

3.3 WATER RESOURCES

This section presents information on existing surface water and groundwater resources in the KVVPP area. It also evaluates potential impacts on stormwater quality and groundwater, and identifies mitigation measures to limit these impacts. Wetlands and other unnamed surface water resources in the project area are discussed in Section 3.2, Vegetation, Wetlands, Wildlife and Habitat, Fisheries, and Threatened and Endangered Species. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.3). Additional information used to evaluate the potential impacts has been referenced.

3.3.1 Affected Environment

Proposed Action

Surface Water

The project site is located within the Yakima River drainage basin. The southern portions of turbine strings A and B are within approximately one-half mile of the Yakima River. Other portions of the project are located within one-half mile of Dry Creek (an ephemeral creek), other unnamed ephemeral creeks, the North Branch Canal of the Kittitas Reclamation District, and livestock watering ponds.

The project area consists primarily of long north-south-trending ridges. Between the ridges are ephemeral and perennial streams that flow into the Yakima River. Slopes within the project area generally range from 9 to 36%, but can reach 84% or more in some of the canyons.

Precipitation at Ellensburg, approximately 10 miles southeast of the project site, averages 8.9 inches annually. Most precipitation occurs in late autumn, winter, and early spring (Kittitas County Conservation District 2001). Dominant soils at the project site exhibit low permeability and have a high runoff potential.

Yakima River

The Yakima River descends from the foot of Keechelus Dam to its confluence with the Columbia River near Richland. The river is divided into three distinct reaches - upper, middle, and lower - on the basis of its physical characteristics. The project is located on the upper reach of the river. The upper reach, which drains the Kittitas Valley, has an average streambed slope of 14 feet per mile (ft/mi) over the 74 miles from the Keechelus Dam to a point upstream from Umtanum (Sagebrush Power Partners LLC 2003c).

In the Kittitas Valley, seasonal river flow patterns can vary greatly on an annual basis because of releases from irrigation reservoirs and changes in precipitation and snowmelt patterns. The dominant season for high river flow occurs during the irrigation season because of the large quantity of water released from irrigation reservoirs. An example in this range in variation is exhibited by data from the Yakima River at Cle Elum during the 1988 to 1989 water years. The

data show post-irrigation flow (October through December) in the river at 271 cubic feet per second (cfs). As the year progresses, the flow gradually increases to 428 cfs in the period from January through March, to 740 cfs from April through May, and to a high of 2,330 cfs during the irrigation period from June through September (Bauer and Hansen 2000).

The three reaches of the Yakima River exhibit varying water quality conditions resulting from differences in geologic sources of contaminants and land use. Compared to the rest of the basin, the Kittitas Valley has relatively low concentrations and loads of suspended sediment, nutrients, organic compounds, and fecal indicator bacteria (Morace et al. 1999). However, the upper Yakima River and several of its tributaries are included in Washington's 303(d) list of impaired waters because of metals, persistent pesticides in water and fish tissue, fecal coliform bacteria, dissolved oxygen, and temperature water quality criteria violations. It should be noted that Ecology is establishing a total maximum daily load (TMDL) for the upper Yakima River basin, which covers the pollution parameters of turbidity, suspended sediment, and organochlorine pesticides. This TMDL would address potential impairment of beneficial uses of the upper Yakima River and its tributaries.

Dry Creek

Dry Creek is an ephemeral stream in the immediate vicinity of the project site. Because the creek is ephemeral, water quality data are limited. However, data collected by Ecology in 1999 at a downstream location near Dry Creek's confluence with the Yakima River show that turbidity levels in Dry Creek are relatively low. Stream flow measurements collected by Ecology show Dry Creek flow ranges from a low of 1.5 cfs in April to a high of 19 cfs by early summer (at the beginning of the irrigation season) (Evans and Larson 2000).

North Branch Canal

The Kittitas Reclamation District (KRD) operates the North Branch Canal. The canal conveys water from the Yakima River for a distance of 36 miles, traversing the project site and providing irrigation water for much of the Kittitas Valley. Most irrigation occurs south of the canal and the project area. Flow in the canal varies during the irrigation season depending on water deliveries to irrigators. Water quality in the canal is generally good and reflects the water quality of the Yakima River. KRD regularly applies aquatic herbicides to the canal for controlling weeds (KRD 2002).

