturbance. However, there are areas with big sagebrush and/or antelope bitterbrush also present.

The least disturbed area observed is the segment of the transmission line corridor that crosses the northeast quarter of the northwest quarter of Section 20 south and west of the Umatilla River. Along this gently sloping area, tarweed and Russian thistle are much reduced, and the common forbs are arrowleaf balsamroot, silky lupine, long-leaf phlox, and turpentine cymopteris.

Wetlands

There were three wet areas on or near the transmission line corridor (Figure H-1). Two of these features are man-made. One site is adjacent to the corridor, but outside the proposed disturbance area. It is a flat area which has been used for years for land application of potato processing wastewater. Water is retained in depressions and the wastewater supports a dense algal community. Weedy introduced species dominate this area.

The second site is a small wetland at the foot of the slope between the West Extension Irrigation Canal and the Umatilla River. This wetland appears to be fed by irrigation water. It is dominated by cattail, water speedwell, watercress, and rabbitfoot polypogon. There are also some willow and cottonwood saplings.

The third site is the riparian corridor along the Umatilla River. Trees along the banks include box elder, black locust, and Russian olive. Common shrubs include willow and Himalayan blackberry. Along the waterline and in the shallows are reed canarygrass, bulrush, and cattail.

Impacts and Mitigation

Project impacts on native vegetation will be minimal. Native vegetation that does occur in the project area is sparse, except for that within the Umatilla Ordnance Depot.. Disturbance will be limited to pole replacement activities along the right-of-way associated with upgrading the existing transmission line. In most cases, native vegetation can be avoided by construction activities. The Project will not affect the native vegetation within the Umatilla Ordnance Depot.

SOILS

Table N-2 identifies the soils at the energy facility site and along electrical transmission line and gas pipeline routes as well as the extent of disturbance resulting from the Project. Along the transmission line route, the disturbance will primarily be at the power pole replacement locations.

Energy Facility Site

Soil at the energy facility site consists of Quincy loamy fine sand. These soils are typically used for irrigated crops, have a low clay content (0 to 5 percent), low shrink-swell potential, and are highly susceptible to wind erosion, particularly when excavated. The soils are generally greater than 5 feet in depth and groundwater is usually more than 6 feet below the surface. Data from nearby Lamb-Weston wells indicate that soil depths at the energy facility site are about 7 feet thick. This soil unit is not classified as Prime Farmland.

Gas Pipeline Right-of-Way

Soils along the gas pipeline route consist of: (1) 2.1 miles of Adkins fine sandy loam; (2) 0.2 miles of Quincy fine sand and (3) 2.4 miles of Quincy loamy fine sand. These soils are typically greater than 5 feet in depth, have a very high to extreme wind erosion susceptibility and are not subject to flooding. The water table is greater than 6 feet below the surface. These soils are generally used for irrigated crops or, to a lesser extent, as rangeland. They have a low shrink-swell potential and low clay content (0 to 5 percent). The Adkins soils are considered Prime Farmland.

Transmission Line Right-of-Way

Soils along the transmission line route consist of: (1) 0.3 miles of Adkins fine sandy loam with slopes of 0 to 5 percent, (2) 0.4 miles of Adkins fine sandy loam with slopes of 5 to 25 percent, (3) 4.5 miles of Burbank loamy fine sand, (4) 0.7 miles of Quincy fine sand, (5) 5.4 miles of Quincy loamy fine sand, and (6) 0.2 miles within a gravel quarry (gravel pit). These soils are discussed above, with the exception of Burbank loamy fine sand. The Adkins fine sandy loam with slopes from 0 to 5 percent is considered Prime Farmland.

The Burbank loamy fine sand is deep and excessively drained. Permeability is rapid with low water capacity, and runoff is slow. Potential for water erosion is slight, but the soil has very high potential for wind erosion. These soils are mostly used for irrigated crops, but are sometime used as rangeland or pasture.

Soil in the area of the gravel quarry has been removed.

Impacts and Mitigation

Because of the susceptibility of the soils in the Project area to wind erosion, precautions will be taken during construction to minimize erosion. This could include watering of the site and pipeline access road and use of dust palliatives. Impacts to soils along the pipeline route will be limited to a short construction period. If appropriate, topsoils and subsoils will be segregated during excavation for the pipeline to minimize impacts on soil fertility.

References

Black, Mike, Wildlife Biologist, Umatilla District Office, ODFW. Personal Communication. Meeting with Lynn Sharp on October 26, 1992.

Daubenmire, R. F. 1975. Plant succession on abandoned fields, and fire influences in a steppe area in southeastern Washington. Northwest Sci. 49:36-48.

Oregon Natural Heritage Program (ONHP). 1991. Rare, threatened and endangered plants and animals of Oregon. Oregon Natural Heritage Program, Portland, Oregon. 64 pp.

ONHP. 1992. Letter and information dated January 16, 1992 to EnviroDynamics.

Stern, Mark, Wildlife Biologist, The Nature Conservancy, Portland, Oregon. Personal Communication. Telephone conversation with Lynn Sharp on July 14, 1992.

U.S. Soil Conservation Service, 1988. Soil Survey of Umatilla County Area, Oregon. 388 pp.

TABLE N-1
PLANT SPECIES, BY COMMON NAME, IDENTIFIED DURING FIELD VISITS, 1-2 JUNE 1992, HERMISTON GENERATING PROJECT

Common Name	*Scientific*
TREES	
Birch	*Betula*
Black cottonwood	*Populus*
Black locust	*Robinia*
Box elder	*Acer*
SHRUBS	
Antelope Bitterbrush	*Purshia*
Big Sagebrush	*Artemisia*
Gray Rabbitbrush	*Chrysothamnus*
Green Rabbitbrush	*Chrysothamnus*
Russian Olive	*Elaeagnus*
Western Virginsbower	*Clematis*
Willow	*Salix*
GRAMINOIDS	
Broomcorn Millet	*Panicum*
Bulbous Bluegrass	*Poa*
Bottle-brush Squirreltail	*Sitanion*
Cheatgrass	*Bromus*
Crested Wheatgrass	*Agropyron*
Green Bristlegrass	*Setaria*
Indian Ricegrass	*Orizopsis*
Needle-and-thread	*Stipa*
One-sided Sedge	*Carex*
Rabbitfoot Beardgras	*Polypogon*
Reed Canarygrass	*Phalaris*
Sandberg's Bluegrass	*Poa*
Soft Rush	*Juncus*
Softstem Bulrush	*Scirpus*
Wildrye	*Elymus*
FORBS	
Alfalfa	*Medicago*
Arrowleaf Balsamroot	*Balsamorhiza*
Bittersweet	*Solanum*
Canada Thistle	*Cirsium*
Cattail	*Typha*
Cheeseplant	*Malva*

TABLE N-1
PLANT SPECIES, BY COMMON NAME, IDENTIFIED DURING FIELD VISITS, 1-2 JUNE 1992, HERMISTON GENERATING PROJECT (continued)

Common Name	*Scientific*
Clasping Pepperweed	*Lepidium*
Coast Fiddleneck	*Amsinckia*
Columbia Milkvetch	*Astragalus*
Common Burdock	*Arctium*
Evening Primrose	*Oenothera*
Field Dodder	*Cuscuta*
Filaree	*Erodium*
Goldenrod	*Solidago*
Hairy Goldaster	*Chrysopsis*
Hoary Chaenactis	*Chaenactis*
Indianwheat	*Plantago*
Ivy Bindweed	*Polygonum*
Knotweed	*Polygonum*
Lady's Thumb	*Polygonum*
Lambsquarters	*Chenopodium*
Lance-leaf Scurfpea	*Psoralea*
Lomatium	*Lomatium*
Long-leaf Phlox	*Phlox*
Lupine	*Lupinus*
Phacelia	*Phacelia*
Prickly Lettuce	*Lactuca*
Prickly Pear	*Opuntia*
Russian Thistle	*Salsola*
Sagebrush Mariposa	*Calochortus*
Showy Milkweed	*Asclepias*
Silky Lupine	*Lupinus*
Small-flower Fiddleneck	*Amsinckia*
Stalk-pod Milkvetch	*Astragalus*
Stinging Nettle	*Urtica*
Tarweed	*Amsinckia*
Thistle	*Cirsium*
Tidytips	*Layia*
Tumblemustard	*Sisymbrium*
Turpentine Cypopterus	*Cymopterus*
Water Speedwell	*Veronica*
Watercress	*Rorippa*
Watson's willowherb	*Epilobium*
White sweetclover	*Melilotus*
Wild begonia	*Rumex*

TABLE N-1
PLANT SPECIES, BY COMMON NAME, IDENTIFIED DURING FIELD VISITS, 1-2 JUNE 1992, HERMISTON GENERATING PROJECT
(concluded)

Common Name	*Scientific*
Yarrow	*Achillea*
Yellow Bee Plant	*Cleome*
Yellow Salsify	*Tragopogon*
Yellow Sweetclover	*Melilotus*

Table N-2
Soils Types and Disturbance

Soil Type	Disturbance
Power Plant Site	
Quincy loamy fine sand	7 acres
Gas Pipeline	
Adkins fine sandy loam (0 to 5 percent slope)	2.2 miles
Quincy fine sand	0.1 miles
Quincy loamy fine sand	2.4 miles
Transmission Line	
Adkins fine sandy loam (0 to 5 percent slope)	0.3 miles
Adkins fine sandy loam (5 to 25 percent slope)	0.4 miles
Burbank loamy fine sand	4.5 miles
Quincy fine sand	0.7 miles
Quincy loamy fine sand	5.4 miles
Gravel Pit	0.2 miles

Please ~~FAX to~~ Copy and mail to Mike Ladd in Pendleton Thanks MM

EXHIBIT O

WATER RESOURCES - OAR 345-21-015(1)(o)

INTRODUCTION

As described in Exhibit F, the Project's projected water requirement is approximately 5.8 cfs (2,600 gpm). A primary water source and several alternative sources of water have been identified that could provide the supplies required for construction and operation of the Project. These alternatives are described in more detail below. In each case neither the planned source, nor any of the preferred alternative sources, require that the Oregon Department of Water Resources ("DWR") approve any form of groundwater or surface water permit or transfer for the Project. Accordingly, no application for a new water right or a water right transfer is filed with this SCA. WRONG

Water discharges are addressed in Exhibits B and M. As described therein, Madison Farms will beneficially use cooling water from the Project for irrigation. Exhibit M contains the Land Application Management Plan and WPCF permit for this beneficial reuse. Madison Farms will also file a water right application for use of this cooling water for irrigation purposes, pursuant to ORS Chapter 537, Section 110 through 330 and OAR 690-11-005 through 690-11-220.

