DEPARTMENT OF ENVIRONMENTAL QUALITY
Environmental Assessment

Permitting and Compliance Division
Water Protection Bureau

Name of Project: OW Ranch, Hanging Woman Creek Project

Type of Project: The applicant proposes in developing and extracting coal bed natural gas (CBNG) from subsurface formations in the Powder River Basin. This process generates produced water, which is considered wastewater and must be disposed of through various methods including discharge to state surface waters. The applicant proposes to discharge about 50% of the produced water to Hanging Woman Creek and its tributaries after treatment, with the remainder of the wastewater to be disposed of through land application with or without treatment. The applicant proposes to discharge to state surface waters under the terms and conditions of a Montana Pollutant Discharge Elimination System (MPDES) permit.

Location of Project: The OW Ranch Hanging Woman Creek Project encompasses solely the OW Ranch Project Plans of Development (POD) located within the township of T9S R43E, about 15 mile south of Birney, Bighorn County, MT. The applicant proposes to site the headquarter of the project at Lat N45º 08'10.68", Lon W106º 28'34.50". The total proposed development area is approximately 13.5 square miles in 15 sections. Discharges from the project will enter the Hanging Woman Creek and its tributaries via five (5) outfalls located at Horse Creek, East Trail Creek, Trail Creak, upstream Hanging Woman Creek near Montana-Wyoming border line, and middle reach Hanging Woman Creek below Horse Creek (Fig. 1).

Description of Project: James W. Guercio, owner of OW Ranch, Boulder, CO, submitted the application for a MPDES discharge permit. The project is proposed a 4-phase (12 months in each phase, 48 months in total) development plan with 75 new CBNG production wells drilled in each phase. The overall production period is anticipated to extend 12–15 years with maximum number of production wells reaches 282 occurring at approximately month 48. No wells have been drilled at the time of application.

Water Management Plan
Produced water from the CBNG production wells was proposed to be disposed of under three regulated activities: 1) discharge treated produced water under MPDES permit MT0031593, through outfalls 001 – 004, to the ephemeral tributaries and upstream mainstem Hanging Woman Creek at a rate of 1.03 mgd (1.6 cfs) seasonally during September 1–March 31; 2) discharge treated produced water under MPDES permit MT0031593, through outfall 005, to middle reach mainstem of Hanging Woman Creek year round at an variable rate of 0.65–5.43 mgd (1.0–8.4 cfs); and 3) dispose of the rest of the produced water, approximately 50% of the total 2,105