Groundwater

The project is located within the Yakima Fold Belt subprovince of the Columbia Plateau physiographic province. The variation in the geology of the overburden, multiple basalt flows, and interbedded sedimentary units results in a complex groundwater system in the region. In order to simplify the description of the area's hydrogeology, the aquifers in the project vicinity can be grouped into two main hydrologic units: the overburden and the basalt aquifers discussed below.

The overburden in the basins of the Columbia Plateau readily transmits water and contains water table aquifers. These aquifers are generally coarse-grained and highly permeable in their upper sections and fine-grained and less permeable at depth. Groundwater movement in the overburden is downward from the anticlinal ridges toward the streams and rivers (i.e., Yakima River) in the intervening basins (Bauer and Hanson 2000). The water-level contours for the overburden aquifer roughly parallel land surface (Whiteman 1986; Lane and Whiteman 1986; Hanson et al. 1994). Recharge is from infiltration of applied irrigation water and precipitation, with precipitation being the predominant source of recharge (Bauer and Vaccaro 1990) (Bauer and Hanson 2000).

Groundwater in the basalts occurs in joints, vesicles, fractures, and in intergranulated pores of the sedimentary interbeds. The basalt forms an extremely complex aquifer system with interflow zones that function as small semiconfined to confined aquifers. The basalt transmits water most readily through these interflow zones, which represent about 5 to 10% of the total thickness of a typical basalt flow (Hanson et al. 1994). Deeper basalt aquifers are generally confined. The hydraulic connection between units is sufficient to allow continuous vertical movement of water between them (Bauer and Hanson 2000). Water-level data indicate that the flow in basalts is downward except near discharge areas, located generally along streams and rivers (Lane and Whiteman 1986). Localized anomalies to this pattern are caused primarily by geologic structures of both known and uncertain nature and secondarily by groundwater pumping and irrigation (Bauer and Hanson 2000).

Groundwater in the project area has domestic, irrigation, and other uses. A review of 39 well descriptions in the project vicinity indicates that while some wells potentially draw water from the overburden aquifer, most of the area's wells penetrate and draw water from the basalt aquifer. Groundwater in the basalt aquifer system is generally suitable for most uses. The dominant water type is calcium magnesium bicarbonate, and sodium bicarbonate is the next most prevalent water type. However, sodium concentrations increase with residence time, and the largest concentrations are found in samples from the deepest wells (Hanson et al. 1994).

As part of a 2002 geotechnical investigation, nine test pits were excavated at the project site (see Figure 3.1-1). Groundwater was not observed in these test pits that were excavated to depths ranging from 5 to 10 feet below ground. Logs maintained by Ecology of local water wells show that even though there are a number of shallow wells in the project area (i.e., some wells have been drilled to depths ranging from 57 to 116 feet), most wells have been drilled deeper than 150 feet and in some cases are as deep as 720 feet deep, which indicates a deep water table for most of the project area.

Floodplains

The 100-year floodplain of the Yakima River is the closest floodplain to the project site. In the project vicinity, the floodplain does not extend beyond State Route (SR) 10 to the west (see Figure 2-1). The closest access road or turbine to the Yakima River would be more than 500 feet in elevation above the level of the river.

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

The project site is located within the Yakima River drainage basin. The southern boundary of the project is within approximately 0.5 mile of the Yakima River. An unnamed perennial stream, a tributary to the Swauk Creek, bisects the eastern portion of the site. No other perennial streams are located within the site.

Groundwater in the project area has domestic, irrigation, and other uses. The closest floodplain to the project site is the 100-year floodplain of the Yakima River. Information on groundwater well yields has not been collected as part of this analysis.