Whether the planned source or one of the alternative sources is used, it is the intent that efficiency of water use be maximized to reduce water requirements, and that new appropriations of water from limited resources be avoided. Water from the Umatilla River is not under consideration as a source in any of the water supply alternatives.

PLANNED SOURCE OF MAKEUP WATER; HERMISTON DEVELOPMENT CORPORATION REGIONAL WATER SUPPLY SYSTEM

The Project's planned source of makeup water is the Hermiston Development Corporation's Regional Water Supply Project. The Hermiston Development Corporation has applied for a surface water right from the Columbia River for municipal, agricultural and industrial purposes. The Regional Water Supply Project is designed to relieve demands on critical groundwater areas, and to provide supplies for further regional development. The Regional Water Supply Project will also provide infrastructure modifications to increase water-use efficiency, and provide supplies that would be dedicated to restore anadromous fish habitat in the Umatilla River. 1

Hermiston Development Corporation filed application No. 71309 with the WRD on February 15, 1991 for 267 cfs from the Columbia River. Of the requested 267 cfs, 7 cfs are proposed for municipal use, 200 cfs are proposed for agricultural use, and 60 cfs are proposed for industrial use. The proposed points of diversion under this application are in Section 11, Township 5 North, Range 28 East, W.M., and in Section 13, Township 5 North, Range 29 East, W.M.

The site of the energy facility, Section 30, Township 4 North, Range 28 East, W.M., is a permitted place of use for irrigation under the application. The application will be amended to include the site of the energy facility as a place of use for industrial and/or municipal use.

The Hermiston Development Corporation application is currently under review by WRD. Applicant has provided Hermiston Development Corporation with an expression of interest in obtaining water for the Project through the Regional Water Supply Project. Applicant will be a customer of the Regional Water Supply Project. Rights to withdraw the water will be held by the Regional Water Supply Project.

Once Hermiston Development Corporation's application is approved and a permit is issued, no further action on the part of the WRD is required for the Project to obtain water from Hermiston Development Corporation.

ALTERNATIVE SOURCES OF MAKEUP WATER

The WRD is currently faced with a substantial backlog of pending water right applications. Should the Hermiston Development Corporation application not be approved in a timely fashion, one of the following alternative sources of makeup water would be used.

Port of Umatilla

App 58215

2

The Port of Umatilla holds permit No. 49497 for the use of up to 155 cfs of water from the Columbia River, an amount well in excess of the Project's requirements. Under this alternative, the Port or Umatilla would supply water to Applicant under the its permit, which was acquired to support development of several industrial areas, including the area in which the Project is located. The Port of Umatilla's permit, which is for municipal use, includes the energy facility site, Section 30, Township 4 North, Range 28 East, W.M. The point of diversion for water under this permit is in Section 10, Township 5 North, Range 28 East, W.M.

The Port of Umatilla is proposing a municipal and industrial supply system that would serve the City of Hermiston as well as users in west Umatilla County. Water would be delivered to the energy facility site via the this system. Alternatively, water could be delivered to the site via a combined-agricultural and industrial system under development by Madison Farms and other property owners in the area. As with the planned source of water supply from Hermiston Development Corporation, under this alternative Applicant would purchase water and the seller, the Port of Umatilla, would continue to hold the water right.

If water would be delivered to the Project site via the Port's regional supply plan, no further action by the WRD would be required for the Project to obtain water. If water would be delivered to the energy facility via the West Umatilla County Water Supply System proposed by Madison Farms and others, an additional point of diversion would be established at Section 13, Township 5 North, Range 27 East (see below).

Madison Farms

App 70272

Applicant has also discussed alternative water supply options with Madison Farms. Kent and Shannon Madison hold permit No. 51017 for 15,000 gpm (33.4 cfs) of water from the Columbia River for irrigation and supplemental irrigation (including soil storage during the winter). The planned point of diversion is at the diversion now operated by C&B Livestock (Section 13, Township 5 North, Range 27 East). 3

The Madison Farms alternative would involve the transfer of a portion of the Kent and Shannon Madison right for industrial use in the vicinity of the energy facility, once that right is certificated. Under this arrangement, water would be taken from the river at the point of diversion near Umatilla and delivered to Madison Farms via the energy facility site, where a portion of the right would be used by the Project. Cooling water from the energy facility would then be returned to the irrigation water system for use at Madison Farms. The owner of the energy facility site, Lamb-Weston, would apply for the transfer application and then supply water to the Project.

Lamb-Weston

App 61680
per 46678

Lamb-Weston holds rights for both groundwater and surface water withdrawals. Lamb-Weston's plant is located adjacent to the energy facility, and it plans to use steam from the energy facility. Lamb-Weston holds a certificated withdrawal right from the Columbia River and from effluent for 10.36 cfs for irrigation and supplemental irrigation (Certificate No.67222). The point of diversion for Columbia River water under this right is in Section 17, Township 5 North, Range 28 East, W.M., and the place of use is Section 1 and 12, Township 4 North, Range 27 East, W.M., and Section 6, Township 4 North, Range 28 East. 4 5.

If water under this right is used by the Project, a portion of the right would be transferred to industrial use at Section 30, Township 4 North, Range 28 East, the site of the Lamb-Weston plant and the energy facility.

5

Lamb-Weston also holds three certificated groundwater rights for a total of 8.35 cfs for industrial use at the energy facility site. Use of these rights by the Project would not required WRD action.

EXHIBIT P

IMPACTS ON FISH AND WILDLIFE

INTRODUCTION

To satisfy OAR 345-22-060, the EFSC must find that the design, construction and operation of the Project is consistent with fish and wildlife habitat mitigation goals and standards contained in OAR 635-415-030, for fish and wildlife species not classified as threatened or endangered.

This Exhibit identifies non-threatened and endangered fish and wildlife species which have been found in the Impact Area. In response to Paragraph 19(ii) of the Project Order, a copy of the biological survey conducted for the impact area, *Vegetation and Wildlife Investigation, Hermiston Generating Project* (Woodward-Clyde, 1992), is attached as Appendix P-1 to this Exhibit . The only other biological survey conducted within the Impact Area of which Applicant is aware is a report on the 1987-89 research on Washington ground squirrels on the Madison Ranch (Betts, 1990), which is described in Exhibit R. As described in Exhibit C, the Impact Area for wildlife and wildlife habitat for the Project is the area within the site boundary of the energy facility and within 500 feet on either side of the proposed rights-of-way for the gas pipeline and transmission line.

This Exhibit discusses how design, construction and operation of the Project will be carried out in a manner consistent with the applicable requirements. Particular attention is paid to protective measures at transmission towers to reduce the potential for electrocution of raptors.

FISH AND WILDLIFE SPECIES AND THEIR HABITAT - OAR 345-21-015(1)(p); PROJECT ORDER, PARAGRAPH 19(ii) and (iii)

Fish

Anadromous fish species present in the Umatilla River include several species of salmon and steelhead trout (*Salmo gairdneri*). Steelhead are the only surviving native wild fishery. Hatchery-derived runs of both chinook salmon (*Oncorynchus tshawytcha*) and coho salmon (*Oncorynchus kisutch*) are being encouraged to naturally re-populate the basin. Millions of smolt are placed in the Umatilla River, but low flows from irrigation withdrawals often prevent smolt from reaching the Columbia River in the spring, and adults are sometimes prevented from moving up river to spawn when flows are low. The Umatilla Project, a project unrelated to this proposal, is intended to improve low flows so that fish can move upstream and downstream more readily (Germond 1992).

The Project will not adversely affect flows in the Umatilla River. Therefore, no adverse impacts on fish are anticipated from its construction or operation.

Wildlife Species

A complete list of all wildlife species observed during field surveys conducted for the Project is included in Table P-1. The most common species observed were the western meadowlark, western kingbird, and long-billed curlew.

Habitat Types and Goals

There are seven basic habitat types within the Impact Area. With the exception of an undisturbed parcel of shrub-grass within the Umatilla Ordnance Depot, none of the habitat within the Impact Area or surrounding region is of exceptional value or unusual.

The structural diversity of these habitats is variable, representing grassland, shrub grass habitats, wetlands, and wooded areas along the Umatilla River and near residences. Below is a description of these habitat types with a brief listing of typical species. Wide-ranging wildlife species such as the coyote, badger, black-tailed jackrabbit, red-tailed hawk, northern harrier, American kestrel, and black-billed magpie occur in all or nearly all of these habitats. Other migratory birds move through the area during fall and spring migration.