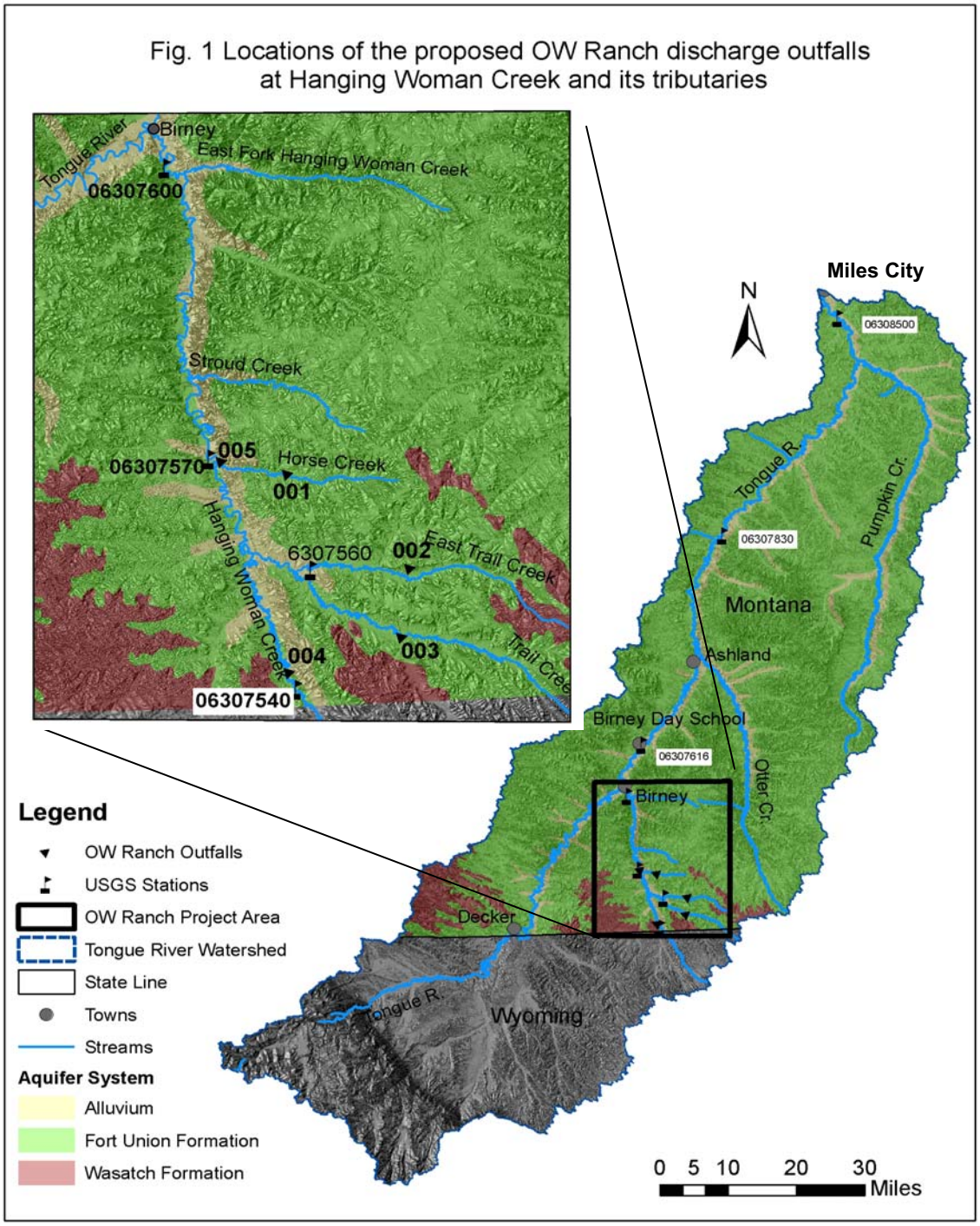

Fig 1. Locations of the proposed OW Ranch discharge outfalls at Hanging Woman Creek and its tributaries. The site locations are approximate.

million gallons per year (MGY), using land application for beneficial uses including hay meadow irrigation, soil water recharge and rangeland enhancement, and on-ranch subsurface drip irrigation (SDI). The total area proposed for land application is 4,300 acres, among which 500 acres is along the alluvial corridors of Hanging Woman Creek and its tributaries. The proposed discharge activities were prioritized and water will be disposed of based on total available amount (Table 1). In the Final Statewide Oil and Gas Environmental Impact Statement, January 2003 (MT-FEIS), analysis concluded that 20% of the produced water from CBM production should go to beneficial uses. The operator has identified beneficial uses of produced water for managed irrigation in hay meadow irrigation, subsurface soil moisture and rangeland enhancement, and subsurface drainage irrigation.

Table 1. OW Ranch Produced Water Management and Disposal Plan.

Rank	Proposed Discharge or Land Application	Proposed Discharge or LA Location	Total (acft)	% of Total	Annual Operation Timing and Flow rate	Treat-ment
1	Discharge to ephemeral tributaries of HWC	Outfall # 1-4, to HWC and its tributaries	670	10%	09/01–03/31, Discharging 212 days at 1.6 cfs	Treated
2	On-ranch hay meadow sprinkler Irrigation	500 ac, within alluvial corridor of HWC above Horse Creek	1660	26%	04/21–09/20, operating 153 days at 5.5 cfs	Treated
3	Discharge to Hanging Woman Creek	Outfall # 5: To lower reach of HWC	2633	41%	1) 1 cfs: Nov.–Jan. 2) 8.4 cfs: Feb, Mar. 3) 5.0 cfs: Apr.–Jun. 4) 2.5 cfs: Jul–Oct. operating 365 days	Treated
4	Soil water recharge and Rangeland enhancement	2500 ac, Upland, off-channel rangeland	1000	15%	04/20–09/20, operating 152 days at 3.3 cfs	untreated
5	On-ranch subsurface drip irrigation (SDI)	1300 ac, Upland, off-channel rangeland	500	8%	08/15–02/15, operating 184 days at 1.4 cfs	Treated