Alternative 2: Springwood Ranch

The Yakima River bounds the Springwood Ranch site along most of its north and east sides. Taneum Creek intersects the northern and southern portions of the site. An intermittent stream with two branches crosses the northern portion of the site and empties into the Yakima River, and another intermittent stream drains from the middle of the site and flows into the Yakima River. Two irrigation canals cross the northwestern portion of the site, and two ponds are located just west of the northwest corner of the site.

As described above for the proposed action, the Yakima River (downstream of the Springwood Ranch site) is listed by Ecology (Ecology 2004) as impaired for fish rearing, harvesting, spawning, and migration as a result of agricultural activities, habitat modification, and removal of vegetation. Taneum Creek is listed by Ecology as limited for instream flows and temperature.

Three major aquifers are present beneath the Springwood Ranch site and surrounding areas. Groundwater wells in the Ellensburg formation produce relatively low (5 to 15 gallons per minute [gpm]) groundwater yields, whereas wells near the site in the Grande Ronde basalt formation range from less than 20 gpm to 700 gpm. Wells near the site are used for domestic single-family residences. Other wells near the site are used for municipal or irrigation water supply.

3.3.2 Impacts

Proposed Action

This section describes the potential direct impacts on surface water and groundwater from development of the KVVPP. Direct impacts could be associated with construction, operations, and decommissioning of any of the proposed project elements, including wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would result in

significant changes to offsite water resources. Table 3.3-1 summarizes potential water resource use and impacts under the proposed action scenarios.

Table 3.3-1: Summary of Potential Water Resources Use and Potential Impacts of the Proposed Action

	330-foot Turbine Scenario	410-foot Turbine Scenario
Construction Impacts		
Surface runoff from ground disturbance and exposed soils	211.2-acre temporary disturbed area	211.2-acre temporary disturbed area
Increased demand for water supplies	2 to 5 million gallons of water for dust control	2.6 to 6.4 million gallons of water for dust control
Encountering groundwater during turbine foundation construction	Excavation depth of 18 feet (for spread footing foundations) to 35 feet (for mono-pier foundations)	Excavation depth of 22 feet (for spread footing foundations) to 35 feet (for mono-pier foundations)
Damage to existing groundwater wells from blasting	Up to 130 blasts for foundation construction	Up to 130 blasts for foundation construction
Operations and Maintenance Impacts		
Erosion potential/area of permanent ground disturbance	108 acres	108 acres
Increased demand for water	<1,000 gallons daily at O&M facility	Same as 330 foot turbine scenario
Decommissioning Impacts		
	Similar to those described for construction	Similar to those described for construction

Source: Sagebrush Power Partners LLC 2003a, f.

Construction Impacts

Surface Runoff and Erosion

Precipitation during construction could result in sediment-laden surface runoff because of ground disturbance and exposed soils. If not properly mitigated, development under either of the 330 or 410-foot turbine scenarios could adversely affect nearby surface waters. This impact would be roughly the same for either of the scenarios.

Water Supply

Construction of the project would require water for road construction, concrete preparation, dust control, and other activities. During construction, the EPC contractor would arrange for delivery of water to the site via water trucks from a source with an existing water right. Estimated water use for all construction-related needs other than dust control is 1 million gallons.

Construction of the project could use up to 6.4 million gallons of water for dust suppression activities along roadways. The amount of water for dust control could be reduced to between 2 and 2.6 million gallons if lignin or another environmentally safe, non-toxic dust palliative is used. This impact would be greater for the 410-foot turbine scenario because it requires the larger volumes of cut and fill and wider access roads for construction equipment.

The amount of water use during construction would depend on the timing of construction and weather (i.e., the need for dust control would be greater in dry, windy summer conditions than during other times of year). However, the impact is not expected to be significant under either the 330 or 410-foot turbine scenarios because of the temporary nature of the impact and the availability of adequate water supplies. The contractor would bring water for construction activities to the site. Water used for dust suppression would be applied using tanker trucks equipped with rear end sprinkler systems. Runoff from dust suppression activities is not expected because only enough water to dampen the soil would be used.