Following the description of each habitat type is a discussion of the habitat quality goal classification for that habitat type, as set forth in OAR 635-415-030 (1) through (4). Plant species identified in the area of the Project are listed in Table P-2. This discussion is related to Exhibit N.

Grasslands

Disturbed grasslands dominated by cheatgrass and tarweed predominated in the non-farmed portions of the study area. These grasslands were found at the proposed energy facility site, in large areas south of Interstate 84 in the vicinity of the gas pipeline, and at scattered locations along the existing transmission line. Western meadowlarks, long-billed curlews, ring-necked pheasants, and horned larks are ground-nesting birds that were found in this habitat. Western kingbirds were common along the transmission line corridor, in grassland, pasture, and cropland habitats. They nest on power poles throughout the transmission corridor.

Grassland habitats at the proposed energy facility site fall within Habitat Category 4, described as "habitat of low value to fish and wildlife," owing to its highly disturbed plant species composition and location with a high level of human disturbance. The mitigation goal for this Category is to minimize loss of habitat value, or to conserve or enhance habitat. Habitat enhancement for these areas could include establishment of raptor and western kingbird nest structures along the upgraded transmission line.

Shrub-grass

Shrub-grass habitats included mixtures of the grassland species listed above, along with rabbitbrush and occasional big sagebrush and antelope bitterbrush. One high quality undisturbed shrub-grass habitat area, which is fenced and lies within the Umatilla Ordnance Depot, was found in the northern portion of the existing transmission line in Section 2 south and west of the Umatilla River. This area was examined several times during June, 1992, as potential habitat for burrowing owls but none were observed. Western meadowlarks, long-billed curlews, and ring-necked pheasants are all ground nesting birds that occupied this habitat.

Shrub-grass habitat within the Impact Area is categorized as either Habitat Category 2 or Habitat Category 3. Habitat Category 2 is: "habitat of high value for an evaluation species and is scarce or becoming scarce statewide or within the physiographic province; or is habitat essential to achieving policies or population objectives specified in a species management plan of the Fish and Wildlife Commission; or is essential habitat of any sensitive species listed by the Fish and Wildlife Commission." Habitat Category 3 is: "habitat of high to medium value for evaluation species, [which] is abundant statewide or within the physiographic province."

The only area that potentially falls within Category 2 is the Umatilla Ordnance Depot parcel, which lies adjacent to a portion of the transmission line. Protection from cattle and sheep grazing in the Ordnance Depot has preserved the native shrub-steppe/grassland vegetation that originally occurred in this area, and as such is a valuable resource. The depot, however, has not been identified as critical habitat for any listed species, and will not be impacted by the Project.

All other shrub-grass habitat within the Impact Area are classified as Category 3. The mitigation goal is no net loss of either habitat units or habitat value. Grasshopper sparrows and long-billed curlews, both state sensitive species, are relatively common in the area and the habitat along the transmission line and gas pipeline does not appear to be essential to their continued occupancy of the Impact Area, as suitable habitat appears to be abundant. Construction of the transmission line and gas pipeline is not expected to result in a net loss of habitat units or value.

Croplands

Irrigated croplands, primarily potatoes and corn, were found scattered throughout the Impact Area in the vicinity of the gas pipeline and along the existing electric transmission line.

These areas do not provide year-round habitat for wildlife, but several wildlife species used them in June, 1992, notably long-billed curlews and ring-necked pheasants. These areas in fact appeared to be preferred by curlews during the June, 1992, field visit. Curlews had been more frequently observed during the April field visit in grassland and shrub grass habitats, where they apparently nested. It appears, however, that these irrigated croplands may be important foraging habitat for curlews and possibly their young after hatching, based on the June, 1992, observations.

Croplands are categorized as Habitat Category 4; of low value owing to their limited value for most species. Habitat Category 4 is described above under Grasslands.

Pastures

Pastures are actually a subset of the Grassland habitat type, and are dominated by introduced plant species. Irrigated and non-irrigated areas occur in the Impact Area. Pastures appear to fit habitat Category 3.

Residential

Scattered residential areas existed in the vicinity of the gas pipeline and adjacent to the existing electric transmission line in its northern extent. These areas supported typical urban species such as the American robin, European starling, house finch, rock dove, and house sparrow.

Residential areas are categorized as Habitat Category 4, which is described above under Grasslands.

Riparian

A narrow band of dense trees and shrubs lined the banks of the Umatilla River at the site of the existing transmission line crossing. Wildlife species observed in this area included unidentified gulls, Canada geese, unidentified terns, and mallards. Given the small amount of this riparian habitat present, it is very unlikely that yellow-billed cuckoos would occur. The Umatilla River may be occasionally utilized by wintering bald eagles feeding on fish or waterfowl.

This riparian habitat is considered Habitat Category 2, which is described above. Upgrading the electrical transmission line will span the riparian area, but will not result in any long term impact. Temporary disturbance during installation of the replacement poles and wire installation may occur if construction occurs during the nesting season; however, no net loss of habitat units or value of Habitat Category 2 will occur as a result of activity in this area.

Emergent Wetlands

One small emergent wetland, apparently created by irrigation, was found just west of the Umatilla River underneath the existing transmission line in a low spot. It appears to have been created by direct irrigation and possibly by leakage from the west extension irrigation canal. The California quail, red-winged blackbird, and brown-headed cowbird were observed in this vicinity. A second larger wetland which contains standing water and emergent vegetation exists in the northern part of the transmission line and was created by application of potato processing water. This area was occupied by long billed curlews, American avocets, mallards, green-winged teal, red-winged blackbirds, Brewer's blackbirds, and killdeer. A third emergent wetland was found about 3/4 mile west of the gas pipeline in a low spot in an irrigated pasture south of Interstate-84. Curlews and killdeer were observed there.

All emergent wetland habitat meets the definition of Category 2 (definition above). The upgrade of the electrical transmission line will avoid permanent disturbance of these areas. Temporary disturbance during installation of the replacement poles and wire installation as well as construction of the gasline are not going to affect these areas. Therefore, no net loss of habitat units or value of Habitat Category 2 will occur as a result of activity in this area.

NATURE, EXTENT AND DURATION OF IMPACTS - OAR 345-21-015(1)(p)

Ground-nesting birds and small mammals could potentially be affected by disturbance or nest destruction during construction of the energy facility and gas pipeline, or upgrading of the electrical transmission line. No impacts are anticipated to fish species since no construction activities are planned that will disturb Umatilla River aquatic habitat.

MITIGATION MEASURES - OAR 345-21-015(1)(p); PROJECT ORDER, PARAGRAPH 19(i)

Potential adverse impacts can be avoided by scheduling construction outside the nesting season for ground nesting species and western kingbirds. If this cannot be done, the energy facility site, and the transmission line and gas pipeline rights-of-way, should be surveyed by qualified biologists and nest sites identified. Discussions should then be held with the local ODFW wildlife biologist to identify whether mitigation is necessary.

Mitigation and enhancement possibilities which could offset potential minor adverse impacts include placing a few nesting platforms for raptors on the new transmission line, and ensuring that the new line also provides suitable areas for western kingbirds to construct nests. The kingbird nesting season is approximately April 15 through August 1.

If wintering bald eagles do occur occasionally at the Umatilla River at the site of the electric transmission line crossing, it is very unlikely that they would be adversely affected by upgrading of this line, as long as the upgraded line is a raptor-proof design. Raptor protection will be employed in the design of the transmission towers following the methods described by Olendorff et al. (1981. A detailed design will be submitted to ODFW for review during the design phase of the Project. All energized facilities will be designed with adequate separation of a minimum of nine feet; the greatest wingspan expected in the area is the 8.5 foot wingspan of the bald eagle. See also Exhibit R.

This mitigation would also avoid impacts to other resident and migrant raptors.

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TABLE P-1
WILDLIFE SPECIES IDENTIFIED DURING FIELD SURVEYS OF THE HERMISTON GENERATING STUDY AREA DURING APRIL THROUGH JUNE 1992

COMMON NAME	SCIENTIFIC NAME
REPTILES	
short-horned lizard	*Phrynosoma douglasii*
BIRDS	
American avocet	*Recurvirostra americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
bank swallow (State sensitive)	*Riparia riparia*
barn swallow	*Hirundo rustica*
Bewick's wren	*Thryomanes bewickii*
black-billed magpie	*Pica pica*
black-crowned night heron	*Nycticorax nycticorax*
black-headed grosbeak	*Pheucticus melanocephalus*
black-necked stilt	*Himantopus mexicanus*
Brewer's blackbird	*Euphagus cyanocephalus*
brown-headed cowbird	*Molothrus ater*
California quail	*Callipepla californica*
Caspian tern	*Sterna caspia*
cliff swallow	*Hirundo pyrrhonota*
common nighthawk	*Chordeiles minor*
European starling	*Sturnus vulgaris*
Forster's tern	*Sterna forsteri*

BIRDS (continued)

grasshopper sparrow (State sensitive)	*Ammodramus savannarum*
great blue heron	*Ardea herodias*
green-winged teal	*Anas crecca*
horned lark	*Eremophila alpestris*
house finch	*Carpodacus mexicanus*
killdeer	*Charadrius vociferus*
lark sparrow	*Chondestes grammacus*
long-billed curlew (State sensitive)	*Numenius americanus*
lazuli bunting	*Passerina amoena*
mallard	*Anas plathrhynchos*
mourning dove	*Zenaida macroura*
northern harrier	*Circus cyaneus*
northern oriole	*Icterus galbula*
osprey	*Pandion haliacetus*
ring-billed gull	*Larus delawarensis*
ring-necked pheasant	*Phasianus colchicus*
red-tailed hawk	*Buteo jamaicensis*
red-winged blackbird	*Agelaius phoeniceus*
rock dove	*Columba livia*
rock wren	*Salpinctes obsoletus*
song sparrow	*Melospiza melodia*
spotted sandpiper	*Actitis macularia*
Swainson's hawk (State sensitive)	*Buteo Swainsonii*
tern sp. (probably Forster's)	*Sterna* sp.
tree swallow	*Tachycineta bicolor*
western kingbird	*Tyrannus verticalis*
western meadowlark	*Sturnella magna*