MPDES Permit MT0031593

The Montana Department of Environmental Quality (the Department) Water Protection Bureau is issuing a discharge permit (MT0031593) in 2009 to OW Ranch to discharge produced water to the Hanging Woman Creek and its tributaries. The initial permit development utilized the requirements for new sources and new dischargers as identified in the Montana Water Quality Act and companion regulations. Regulations require the discharge to be nonsignificant under the nondegradation policies to state waters. The permit was developed with a set of water quality based effluent limits (WQBEL) pursuant to Montana surface water classification and applicable standards. The year round discharge from Outfall 005 will create an effluent dominant stream in the lower reach of Hanging Woman Creek, which eventually will join a downstream high quality

water, the Tongue River. For this reason, the WQBEL for Outfall 005 were set forth based on water quality standards and receiving water quality of the Tongue River, as well as the Hanging Woman Creek and its tributaries. Reasonable potential analysis was performed to identify any possible impact the effluent on the receiving waters in order to meet the water quality standards and nonsignificance requirements. Parameters that have effluent limits include electric conductivity [EC, representation of total dissolved solids, (TDS)], sodium adsorption ratio (SAR), iron, fluoride, and ammonia. Limits for all parameters are developed from nondegradation criteria.

The Department drafted the permit following Environmental Protection Agency (EPA) Technical Support Document (TSD). The draft permit stipulates discharge water quality based on the USGS calculated 7-day, 10 year (7Q10) low flow condition. This conservative approach builds in additional protection and holds the impact of the discharge non-significant to the receiving water and downstream waters that may subject to potential impact. See the Statement of Basis (SOB) for permit MT0031593 for a discussion concerning permitting decisions and methodology.

Baseline receiving water quality has been developed utilizing data from USGS operating observation stations in the Hanging Woman Creek and the Tongue River. Baseline data for Hanging Woman Creek is from a USGS station located at middle reach of Hanging Woman Creek right next to the discharge Outfall 005 (USGS station 06307670). Baseline data for the Tongue River are from USGS station 06307616 at Birney Day School, the closest station below Hanging Woman Creek, and from station 06308500 at Miles City, the most downstream station on the Tongue River. The period of records (POR) at these stations are long enough to establish baseline conditions and to reflect the background water quality. The resulting ambient water quality was sorted into seasonal corresponding to the discharge period and irrigation/non-irrigation seasons specified in ARM 17.30.670.

The downstream mainstem of Hanging Woman Creek (segment MT42B002_031) from Stroud Creek to the Tongue River was not listed on the 303(d) list in 1996. But in 2006, the stream is listed on 303(d) list as being impaired and a Total Maximum Daily Load (TMDL) is required. The stream was assessed for partial support of aquatic life and warm water fishery, but was not assessed for primary contact recreation. The probable causes identified were sedimentation/ siltation. Probable sources were listed as grazing in riparian or shoreline zones and stream bank modification/destabilization. A TMDL is not yet developed for this segment.

The Tongue River from Hanging Woman Creek to the diversion dam just above Pumpkin Creek (MT42C001_012) was listed on the 1996 303(d) list for metals, salinity/TDS/chlorides, other inorganics, flow alteration and suspended solids. However, in 2006 the stream was not assessed for any beneficial use impairment due to insufficient data and therefore there is no TMDL necessary for this reach of the river.