Groundwater Levels and Quality

Encountering significant amounts of groundwater during the construction of the turbine foundations is not expected. Required excavation depths for constructing the turbine towers would depend on the type of foundation used. For example, excavation, drilling, and blasting to construct mono-pier foundations for the wind turbine generators could penetrate to depths of 35 feet. If spread footing foundation designs are used, the depth of excavation would range from 14 feet (for the smaller 330-foot turbines) to 22 feet (for the larger 410-foot turbines). In comparison, foundations for the O&M facility and substations would be shallow, only several feet deep, and would not encounter groundwater (Taylor, pers comm., 2003).

Some localized pockets of saturated subsurface soils could be encountered on ridges in places where surface water infiltrates the subsurface and collects above zones of cementation. Cemented soils have lower porosity and permeability, and were found in the upper 1 to 7 feet in the project area.

In the event of a substantial rainfall, foundation excavations could provide a temporary conduit for surface seepage, resulting in accelerated recharge to the overburden and basalt aquifers and a temporary rise in groundwater turbidity in the immediate vicinity of the foundation construction. However, potential groundwater impacts are not expected to be adverse because of the short duration of foundation construction (two to three months) and the likelihood that this stage of construction would occur during the dry season. If groundwater (perched or otherwise) is encountered during excavation and construction activities and draining (dewatering) is required, the water generated during dewatering activities would be pumped into a settling basin for infiltration, as needed. The exact location and size associated with siting a settling basin at the project site are unknown and would depend upon the amount of groundwater recharge anticipated to be encountered during construction (Taylor, pers. comm., 2003). However, it is unlikely that water generated during excavation pit dewatering would discharge to surface water sources. The overall impact on groundwater is expected to be temporary and unlikely to affect water wells in the project area.

Disruption to Existing Groundwater Wells

During the EIS scoping process and again in comments on the Draft EIS, concern was raised that proposed blasting activities required to construct turbine foundations could adversely affect existing groundwater wells in the project area. Because of the rocky conditions on the site, it is anticipated that most wind turbine foundations would require one to two blasts each, up to 130

blasts for the full build-out of 65 turbines. Blasting would occur during the foundation excavation phase of construction that would last for approximately two to three months. As described above, existing water well depths in the project area range from 57 feet to more than 720 feet below ground, with most wells greater than 150 feet deep. Because of the differences in depth between the majority of existing groundwater wells and proposed foundation sites, well damage is not anticipated.

Operations and Maintenance Impacts

Erosion and Sedimentation

No significant erosion or sedimentation impacts on project-area surface waters are expected as a result of operation and maintenance of the KVVWPP. Project operation would result in a permanent developed footprint of 108 acres. However, as described in Section 3.1, Earth Resources, operational BMPs would be implemented to control erosion and sedimentation.

Water Supply

Operation of the project would require a domestic well to serve the limited needs of the O&M facility. The well, which would provide water for bathroom and kitchen use and general maintenance purposes, is expected to consume less than 1,000 gallons per day under all three proposed action scenarios. No significant impacts on groundwater supplies are expected because of facility operations.

Decommissioning Impacts

Impacts on water resources and water quality from decommissioning of the project would be similar to those described for construction. Water would be needed for dust control. There would be potential for soil erosion and impacts on stormwater quality. Impacts are expected to be minimal, however, because appropriate construction BMPs would be followed during decommissioning.

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

Impacts during construction of the Swauk Valley Ranch alternative could include sediment-laden surface runoff from ground disturbance and exposed soils. If not properly mitigated, runoff from disturbed areas could adversely affect nearby surface waters. Construction of the project would require delivery of water to the site for road construction, concrete preparation, dust control, and other activities. Construction activities would not result in any adverse impacts on local groundwater. The amount of water required would depend on the number of turbines and other facilities constructed and the total length of access roads. Given that the hypothetical Swauk Valley Ranch project is smaller than the KVVWPP, the construction water needs would likely be less than those for the KVVWPP. The overall impact on groundwater in the project area is expected to be temporary and unlikely to affect water wells.

Project operations and maintenance would result in no major erosion or sedimentation impacts on local surface waters. Operation of the project would require a domestic well to serve the limited needs of the O&M facility. No significant impacts on groundwater supplies are expected because of facility operations.