MAMMALS

badger	*Taxidea taxus*
black-tailed jackrabbit	*Lepus californicus*
coyote	*Canis latrans*
desert cottontail	*Sylvilagus audubonii*
ground squirrel sp. or spp.	*Spermophilus* sp. or spp.
kangaroo rat	*Dipodomys ordii*
plains pocket gopher	*Thomomys talpoides*
red fox	*Vulpes vulpes*
weasel sp. (sign, probably long-tailed)	*Mustela* sp.
yellow-bellied marmot	*Marmota flaviventris*

Source: Woodward-Clyde, 1992

TABLE P-2
PLANT SPECIES IDENTIFIED DURING FIELD SURVEYS OF THE HERMISTON GENERATING STUDY AREA DURING JUNE 1-2, 1992

Scientific Name	Common Name
TREES	
Acer negundo	Box elder
Betula	Birch
Populus trichocarpa	Black cottonwood
Robinia pseudo-acacia	Black locust
SHRUBS	
Artemisia tridentata	Big sagebrush
Chrysothamnus nauseosus	Gray rabbitbrush
Chrysothamnus viscidiflorus	Green rabbitbrush
Clematis ligusticifolia	Western virginsbower
Elaeagnus angustifolia	Russian olive
Purshia tridentata	Antelope bitterbrush
Salix	Willow
GRAMINOIDS	
Agropyron cristatum	Crested wheatgrass
Bromus tectorum	Cheatgrass
Carex unilateralis	One-sided sedge
Elymus	Wildrye
Juncus effusus	Soft rush
Orizopsis hymenoides	Indian ricegrass
Panicum miliaceum	Broomcorn millet
Phalaris arundinacea	Reed canarygrass
Poa bulbosa	Bulbous bluegrass
Poa sandbergii	Sandberg's bluegrass
Polypogon monspeliensis	Rabbitfoot beardgrass
Scirpus validus	Softstem bulrush
Setaria viridis	Green bristlegrass
Sitanion hystrix	Bottle-brush squirreltail
Stipa comata	Needle-and-thread
FORBS	
Achilleamillefolium	Yarrow
Amsinckia intermedia	Coast fiddleneck
Amsinckia lycopsoides	Tarweed
Amsinckia menziesii	Small-flower fiddleneck
Arctium minus	Common burdock

FORBS (continued)

Asclepias speciosa	Showy milkweed
Astragalus sclerocarpus	Stalk-pod milkvetch
Astragalus succumbens	Columbia milkvetch (ONHP List 4)
Balsamorhiza sagittata	Arrowleaf balsamroot
Calochortus macrocarpus	Sagebrush mariposa (ONHP List 3)
Chaenactis douglasii	Hoary chaenactis
Chenopodium album	Lambsquarters
Chrysopsis villosa	Hairy goldaster
Cirsium	Thistle
Cirsium arvense	Canada thistle
Cleome lutea	Yellow bee plant
Cuscuta pentagona	Field dodder
Cymopterus terebinthinus	Turpentine cypopterus
Epilobium watsoni	Watson's willowherb
Erodium cicutarium	Filaree
Lactuca serriola	Prickly lettuce
Layia glandulosa	Tidytips
Lepidium perfoliatum	Clasping pepperweed
Lomatium	Lomatium
Lupinus	Lupine
Lupinus sericeus	Silky lupine
Malva neglecta	Cheeseplant
Medicago sativa	Alfalfa
Melilotus alba	White sweetclover
Melilotus officinalis	Yellow sweetclover
Oenothera	Evening primrose
Opuntia polyacantha	Prickly pear
Phacelia hastata	Phacelia
Phlox longifolia	Long-leaf phlox
Plantago patagonica	Indianwheat
Polygonum	Knotweed
Polygonum convolvulus	Ivy bindweed
Polygonum persicaria	Lady's thumb
Psoralea lanceolata	Lance-leaf scurfpea
Rorippa nasturtium-aquaticum	Watercress
Rumex venosus	Wild begonia
Salsola kali	Russian thistle
Sisymbrium altissimum	Tumblemustard
Solanum dulcamara	Bittersweet
Solidago	Goldenrod
Tragopogon dubius	Yellow salsify
Typha latifolia	Cattail
Urtica dioica	Stinging nettle
Veronica anagallis-aquatica	Water speedwell

Source: Woodward-Clyde, 1992

APPENDIX P-1

VEGETATION AND WILDLIFE INVESTIGATION
HERMISTON GENERATING PROJECT

REPORT

VEGETATION AND WILDLIFE INVESTIGATION HERMISTON GENERATING PROJECT

Prepared for
U.S. Generating Company
7475 Wisconsin Avenue, Suite 1000
Bethesda, MD 20814-3422
December 1992

by

Woodward-Clyde Consultants
111 SW Columbia, Suite 990
Portland, Oregon 97201

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1.0 INTRODUCTION

U.S. Generating Company wishes to preserve the option of applying for permits necessary to develop a cogeneration plant at the Lamb Weston Potato Processing plant located in Hermiston, Oregon, in 1992. U.S. Generating Company contracted with Woodward-Clyde Consultants to perform reconnaissance field surveys for rare, threatened, and endangered plants and animals in the vicinity of the proposed plant site and other areas that could be affected by the proposal.

When the Endangered Species Act was passed in 1973, the importance of protecting animals and plants from extinction became nationally recognized. Since passage of the act, studies have been ongoing to determine which species are threatened or endangered, and therefore in need of protection. The species considered in this study were originally placed on one or more state or federal lists (Oregon Natural Heritage Program [ONHP] 1991), or are currently being evaluated by ONHP or the U.S. Fish and Wildlife Service (USFWS), because they have been infrequently observed or because local or regional biologists feel that information concerning their distribution or abundance is inadequate. As additional data on these species becomes available, it may be determined that some of them are common. Others may be truly rare or their habitats may be in jeopardy. All sighting reports of any of the species listed by USFWS or ONHP will assist in determining whether or not they are truly rare.

2.1 LITERATURE REVIEW

2.1.1 Plants

A search of the ONHP data base for sensitive plant species (letter to EnviroDynamics dated January 16, 1992) identified several occurrences within the project's potential impact area. Within a 15-mile radius of the site, the following species of concern were identified:

Lawrence's milkvetch	*Astragalus collinus var. laurentii*
Thompson's sandwort	*Arenaria franklinii var. thompsonii*
Columbia cress	*Rorippa columbiae*
Robinson's onion	*Allium robinsonii*

Information about these species characteristics, habitat requirements, and flowering dates were obtained from taxonomic literature and an examination of herbarium specimens and data at Oregon State University. Information on status was derived from ONHP (1991) and Vrilakas (pers. comm. 1992). Status, habitat information, and flowering dates were:

Lawrence's milkvetch: Federal Candidate (Category 2), meaning that more information is required to determine whether the species should be listed. ONHP list 1, species or subspecies threatened with extinction or presumed to be extinct throught its entire range, or needing active protection to ensure survival. Oregon Department of Agriculture (ODA) candidate species list dated March 1991. Habitat: basaltic grassland and sagebrush desert, known only from Morrow County, Oregon. Flowers: May-June.

Thompson's sandwort: Was a federally proposed Candidate. A recent study by the Washington Natural Heritage Program concluded that the only site where this subspecies was found was the type location (the site where it was originally found), and that all other populations were a different subspecies (Vrilakas, pers. comm.

1992). ODA candidate species list, dated March 1991. Habitat: sand dunes, scabland, and sagebrush slopes, along the Columbia River in Gilliam and Morrow (possibly to Wasco) Counties, Oregon. Flowers: May-June.

Columbia cress: Federally proposed Candidate (Category 2), more information required. ODA candidate species list, dated March 1991, ONHP List 1 (threatened with extinction, presumed extinct, and/or needing active protection). Habitat: wet sites (lake, stream or ditch edges) in clayey soils. Flowers: May-August.

Robinson's onion: Federally dropped from consideration; may be extinct in Oregon. ONHP list 2, threatened with extirpation or presumed extirpated from Oregon, often peripheral or disjunct species. These species are of concern when the floral diversity within Oregon's borders are considered and can be significant when protecting the genetic diversity of a taxon. Habitat: sand and gravel deposits along the Columbia River from near Vantage, Washington, to about the mouth of the John Day River, Oregon; apparently restricted to the bottom and lower benches of the river valley. Flowers: April-May.

2.1.2 Animals

The ONHP (letter to EnviroDynamics dated January 16, 1992) identified six wildlife species of concern as occurring within a 15-mile radius of the proposed plant site:

Washington ground squirrel	*Spermophilus washingtonii*
Long-billed curlew	*Numenius americanus*
Yellow-billed cuckoo	*Coccyzus americanus*
American white pelican	*Pelecanus erythrorhynchos*
Northern bald eagle	*Haliaeetus leucocephalus*
Painted turtle	*Chrysemys picta*

Information about these species characteristics, habitat requirements, and status were derived from Stebbins (1966), Ingles (1965), Nussbaum et al. (1983), National Geographic Society (1987), and ONHP (1991). Status and habitat information are as follows:

Washington ground squirrel: State critical, a species for which listing as threatened or endangered is pending or those for which listing may be appropriate if immediate conservation actions are not taken, or species which are peripheral but at risk throughout their range, on disjunct populations. ONHP 2 -threatened with extirpation or presumed extirpated from the state, often peripheral or disjunct. Habitat: grasslands, low sagebrush, wheat fields, rocky hillsides of Southeastern Washington and Northern Oregon, feeds on vegetation.