The Tongue River from the diversion dam just above Pumpkin Creek to the mouth (MT42C001_011) was listed on the 1996 303(d) list for metals, other inorganics, salinity/TDS/chlorides, flow alteration and suspended solids. In 2006, the river segment was assessed as category 4c, polluted waters that impaired by non-pollutant and do not require a TMDL. The stream segment was assessed as fully supporting agriculture and industrial use, and partially supporting aquatic life, warm water fisheries, and contact recreation. Drinking water use was not assessed due to insufficient data. The probable cause for impairment was low flow alteration possibly caused by hydrostructure flow regulation/modification. Therefore, no TMDL is required for this reach of the river.

Land Application of Produced Water
The applicants proposes three land application sites to dispose of approximately 50% of the total produced water, up to 1,030 MGY in total from OW Ranch CBNG Project. Among the three land application sites, the on-ranch hay meadow sprinkler irrigation system is to be along the alluvial corridor of Hanging Woman Creek and its tributaries using treated CBNG water. The applicant has identified 1461 acre candidate parcels in various sizes for this purpose. The other two land application sites are both proposed to be conducted on upland, off-channel areas. However, the soil moisture recharge and/or rangeland enhancement is proposed to use untreated produced water, while the on-ranch SDI is proposed to use treated water.

Due to the potential discharge of pollutants from land application sites to enter surface water, the Department is requiring, as a special condition of the discharge permit (MT0031593), that the permittee develop and implement a Best Management Practice (BMP) plan to minimize impacts to surface water and ground water. ARM 17.30.1345(1) states that "*All permit effluent limitations, standards and prohibitions must be established for each outfall or discharge point of the permitted facility, except as otherwise provided under ARM 17.30.1344[40 CFR 122.44(k)] (BMP's where limitations are infeasible).*" Runoff from land application sites is anticipated yet since monitoring and limitations are infeasible, a BMP plan is therefore required.

The goal of the BMP plan is to minimize any runoff from excessive irrigation entering state waters, and to reduce significant change of surface water quality due to soil leaching or erosion from riparian land irrigation.

The permit conditions requires that the BMPs shall include, but are not limited to, water budget, riparian buffer zone installation and management, record keeping, executable irrigation schedule with application rate adjustment to precipitation, soil moisture, site specific soil chemistry, land slope condition and distance to river channel.

Agency Action and Applicable Regulations: The proposed action is to issue a MPDES permit to the applicant for discharge of treated wastewater. The permit specifies effluent limitations, waste disposal requirements, and monitoring requirements. The Department is issuing this permit under the authority of the Montana Water Quality Act 75-5-101 *et seq.* MCA, and the Montana Pollutant Discharge Elimination System rules, ARM 17.30.12 *et seq.* Permit limitations

have been developed utilizing the nondegradation provisions of the Water Quality Act at § 75-5-303 MCA, and rules at ARM 17.30.701 *et seq.*

For the purpose of this environmental assessment (EA), the Department will only be analyzing impacts from the proposed project, and the cumulative impacts associated with existing approved plan of development (POD). Statewide Oil and Gas Environmental Impact Statement (EIS) has been developed by the Bureau of Land Management (BLM), with the assistance of U. S. EPA, Department of Energy, Bureau of Indian Affairs and Crow Tribe of Indians in January 2003 (MT-FEIS). A final supplement to this EIS with proposed amendment of the Powder River and Billings resources management plan areas was further developed and published in October 2008 with more participating agencies, local tribes and counties, including U.S. Army Corps of Engineers, Montana Department of Environmental Quality, Montana Board of Oil and Gas Conservation (MBOGC), lower Brule Sioux Tribe, and eight counties within the Powder River and Billings Resource Management Plan areas. Impacts to the environment and human population, mitigation measures and general goal of this EA will be drawn from the 2008 amended FS-EIS.

Summary of Issues: The Department proposed to issue MPDES permit to limit the discharge of produced water from CBNG development to the Tongue River. Issues of concern include: impacts to air quality, cultural resources, ground and surface water quality and quantity, sensitive wildlife and vascular species, and impacts to the human environment.