Impacts on water resources from decommissioning of the project would be similar to those described for construction.

Alternative 2: Springwood Ranch

Impacts during construction of the Springwood Ranch alternative could include sediment-laden surface runoff from ground disturbance and exposed soils. If not properly mitigated, runoff from disturbed areas could adversely affect nearby surface waters. In particular, six to eight of the presumed turbine locations (and their associated access roads) would be within approximately one-quarter mile of the Yakima River near slopes marked with high erosion and landslide potential. Site construction would have minimal impacts on groundwater. Runoff from disturbed areas would be infiltrated onsite, resulting in a minor temporary increase in groundwater recharge.

No analysis has been performed to determine the source or volume of water required during construction activities.

Operation of a wind energy project would have minimal influence on existing surface water runoff patterns for Springwood Ranch. Therefore, long-term operation would not result in significant impacts on surface water resources. Operation of the project would likely have minimal long-term impacts on groundwater. Impervious surfaces associated with turbines, roads, and buildings would result in a minor increase in surface runoff volume, some of which could translate into a minor increase in groundwater recharge. Water demands for project operation would likely be filled through construction of a domestic well and would have no impact on groundwater supply.

Impacts on water resources from decommissioning of the project would be similar to those described for construction.

No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others, and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and extent of future development at the project site, impacts on water resources could be similar to or even greater than the proposed action.

If the proposed project were not constructed, the region's baseload power needs could be delivered through development of other generation facilities, most likely a gas-fired combustion turbine. A gas-fired combustion turbine facility generating 60 aMW of power could require approximately 14 acres for the plant site (Bonneville and U.S. Department of Energy 1993).

However, gas-fired combustion turbine projects could expose more soil to potential erosion because of the possible need to establish a gas pipeline to the facility and electrical transmission interconnections. Also, substantial amounts of water, estimated at 200 acre-feet (65 million gallons) per year (Bonneville and U.S. Department of Energy 1993) would be needed for cooling water during plant operation. Operation of a water-cooled combustion turbine facility would also result in discharge of large volumes of wastewater.

Development of other wind energy projects would result in impacts similar to those of the proposed action.

3.3.3 Mitigation Measures

Proposed Action

Mitigation Measures Proposed by the Applicant

Surface Runoff Pollution during Construction

The Applicant proposes to develop and implement, as required by the National Pollutant Discharge Elimination System (NPDES) General Stormwater Permit for Construction Activities, a detailed SWPPP to minimize the potential for discharge of pollutants from the site during construction. See Mitigation Measures in Section 3.1, Earth Resources, for a detailed description of proposed SWPPP activities and measures to be implemented during construction.

Surface Runoff Pollution during Operations

The Applicant proposes to develop and implement a detailed SWPPP to minimize the potential for discharge of pollutants from the site during operations and maintenance activities. See Mitigation Measures in Section 3.1, Earth Resources, for a detailed description of proposed SWPPP activities and measures to be implemented during project operations and maintenance.

Water Supply

A licensed well driller would install a potable water well to serve the O&M facility. The well would be installed consistent with Kittitas County Environmental Health Department and Ecology requirements.

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

Similar to the proposed action, a detailed SWPPP would be developed to minimize the potential for pollutant discharge from the project site during construction, operations, and decommissioning. As part of the project, a licensed well driller would install a potable water well to serve the O&M facility.

Alternative 2: Springwood Ranch

Mitigation measures related to water resources would be similar to those described for the proposed action and the Swauk Valley Ranch alternative. Additional site-specific mitigation measures would be warranted for the six to eight turbines (and their associated access roads) that would be located within one-quarter mile of the Yakima River near slopes with high erosion and landslide potential. These measures could include setback distances for structures, infiltration systems, detention ponds, and additional sediment and erosion control BMPs.

No Action Alternative

No mitigation measures related water resources are proposed for the No Action Alternative.

3.3.4 Significant Unavoidable Adverse Impacts

With implementation of the mitigation measures outlined above, significant unavoidable adverse impacts on surface water and groundwater resources resulting from project operation are not anticipated.