Long-billed curlew: Federal Category 3C, has proven to be more abundant or widespread than previously believed and/or those not subject to any identifiable threats (U.S. Fish and Wildlife Service 1991). ONHP list 4, of concern but not currently threatened or endangered (includes taxa rare but currently secure, as well as taxa declining in abundance or habitat but still too common to be proposed as threatened or endangered). Habitat: wet meadows, grasslands, low sagebrush during the nesting season; uses other wetlands, tidal flats, grain fields during migration, feeds on invertebrates.

Yellow-billed cuckoo: No longer listed as a Candidate species by the U.S. Fish and Wildlife Service. Classified as 3B, indicating that the names on the basis of current taxonomic understanding do not represent taxa (species or subspecies) meeting the Endangered Species Act's definition of "species." According to Stern (pers. comm. 1992), the yellow-billed cuckoo was recently determined to represent one subspecies, rather than including a western subspecies which was formerly listed as a candidate. Listed as State Critical, a species for which listing as threatened or endangered is pending, or those for which listing may be appropriate if immediate conservation actions are not taken, or species which are peripheral but at risk throughout their range, or disjunct populations. ONHP 2 - threatened with extirpation or presumed extirpated from the state, often peripheral or disjunct. Habitat: dense riparian vegetation, willow or alder thickets near water, feeds on insects.

American white pelican: State vulnerable, listing as threatened or endangered is not believed imminent; listing could or is being avoided through protective measures. Habitat: nests on islands in large lakes in Eastern Oregon and at scattered locations throughout Western North America, feeds on fish.

Northern bald eagle: Listed as threatened in Oregon and Washington. ONHP List 1, meaning it is threatened with extinction throughout its range, needing active protection measures. Habitat: nests in large older tree, often partially dead, usually near water; feeds on waterfowl, fish, carrion; winters in small numbers along the Columbia in the project vicinity; also winters at scattered locations and varying numbers throughout the state.

Painted turtle: State critical, listing for threatened or endangered status is pending, or listing may be appropriate if conservation actions are not taken, or the species is peripheral. ONHP list 3, additional information is needed for a determination of status in Oregon. Habitat: usually marshy ponds or small lakes, also found in slow-moving streams and quiet backwaters of rivers, preferring muddy bottoms with considerable aquatic vegetation, omnivorous, feeding on most kinds of plants and small animals present in the water.

2.2 FIELD SURVEYS

Field surveys included the proposed plant site, the right-of-way of an existing electric transmission line which would be upgraded, and the general vicinity of a gas pipeline which would supply this cogeneration plant with fuel. The surveys included ground coverage by two observers of an area approximately 500 feet wide along the entire 10.75-mile (approximate) length of the existing electric transmission line which originates at the Lamb Weston Plant and goes north to the Bonneville substation near the Columbia River. The gas pipeline route was not identified specifically but would extend approximately 4 miles from the Lamb Weston Plant to an existing pipeline located south of Interstate 84 (Figure 1). The site of the proposed cogeneration plant adjacent to the Lamb-Weston plant was examined on foot. Surveys were conducted on April 29 and June 1-2, 1992. The areas covered are shown in Figure 1. Additional wildlife surveys were also conducted on June 13, 14, 20, 21, and 28.

2.2.1 Vegetation

Based on flowering phenology, a survey was conducted in April 1992 for populations of Robinson's onion in the vicinity of the Columbia River near the Bonneville substation. In June 1992, surveys for populations of the other three species were conducted in the project area. The entire length of the transmission line corridor (an area approximately 500 feet wide) was walked in June, with special attention given to areas with habitats potentially suitable for any of the species of concern. A general description of the common plant communities of the site was recorded, as well as descriptions of the three small wetland areas that occur along the transmission line corridor.

2.2.2 Wildlife

Descriptions of the habitat and vegetation type along the existing transmission route and at the Lamb Weston site were recorded. All species observed (or best possible identification) were recorded. Notes and observations on the existing land use within a broad potential pipeline corridor were also recorded.

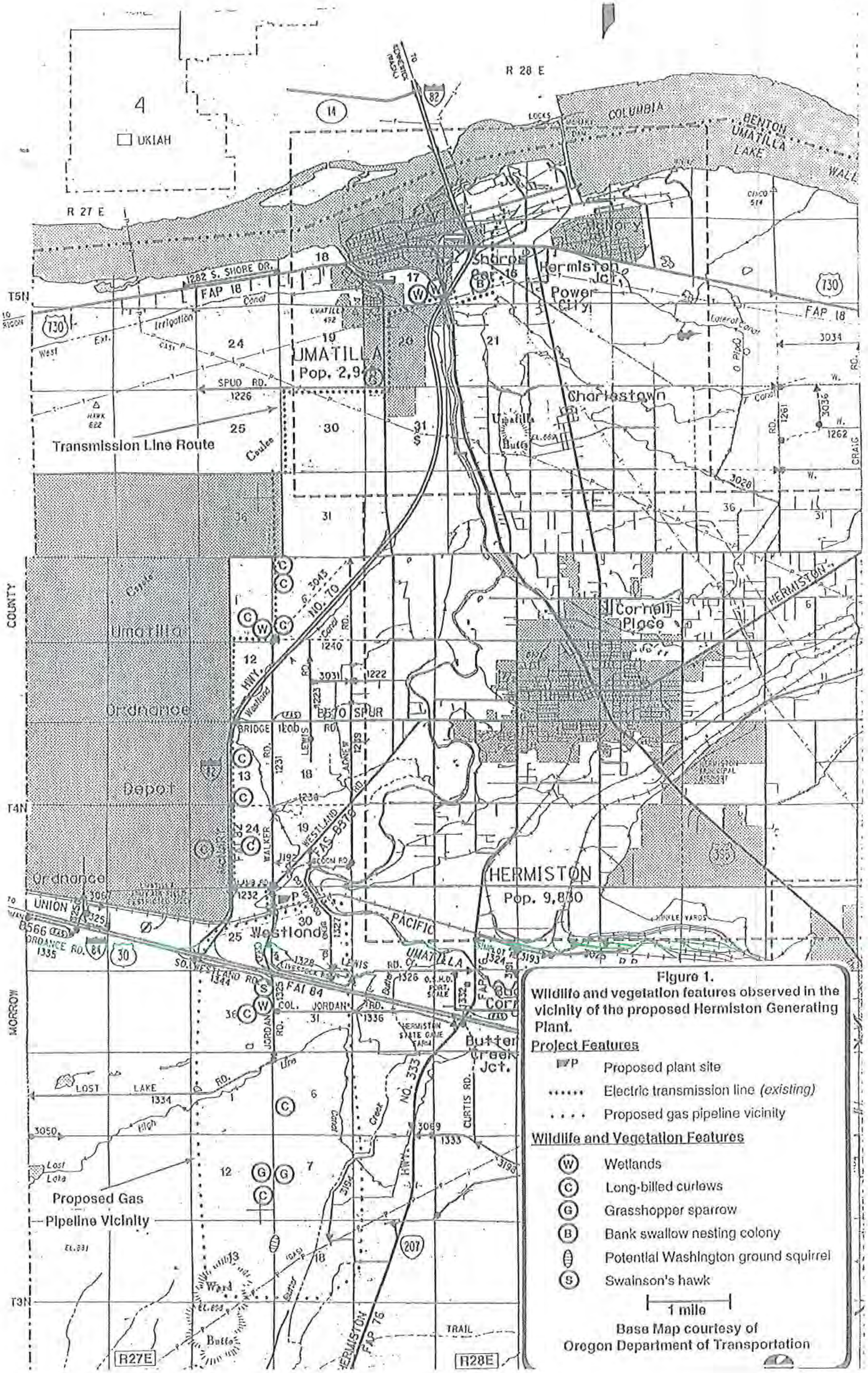

Figure 1.
Wildlife and vegetation features observed in the vicinity of the proposed Hermiston Generating Plant.