Affected Environment & Impacts of the Proposed Project:

> Y = Impacts may occur (explain under Potential Impacts). *Include frequency, duration (long or short term), magnitude, and context for any significant impacts identified. Reference other permit analyses when appropriate (ex: statement of basis). Address significant impacts related to substantive issues and concerns. Identify reasonable feasible mitigation measures (before and after) where significant impacts cannot be avoided and note any irreversible or irretrievable impacts. Include background information on affected environment if necessary to discussion.*
>
> N = Not present or No Impact will likely occur. *Use negative declarations where appropriate (wetlands, T&E, Cultural Resources).*

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RESOURCE	[Y/N] POTENTIAL IMPACTS AND MITIGATION MEASURES
1. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE: Are soils present which are fragile, erosive, susceptible to compaction, or unstable? Are there unusual or unstable geologic features? Are there special reclamation considerations?	[N] Topography of the southern (upstream) half of the Hanging Woman Creek basin is mostly continuous grass-covered ridges and valleys with many scattered small buttes along ridge tops. The general slope is moderate (60-110 ft/mi), rising from an altitude of about 3,600 ft along Hanging Woman Creek to about 4,500 ft along the higher parts of the drainage divide in Wyoming. In the northern part of the Hanging Woman Creek Watershed, the land surface is more rugged with the deep-cut and narrow river valley along with steep-sided ridges (see Fig. 1). Hanging Woman Creek meanders within a relatively flat alluvial valley. Generally, the valley floor has a width of 1,000 to 2,000 ft and slopes about 22 ft/mi. The valley has an altitude of about 3,120 ft at its northern end where Hanging Woman Creek flows into the Tongue River (USGS Open File Report 89-4047, 1989). The Tongue River Member of the Fort Union Formation (Paleocene age) are outcropped at the surface in most of the OW Ranch CBNG proposed production area and underlie the entire Hanging Woman Creek watershed. The sedimentary rocks of this member include light-yellow to gray sandstone, sandy shale, gray shale, and coal. In the southern part and area away from the river valleys, sedimentary rocks of the Wasatch Formation (Eocene age) cap the higher buttes and ridges (See Fig. 1). The valleys of Hanging Woman Creek and its tributaries contain alluvium (Holocene and Pleistocene age), consists of sand, silt, gravel and clay, derived from sandstone, shale, and clinker of the Fort Union and Wasatch Formations (USGS Open File Report 89-4047, 1989). There are two type of proposed produced water discharge activities may potentially impact the soils. (1) discharge of produced water through outfall 001–005 into the channels of the Hanging Woman Creek and its tributaries; (2) dispose of treated or untreated produced water through land application within OW Ranch. The discharge of treated produced water into Hanging Woman Creek and its tributaries will not have adverse impact to the water and soil because a set of Water quality based effluent limit (WQBEL) have been developed based on Montana Non-degradation Policies (ARM 17.30.715). The discharged water quality is better than the ambient water quality since a high quality water–the Tongue River has been used to set these limits. The discharge will dilute the receiving water in Hanging Woman Creek and meet the non-degradation criteria of the Tongue River with regard to TDS or EC, SAR, iron, and fluoride. The designated uses, including agricultural irrigation water use for these rivers will be protected. Using water from the river channel for irrigation will not cause soil damage because of the WQBEL for the discharge. In fact, the discharge will improve the water quality and add some positive impact to the receiving water.