TABLE 3-1
PLANT SPECIES IDENTIFIED DURING FIELD SURVEYS OF
THE HERMISTON GENERATING STUDY AREA DURING JUNE 1-2, 1992

Scientific	Name	Common Name
TREES		
Acer	*negundo*	Box elder
Betula		Birch
Populus	*trichocarpa*	Black cottonwood
Robinia	*pseudo-acacia*	Black locust
SHRUBS		
Artemisia	*tridentata*	Big sagebrush
Chrysothamnus	*nauseosus*	Gray rabbitbrush
Chrysothamnus	*viscidiflorus*	Green rabbitbrush
Clematis	*ligusticifolia*	Western virginsbower
Elaeagnus	*angustifolia*	Russian olive
Purshia	*tridentata*	Antelope bitterbrush
Salix		Willow
GRAMINOIDS		
Agropyron	*cristatum*	Crested wheatgrass
Bromus	*tectorum*	Cheatgrass
Carex	*unilateralis*	One-sided sedge
Elymus		Wildrye
Juncus	*effusus*	Soft rush
Orizopsis	*hymenoides*	Indian ricegrass
Panicum	*miliaceum*	Broomcorn millet
Phalaris	*arundinacea*	Reed canarygrass
Poa	*bulbosa*	Bulbous bluegrass
Poa	*sandbergii*	Sandberg's bluegrass
Polypogon	*monspeliensis*	Rabbitfoot beardgrass
Scirpus	*validus*	Softstem bulrush
Setaria	*viridis*	Green bristlegrass
Sitanion	*hystrix*	Bottle-brush squirreltail
Stipa	*comata*	Needle-and-thread
FORBS		
Achillea	*millefolium*	Yarrow
Amsinckia	*intermedia*	Coast fiddleneck
Amsinckia	*lycopsoides*	Tarweed
Amsinckia	*menziesii*	Small-flower fiddleneck
Arctium	*minus*	Common burdock
Asclepias	*speciosa*	Showy milkweed

TABLE 3-1
PLANT SPECIES IDENTIFIED DURING FIELD SURVEYS OF
THE HERMISTON GENERATING STUDY AREA DURING JUNE 1-2, 1992
(concluded)

Scientific	Name	Common Name
Astragalus	*sclerocarpus*	Stalk-pod milkvetch
Astragalus	*succumbens*	Columbia milkvetch (ONHP List 4)
Balsamorhiza	*sagittata*	Arrowleaf balsamroot
Calochortus	*macrocarpus*	Sagebrush mariposa (ONHP List 3)
Chaenactis	*douglasii*	Hoary chaenactis
Chenopodium	*album*	Lambsquarters
Chrysopsis	*villosa*	Hairy goldaster
Cirsium		Thistle
Cirsium	*arvense*	Canada thistle
Cleome	*lutea*	Yellow bee plant
Cuscuta	*pentagona*	Field dodder
Cymopterus	*terebinthinus*	Turpentine cypopterus
Epilobium	*watsonii*	Watson's willowherb
Erodium	*cicutarium*	Filaree
Lactuca	*serriola*	Prickly lettuce
Layia	*glandulosa*	Tidytips
Lepidium	*perfoliatum*	Clasping pepperweed
Lomatium		Lomatium
Lupinus		Lupine
Lupinus	*sericeus*	Silky lupine
Malva	*neglecta*	Cheeseplant
Medicago	*sativa*	Alfalfa
Melilotus	*alba*	White sweetclover
Melilotus	*officinalis*	Yellow sweetclover
Oenothera		Evening primrose
Opuntia	*polyacantha*	Prickly pear
Phacelia	*hastata*	Phacelia
Phlox	*longifolia*	Long-leaf phlox
Plantago	*patagonica*	Indianwheat
Polygonum		Knotweed
Polygonum	*convolvulus*	Ivy bindweed
Polygonum	*persicaria*	Lady's thumb
Psoralea	*lanceolata*	Lance-leaf scurfpea
Rorippa	*nasturtium-aquaticum*	Watercress
Rumex	*venosus*	Wild begonia
Salsola	*kali*	Russian thistle
Sisymbrium	*altissimum*	Tumblemustard
Solanum	*dulcamara*	Bittersweet
Solidago		Goldenrod
Tragopogon	*dubius*	Yellow salsify
Typha	*latifolia*	Cattail
Urtica	*dioica*	Stinging nettle
Veronica	*anagallis-aquatica*	Water speedwell

TABLE 3-2
WILDLIFE SPECIES IDENTIFIED DURING FIELD SURVEYS OF THE HERMISTON GENERATING STUDY AREA DURING APRIL THROUGH JUNE 1992

COMMON NAME	SCIENTIFIC NAME
REPTILES	
short-horned lizard	*Phrynosoma douglasii*
BIRDS	
American avocet	*Recurvirostra americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
bank swallow (State sensitive)	*Riparia riparia*
barn swallow	*Hirundo rustica*
Bewick's wren	*Thryomanes bewickii*
black-billed magpie	*Pica pica*
black-crowned night heron	*Nycticorax nycticorax*
black-headed grosbeak	*Pheucticus melanocephalus*
black-necked stilt	*Himantopus mexicanus*
Brewer's blackbird	*Euphagus cyanocephalus*
brown-headed cowbird	*Molothrus ater*
California quail	*Callipepla californica*
Caspian tern	*Sterna caspia*
cliff swallow	*Hirundo pyrrhonota*
common nighthawk	*Chordeiles minor*
European starling	*Sturnus vulgaris*
Forster's tern	*Sterna forsteri*
grasshopper sparrow (State sensitive)	*Ammodramus savannarum*
great blue heron	*Ardea herodias*

COMMON NAME	SCIENTIFIC NAME
green-winged teal	*Anas crecca*
horned lark	*Eremophila alpestris*
house finch	*Carpodacus mexicanus*
killdeer	*Charadrius vociferus*
lark sparrow	*Chondestes grammacus*
lazuli bunting	*Passerina amoena*
long-billed curlew (State sensitive)	*Numenius americanus*
mallard	*Anas plathrhynchos*
mourning dove	*Zenaida macroura*
northern harrier	*Circus cyaneus*
northern oriole	*Icterus galbula*
osprey	*Pandion haliacetus*
ring-billed gull	*Larus delawarensis*
ring-necked pheasant	*Phasianus colchicus*
red-tailed hawk	*Buteo jamaicensis*
red-winged blackbird	*Agelaius phoeniceus*
rock dove	*Columba livia*
rock wren	*Salpinctes obsoletus*
song sparrow	*Melospiza melodia*
spotted sandpiper	*Actitis macularia*
Swainson's hawk (State sensitive)	*Buteo Swainsonii*
tern sp. (probably Forster's)	*Sterna* sp.
tree swallow	*Tachycineta bicolor*
western kingbird	*Tyrannus verticalis*
western meadowlark	*Sturnella magna*

MAMMALS

badger	*Taxidea taxus*
black-tailed jackrabbit	*Lepus californicus*
coyote	*Canis latrans*

TABLE 3-2
WILDLIFE SPECIES IDENTIFIED DURING FIELD SURVEYS OF THE HERMISTON GENERATING STUDY AREA DURING APRIL THROUGH JUNE 1992
(Continued)

COMMON NAME	SCIENTIFIC NAME
desert cottontail	*Sylvilagus audubonii*
ground squirrel sp. or spp.	*Spermophilus* sp. or spp.
kangaroo rat	*Dipodomys ordii*
plains pocket gopher	*Thomomys talpoides*
red fox	*Vulpes vulpes*
weasel sp. (sign, probably long-tailed)	*Mustela* sp.
yellow-bellied marmot	*Marmota flaviventris*

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3.0
RESULTS

3.1 THREATENED AND ENDANGERED PLANT SPECIES

Potential habitat for Lawrence's milkvetch was present in limited amounts in the study area, but this species was not found. Columbia cress, which occurs in moist, clayey soils at wet sites, was also not found in the study area and potential habitat was not present. Robinson's onion habitat, sand and gravel deposits along the Columbia River, was not present in the study area and this species was not found. A list of all plant species observed during field studies is provided in Table 3-1.

Two species were observed which are on ONHP lists, but not given any Federal classification at this time. The Columbia milkvetch, which was fairly commonly observed at several localities along the transmission line, is on OHNP List 4, which contains taxa (species or subspecies) of concern that are not currently threatened or endangered. ONHP List 4 includes taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered; it is equivalent to the Watch List of previous editions of ONHP (1991). Also observed was sagebrush mariposa, which is on ONHP List 3. ONHP List 3 includes species for which more information is needed before the species' status can be determined, but which may be threatened or endangered in Oregon or throught its range ONHP (1991).

3.2 PLANT COMMUNITIES

Prior to the introduction of grazing, this part of the Columbia Basin was dominated by bunchgrasses such as bluebunch wheatgrass and Idaho fescue, and shrubs such as big sagebrush and antelope bitterbrush. Most of the native grassland and shrub-steppe communities no longer exist in the study area. Native bunchgrasses and shrubs have been replaced by cheatgrass and other weedy herbs and shrubs. The largest remaining remnants of native bunchgrass prairie in Eastern Oregon are inside the boundaries of the Umatilla Ordnance Depot where they have been protected from livestock grazing.

Normally after disturbance, there is a successional return to a given climax community when the disturbance (e.g., grazing) is eliminated. However, the introduction of cheatgrass to the drier zones of Oregon has altered this natural successional pattern. A stand of cheatgrass apparently has the ability to maintain itself indefinitely, even if the disturbance is removed. Daubenmire (1975) found no evidence that cheatgrass will ever give way to native grasses, even after 50 years of protection from grazing.

3.2.1 Uplands

Large areas adjacent to the corridor are under cultivation, most frequently under center-pivot irrigation systems. The rest of the land is dominated by cheatgrass and tarweed. The most common associated grasses are occasional patches of Sandberg's bluegrass and needle-and-thread grass. Frequently occurring forbs in addition to tarweed are tumblemustard, hairy golden aster, Russian thistle, and lance-leaf scurfpea.

Some sites also have a shrub layer overlaying the herbaceous community described above. Frequently the dominant shrub is gray rabbitbrush, another indicator of past grazing disturbance. However, there are areas with big sagebrush and/or antelope bitterbrush also present.

The least disturbed area observed is the segment of the transmission line corridor that crosses Section 20 south and west of the Umatilla River. Along this gently sloping area, tarweed and Russian thistle are much reduced, and the common forbs are arrowleaf balsamroot, silky lupine, long-leaf phlox, and turpentine cymopteris.

3.2.2 Wetlands

There were three wet areas on or near the transmission line corridor (Figure 1). One site is adjacent to the corridor, but outside the proposed disturbance area. It is a flat area which has been used for years for land application of potato processing wastewater. Water is retained in depressions and the wastewater supports a dense algal community.

The second site is a small wetland at the foot of the slope between the West Extension Irrigation Canal and the Umatilla River. This wetland appears to be fed by irrigation water.

It is dominated by cattail, water speedwell, watercress, and rabbitfoot polypogon. There are also some willow and cottonwood saplings.

The third site is the riparian corridor along the Umatilla River. Trees along the banks include box elder, black locust, and Russian olive. Common shrubs include willow and Himalayan blackberry. Along the waterline and in the shallows are reed canarygrass, bulrush, and cattail.

3.3 THREATENED AND ENDANGERED WILDLIFE SPECIES

Threatened or endangered species were not observed during the field surveys. Bald eagles (Threatened in the U.S. and Oregon) are known to winter along the Columbia River near the Umatilla River, but were not recorded along the Umatilla (ONHP 1991). Peregrine falcons (Endangered in the U.S. and Oregon) could occasionally migrate through the study area during spring and fall.

3.4 WILDLIFE HABITATS AND SPECIES OBSERVED

Four state sensitive species (long-billed curlew, Swainson's hawk, grasshopper sparrow, and bank swallow) were recorded during 1992 field surveys. A fifth species, the Washington ground squirrel, had been previously recorded by Betts (1990). The ground squirrel location is now an irrigation circle, evidence of squirrels was not seen in 1992, but they are active only during February-May and could have been missed. Curlews were fairly common in the areas surveyed. Approximately 10 to 15 curlew pairs were seen (a more exact count was impossible because of their high mobility). Six pairs of birds appeared to have young (they reacted to us by calling loudly, or were observed mobbing hawks). The curlew is listed as Category 3C by the U.S. Fish and Wildlife Service (see Section 2.1.2). Locations of sensitive species sightings are shown in Figure 1. Wildlife species observed are listed in Table 3-2. The species most commonly observed at the Lamb Weston site and along the existing transmission line were the western meadowlark, western kingbird, and long-billed curlew.

There are seven basic habitat types within the study area. The structural diversity of these habitats is variable, including grassland, shrub grass habitats, wetlands, and wooded areas along the Umatilla River and near residences. Wide-ranging wildlife species such as the coyote, badger, black-tailed jackrabbit, red-tailed hawk, northern barrier, American kestrel, and black-billed magpie range through all or nearly all of these habitats.

3.4.1 Grasslands

Disturbed grasslands dominated by cheatgrass and tarweed predominated in the nonfarmed portions of the study area. These grasslands were found at the proposed cogeneration plant site, in large areas south of Interstate 84 in the vicinity of the gas pipeline, and at scattered locations along the existing transmission line. Western meadowlarks, long-billed curlews, ring-necked pheasants, and horned larks are ground-nesting birds that were found in this habitat.

3.4.2 Shrub-grass

Shrub-grass habitats included mixtures of the species listed above with rabbitbush and occasional big sagebrush and antelope bitterbrush. One relatively undisturbed shrub-grass habitat area existed in the northern portion of the existing transmission line in Section 2.0 south and west of the Umatilla River. This area was examined several times during June as potential habitat for burrowing owls but none were observed. Western meadowlarks, long-billed curlews, and ring-necked pheasants are all ground nesting birds that occupied this habitat.

3.4.3 Croplands

Irrigated croplands, primarily potatoes and corn, were found scattered throughout the study area in the vicinity of the gas pipeline and along the existing electric transmission line. These areas do not provide year round habitat for wildlife, but several wildlife species used them in June, notably long-billed curlews and ring-necked pheasants. These areas in fact appeared to be preferred by curlews in the June field visit. Curlews had been more frequently observed during the April field visit in grassland and shrub grass habitats, where they apparently nest. It appears, however, that these irrigated croplands may be important foraging habitat for curlews and possibly their young, based on the June observations.

3.4.4 Pastures

Irrigated pasture was found in the northern part of the vicinity of the proposed gas pipeline and at one wetland site along the electric transmission line. These areas, which contained standing water, were occupied by long-billed curlews, American avocets, mallards, green-winged teal, red-winged blackbirds, Brewer's blackbirds, and killdeer.

3.4.5 Residential

Scattered residential areas existed in the vicinity of the gas pipeline and adjacent to the existing electric transmission line in its northern extent. These areas supported typical urban species such as the American robin, European starling, house finch, rock dove, and house sparrow.

3.4.6 Riparian

A narrow band of dense trees and shrubs lined the banks of the Umatilla River at the site of the existing transmission line crossing. Wildlife species observed in this area included unidentified gulls, Canada geese, unidentified terns, and mallards. It is very unlikely, given the small amount of this riparian habitat present, that yellow-billed cuckoos would occur. The Umatilla River may be occasionally utilized by wintering bald eagles feeding on fish or waterfowl.

3.4.7 Emergent Wetlands

One small emergent wetland, apparently created by irrigation, was found just west of the Umatilla River underneath the existing transmission line. The California quail, red-winged blackbird, and brown-headed cowbird were observed in this vicinity.

3.5 POTENTIALLY SENSITIVE ENVIRONMENTAL RESOURCES WITHIN A 15-MILE RADIUS

There are a number of habitats and sites within a 15-mile radius of the plant site, electric transmission line, and vicinity of the proposed gas pipeline. To the east, the Umatilla River flows northward past the site and is crossed by the electric transmission line in the northern part of the study area. Riparian areas, wetlands, and open water habitats provide habitat for a variety of wildlife and plants. An area of uneven terrain with potholes and other features lies to the east of the project site. In addition, wetland complexes at Umatilla Meadows and

Echo Meadows are also located to the east of the project site. Farther to the east, the Cold Springs Reservoir and Cold Springs National Wildlife Refuge is operated by the U.S. Fish and Wildlife Service. Large numbers of migratory waterfowl and water-associated birds use this refuge year-round, for both nesting, migration stopover, and wintering habitat. To the southeast of the site, there is riparian habitat along the Umatilla River, which flows from the southeast. Butter Creek is located to the south. There are numerous sandy habitats in the Sand Hollow area to the southwest of the site. The Umatilla Ordnance Depot is located adjacent to the west side of much of the transmission line. Protection from cattle and sheep grazing in the Ordnance Depot has preserved the native shrub-steppe/grassland vegetation that originally occurred in this area, and as such it is a valuable resource, supporting pronghorn, burrowing owls, and a diversity of other species not now found in the remainder of the project area. To the north is the Columbia River, Lake Umatilla Pool and McNary Pool as McNary Dam is near the northern end of the project area.

4.0
DISCUSSION

4.1 THREATENED AND ENDANGERED PLANT SPECIES

It is highly unlikely that these species might occur on the project site, primarily because the appropriate habitat is absent or there has been too much disturbance and resulting displacement of native species. Lawrence's milkvetch might have had potential habitat, but none of the project site was rocky, and all previous sightings were in Morrow County.

Columbia cress grows only in moist, clayey soils, none of which were encountered on the study area.

Robinson's onion is found only on sand and gravel deposits along the Columbia River lower benches. The corridor will not be disturbed at the river north of the substation, and the bench south of the substation is one of the most disturbed, in terms of vegetation on the site.

4.2 WETLANDS

It is possible that the emergent wetland west of the Umatilla River could be affected by construction of the upgraded transmission line if a tower were to be planned for this wetland, assuming that constructing a tower there required placement of fill material. Placement of fill or removal of material from a wetland could require a permit from the Oregon Divison of State Lands (DSL) and U.S. Army Corps of Engineers if either or both agency determined that they had jurisdiction. If possible, minimizing impacts to the other wetlands, whether natural or artificially created, during construction and operation of the proposed cogeneration facility, would minimize habitat loss to many of the wildlife species, particularly waterfowl and shorebirds such as the long-billed curlew, in the vicinity.

4.3 WILDLIFE IMPACTS

Based on the probable or known occurrence of wildlife species of concern in the project vicinity, the results of the field surveys, and an assessment of habitat suitability, it is unlikely that any of the other species of concern listed in Section 2.1.2 exist in the study area on more than a very occasional basis. It is also unlikely that any of the species of concern that do exist in the study area would be adversely affected by any aspect of this project. Ground-nesting birds could potentially be affected by disturbance or nest destruction during construction of the plant, the rebuilding of the transmission line, or the gas pipeline. This potential adverse impact can be avoided by scheduling construction to avoid the nesting season for these species, which is approximately April 15 through August 1. If wintering bald eagles do occur occasionally at the Umatilla River at the site of the electric transmission line crossing, it is very unlikely that they would be adversely affected by upgrading of this line, as long as the upgraded line is a raptor-proof design.

5.0
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EXHIBIT Q

RECREATIONAL FACILITIES AND OPPORTUNITIES

INTRODUCTION

For the EFSC to issue a site certification for the Project, OAR 345-22-100(1) requires that it find the design, construction and operation of the Project will not result in significant adverse impacts to important recreational opportunities within the Impact Area. In making this determination, the EFSC can take mitigation into account if there are potential adverse impacts.

As described in Exhibit C, the Impact Area for recreational opportunities as defined in the Project Order is the area within five miles of the energy facility site, and within the proposed rights-of-way for the gas pipeline and transmission line.

This Exhibit identifies existing and proposed recreational opportunities within the Impact Area, and establishes that no adverse impacts will result to them from the Project.