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	The second proposed activity of the OW Ranch project is to dispose of 50 % of the produced water (approximately 2,105 MGY) through land application. The three proposed land application activities are: a) hay meadow irrigation using treated water along Hanging Woman Creek alluvial corridor; b) soil water recharge and rangeland enhancement using untreated produced water; c) on-ranch SDI with treated water. The latter two are proposed to be conducted on off-channel upland areas. Within the OW Ranch Hang Woman Creek Project area, soils have developed from alluvium of modern channel and flood plains, alluvial terraces, as well as residuum derived from the Tertiary sediment rocks-the Wasatch Formation and Tongue River Member of the Fort Union Formation (USDA, *Soil Survey of Big Horn County Area, Montana*, 1977). Soils identified in the project plans of development, indicate numerous soil types within the project area. However, most of the soils are with high clay content and classified as clay or silt loam with low plasticity in STATEGO data under Unified Soil Classification System. Textures range from clay to sandy loam; permeability ranges from 0.2 to 0.6 in/hr for areas along Hanging Woman Creek and Horse Creek, while permeability is 0.6 to 2.0 in/hr in areas along Trail Creek and East Trail Creek. To identify most suitable land parcels for the hay meadow irrigation land application sites, the permittee took soil samples from 18 locations in September 2006 within the alluvium along river channels and areas adjacent to the Hanging Woman Creek riparian corridor after initial reconnaissance. For each location, 10 soil samples were taken along the soil profile by 6 inch increments from surface to 48 in, and by 12 in increments from 48 in to 72 in, which resulted in 80 individual soil samples. The predominant soil mapping unit in the survey area was the "Haverson" series in various slope categories, along with the Fort Collins and Glenberg soil series. These three major soil series account for 80% of the candidate irrigation areas. Among the 80 individual soil samples, 60% of the saturated soil paste extract showed that specific conductance values exceed the generally considered threshold for saline soil. Meanwhile, 35% of the soil samples have Exchange Sodium Percentage (ESP) of 15% or higher, which suggests that 35% percent of the soil are sodic. However, further inspecting of the soil profiles suggested that 44% of the sampling sites (8 out of 18) have low soil salinity (<1000 µS/cm) from surface to at least 45 in, possibly due to substantial leaching. These sites will be excellent land sites for treated produced water irrigation. One third of the sampling locations (6 sites in total) demonstrate very limited previous leaching with only 15–18 in of historic leaching from the surface. Soils below 15–18 inch are still highly saline associated with shallow ground water table. These areas are not suitable for land application of produced water because of the shallow ground water table. Three out of the total eighteen sampling sites are clearly saline with high EC throughout the 72 inch soil profile. The EC ranges approximately from 3,000 to 10,000 µS/cm, which indicates these sites are unsuitable for land application of produced water. One sampling site was described as upland, off-channel of the Hanging Woman Creek and its tributaries. This site has very high soil salinity (approximately

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	1,500–16,000 µS/cm). The soil sampling results indicate that some soils in the project area are saline, some also sodic, especially in off-channel, upland area. Therefore, irrigation using produced water is possibly impact the soil in various ways. Land application using treated produced water will have positive impact to the soil, possibly leach more soil salt out to deep soil layers. However, attention need to be paid to areas that ground water level is shallow. Land application using untreated water is a particular concern because upland, off-channel land sites tend to have high soil salinity and sodicity. Untreated water with high salinity and SAR has the potential to reduce the soil permeability and damage the natural vegetation. Land apply treated water to saline or sodic soil areas may need excessive amount of water to leach the salt or sodium out, or need soil amendiment before the soil can be used for crop or hay production. Such excessive application of water or soil amendment may impose additional impact to soil, ground water or surface water if runoff or infiltration is generated. To minimize the impact to the soil, a careful selection of land parcels for land application and a site specific irrigation management plan are needed. The permittee already started the process to select candidate land sites through soil sampling. MPDES permit MT0031593 further requested a BMP plan in the special condition section VIII.b for the Department review and approval before the commencement of any land application, which will ensure the impact to local soil be minimum. Mitigation measures identified and requested in the BMP plan include the followings: A BMP plan is required for each of the three land application sites and shall follow the guidelines below (pursuant to DEQ-9, section 5): • The wastewater must be applied in a manner so as to prevent any pollutant from entering state waters. • Any permanent or temporary piping used to transfer wastewater to the irrigation system must be designed, constructed, and operated so that the wastewater is not discharged to state waters at any time during start-up, operation, and shut down. • Irrigation practices should be managed to prevent ponding of wastewater on the land application site. • Wastewater may not be land applied or irrigated on frozen or snow-covered ground. • The land application site shall maintain at least a 100-foot setback or 35-foot vegetated buffer zone between any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters. The permit conditions also require that the BMP plans shall include site specific measures to minimize the impacts to surface water, ground water and soil. In addition, the permit requires an annual soil monitoring for each land application