SUMMARY OF FINDINGS

No State recreational facilities occur within the Impact Area. Existing recreational opportunities within the Impact Area include the Umatilla River, various City of Hermiston recreational facilities, and a Protected Area. The Project would not adversely impact any existing or proposed recreational facilities within the Impact Area. Nor would it detract from recreational opportunities generally available in the vicinity such as hiking, cycling, and boating.

EXISTING AND PLANNED RECREATIONAL OPPORTUNITIES IN THE IMPACT AREA - OAR-345-21-015(1)(q)(A)

Existing Recreational Facilities and Opportunities

Most of the recreational activities in the vicinity of the Project (including hiking, fishing, hunting, and boating) are concentrated along the Columbia River and nearby National and State Wildlife areas. None of these is located within the project Impact Area. Nevertheless, limited recreational opportunities do occur within the Impact Area, and they are discussed below.

State Recreational Facilities

There are no State parks or other State-owned recreational facilities within the Impact Area and there are no plans for their development within the Impact Area (Willis 1992).

Umatilla County Recreational Facilities

There are no County recreational facilities within the Impact Area (Mabbott 1992).

The Umatilla River runs through the Impact Area east of the energy facility site, and the electrical transmission line crosses the river near the City of Umatilla. The river provides opportunities for fishing, hiking, and wildlife viewing. The public has access to the River from a County road that runs along the River. Fishing is allowed along the right-of-way. (Conforth 1992).

City of Hermiston Recreational Facilities

The City of Hermiston is located within the Impact Area. Recreational facilities in the City of Hermiston include:

- The Umatilla Fairgrounds;
- A community recreational center;
- Three small neighborhood parks offering picnic and playground facilities;
- Three large parks offering ball fields, basketball courts, tennis courts, playgrounds and picnic facilities;
- A four-complex ball field; and

- Butte Park, providing hiking and jogging trails and a soccer field.

A new neighborhood park is also planned (Conforth 1992).

Protected Areas

The only Protected Area located within the five-mile Impact Area is the Hermiston Agricultural Research & Extension Center, located approximately 4 miles east of the energy facility site.

Future Recreational Facilities and Opportunities that May Be Developed If the Project is Not Constructed.

There are no known recreational facilities that would be developed in the Impact Area if the Project were not constructed.

Impacts of the Project on Existing and Future Recreational Facilities and Opportunities

The types of impacts that could affect recreational opportunities include air quality degradation, noise, light and glare, visual impacts, and traffic.

Air Quality

Air pollutant emissions from the Project will comply fully with air quality regulations established by the DEQ and EPA. These regulations are designed, among other things, to preclude significant impacts to recreational areas (see the PSD analysis included in Exhibit M).

Noise

As described previously, most of the recreational facilities within the Impact Area are located within the City of Hermiston, approximately 3 miles from the energy facility site. Because of the energy facility's distance from these recreational facilities, noise from the Project would be inaudible. The Hermiston Agricultural Research & Extension Center is also outside the audible range from the Project.

Fishing and hiking opportunities located within about 1/4 mile of the energy facility site, along the Umatilla River, are within audible range of the Project. However, the Project is located in an existing industrial area with elevated noise levels and Project noise would not result in a significant increase in ambient noise levels at this location.

Light and Glare

Because of intervening terrain, the Project will not be visible from the City of Hermiston. Consequently, neither light nor glare from the Project will have any adverse impact on the recreational opportunities identified or proposed within the City. The Project will also not be visible from the Hermiston Agricultural Research & Extension Center.

Fishing and hiking along the Umatilla River are the only recreational activities close enough to the Project to be affected by light and glare from the Project. However, because these activities occur during daylight hours, light and glare from the Project will not have any adverse impact.

Visual

Because of the intervening topography and natural and manmade features, the Project, with the possible exception of the upper portion of the stack, will not be visible from the City of Hermiston, where most of the recreational areas identified above are located, or from the Hermiston Agricultural Research & Extension Center.

Other portions of the Project will be visible from the Umatilla River. However, because the Project is located in an existing industrial area, it will not present significant additional visual intrusion at this location. The electrical transmission line will cross the Umatilla River near the City of Umatilla, but the line will be an upgrade of an existing line. In addition, there are already two other larger transmission lines crossing the river at the same location. For these reasons, the transmission line will not create an additional significant visual intrusion to recreational uses at the Umatilla River.

A complete discussion of the project's expected visual impact is provided in Exhibit S.

Traffic

The recreational areas identified above are east and north of the energy facility site. Most of the traffic from the Project will be to the west and south, toward I-82 and I-84. Further, because of the short distance from the energy facility site to the interstate highway system, very little Project traffic will be along local roads. In addition, traffic from the Project during operations will be light, consisting of traffic from approximately 25 employees over three shifts and infrequent truck deliveries. Construction traffic will be heavier, with a construction work force of up to 200 workers and truck deliveries of equipment and materials. This traffic is insignificant compared to the existing work force at the Lamb-Weston plant. Accordingly, identified recreational facilities will not be significantly affected.

Impacts on Future Recreational Opportunities and Facilities

The energy facility site is located in an existing industrial area with plans for expanded industrial uses. The site, therefore, has little potential for future development of recreational opportunities or facilities. The gas pipeline and the electrical transmission line will be located almost entirely within lands zoned for agricultural use (see land use discussion in Exhibit I). Additionally, construction of the gas pipeline and upgrading of the electrical transmission line will not preclude recreational uses in these areas. For these reasons, the Project will not adversely impact future recreational opportunities

MAP OF IMPACT AREA - OAR-345-21-015(1)(q)(B)

Figure Q-1 shows the designated project Impact Area for recreational opportunities, as well as the types and numbers of existing and proposed recreational facilities.

MITIGATION MEASURES

None required.

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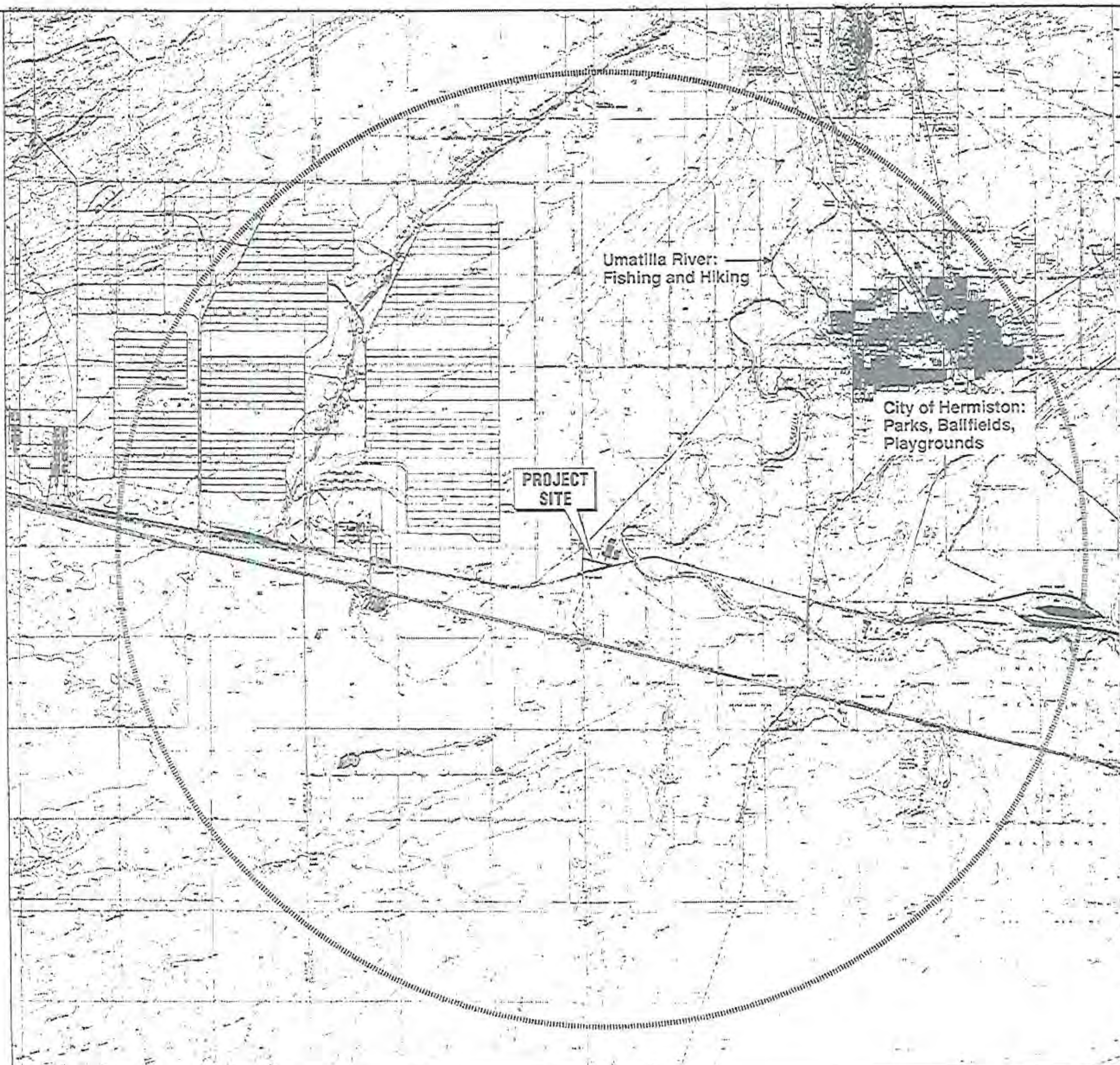

5-mile Impact Area Boundary

NORTH

Hermiston Generating Company
HERMISTON PROJECT
Recreational Facilities and Opportunities Map
Date: 12-22-92 — Figure O-1