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	site as part of the BMP plan. In addition, mitigation measures for the CBNG drilling well development were also specified in BLM Final Supplemental EIS (BLM, 2008), which include: • Construction activities will be conducted in accordance with the BLM Gold Book (USDI and USDA, 2006; http://www.blm.gov/bmp/goldbook.htm) requirement. • Federal lease in excess of 30 percent will be required to obtain approval for occupancy from the BLM based on mitigation of erosion, surface productivity after remediation and mitigation to surface water quality. Water bar will be constructed on slopes 3:1 or steeper. • Riparian zones will be protected by federal lease stipulations and permit mitigation measures. • Construction activities will be restricted during wet and muddy conditions; following BMPs, during road and utility ROW construction, surface soils will be stockpiled adjacent to the sides of the cuts and fills. Erosion control measures will be maintained and continued until adequate vegetation cover is reestablished. Top soils from construction will be reused in reclamation process. • Stream crossings will be designed to minimize impacts and impede stream flow. Therefore, soils will be impacted insignificantly or positively by the issuance of the MPDES permits.
2. WATER QUALITY, QUANTITY AND DISTRIBUTION: Are important surface or groundwater resources present? Is there potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality?	[Y]Groundwater The Montana Final Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans (MT-FEIS) Chapter 4 – Hydrological Resources, has determined that there will be impacts to the ground water from CBNG production. Ground water impacts associated with the preferred alternative in the MT-FEIS focus on drawdown of the aquifer(s) from the edge of the CBNG field production, and the potential for CBNG produced water (untreated) to infiltrate through the more permeable shallow sub-soils and alter the quality of alluvial ground water. Ground water monitoring by the Montana Bureau of Mine and Geology (MBMG) and the BLM began in the 1970's in association with coal mining in this area. Currently MBMG manages Montana coalbed-methane (CBM) regional ground-water monitoring network, which started from 2004. The MBMG collects data at a network that consists of monitoring wells installed during the late 1970s and early 1980s in response to actual and potential coal mining, as well as monitoring wells specifically installed to monitor CBM impacts, domestic wells, stock wells, and springs (Wheaton, *et al.*, 2005).. The USGS is also installing six (6) well clusters along the southern boundary of the Northern Cheyenne Reservation to track drawdown effects from CBNG development east of the CX Field of Fidelity and nearby areas. The BLM is installing ground water monitoring well clusters throughout the Montana portion of the Powder River Basin, including areas adjacent to the Northern

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	Cheyenne and Crow Reservations. Currently, monitoring wells are in place outside the producing field to monitor regional impacts such as the magnitude of drawdown, and the rates and extent of vertical leakage (BLM, 2004 and 2005). The first reported water or gas production in Montana occurred during April, 1999 in the CX field, where Fidelity CBNG production commenced and is currently on-going. After nearly 9 years of CBM production, the 20-ft drawdown contours for both the Dietz and Canyon coals extend about 1.0 to 1.5 miles beyond the edges of the CX field. These distances are similar to, but somewhat less than originally predicted in the Montana CBM environmental impact statement. The radius of the 20-ft drawdown contour is expected to increase as the duration of production increases; however, little change in this radius can be discerned since 2004 (Wheaton, *et al.*, 2008). Projections based on computer modeling and reviews of current data from mines, show drawdown of 20 ft is expected to eventually reach as far as 4 miles beyond the edges of large production fields. Drawdown decreases at greater distances, and drawdown of 10 ft was predicted to reach as far as 5 to 10 miles beyond production fields after 20 years. Faults tend to act as barriers to ground-water flow and drawdown does not migrate across fault planes where measured in monitoring wells. Vertical migration of drawdown tends to be limited by shale layers. With the ground water levels reduced/lowered, there will be a loss of ground water resources. Some springs and supply wells that are sourced from the producing coal beds may experience reduced water availability. Streams that receive significant portions of their flow from ground water discharge from coal beds that subcrop beneath and recharge the alluvium may decline due to the loss of ground water base flow. In larger surface water bodies this impact may not be measurable (Wheaton and Donato, 2004). Mitigation agreements are required by the State and the BLM under MCA 82-11-175 to be offered to each appropriator of water who holds an appropriation right or permit to appropriate groundwater and is adversely impacted by CBNG production. The agreements include water wells or natural springs within one mile of CBNG production, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely impacted. These agreements will apply whether the impacts are due to reduced yield, the production of methane (methane migration), or a change in water quality. Mitigation measures must address the reduction or loss of water resources and provide for prompt supplementation or replacement of water from natural spring or water well adversely affected by CBNG well (BLM, FS-EIS, 2008) Ground water levels in overlying and underlying aquifers (sandstones) are expected to show little response to drawdown from CBNG production due to shale dominated stratigraphic sequences. However, the Order [No. 99-99 (Controlled Ground Water Area)] requiring mitigation agreements applies to "all" wells and springs, not just those which derive their water from the developed coal seam(s). Water rights are presently being adjudicated on a watershed basis (BLM, 2004 and 2005).

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	[N]Surface Water As stated in the MT-FEIS, surface water quality would be slightly altered, however, downstream uses would not be diminished. Surface water flow would be moderately increased. However, in Hanging Woman Creek, although the stream will become effluent dominant in most of the times, the river channel is a stable type E4 (USGS Open-file report 2004-5266, 2005), which features as low to moderately sinuosity, gentle to moderately steep channel gradients, with very low channel width/depth ratios. The applicant also conducted a river morphology survey and confirms the river channel type and stability (OW Ranch application, 2007). E4 stream type exhibits predominantly gravel sized bed materials, Stream banks are composed of materials finer than the dominant channel bed materials, and are typically stabilized with extensive riparian or wetland vegetation that forms densely rooted sod mats from grasses and grass like plants, as well as woody species. The bed and banks are inherently stable in nature (Rosgen, 1996, Applied River Morphology). Therefore, the discharge will not cause significant riparian erosion and increased sedimentation. The effluent amount is found insignificant to the Tongue River. Under the preferred alternative of the MT-EIS, beneficial reuse would be emphasized. For each POD, a water management plan (WMP) would be required. Contained in the WMP, the applicant would identify options including: injection, treatment, impoundment, direct discharge, or any other operator proposed disposal method. The WMP must address both site-specific conditions and cumulative effects of the proposed management and their effects on soil, water, vegetation, wildlife, stream channel stability and any other resources reasonably expected to be impacted. The WMP must be submitted with the POD and require approval prior to issuance of approvals for Applications for Permit to Drill. Analysis conducted in the MT-FEIS concludes there would be no impact to beneficial uses under the preferred alternative. The operator has not submitted WMPs for the OW Ranch PODs, rather choose to apply MPDES permit first. However, the application indicates a WMP is in fact already formalized with five prioritized water treatment (see Table 1 of this EA), disposal and beneficial uses with seasonally variable quantities. The BMP plan requirement in the MPDES permit MT0031593 for the land application will further ensure the land application will not generate significant impact to surface waters. The discharge of treated produced water into Hanging Woman Creek and its tributaries through Outfall 001–005 will not have adverse impact to the surface water because two sets of WQBELs have been developed based on Montana applicable water quality standards and Non-degradation Policies (ARM 17.30.715). No water quality standards and degradation criteria will be violated with these permit limits because no mixing zone was granted, and the WQBEL will be met at end of pipe. Because the WQBEL limits for all five outfalls are based on a downstream high quality water–the Tongue River at the 7Q10 flow under non-degradation criteria, rather than just based on the direct receiving water–Hanging Woman Creek, the WQBEL for the effluent is more than sufficient to protect Hanging Woman Creek and its tributaries, and sufficient to protect the downstream high

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	quality water–the Tongue River. Therefore, the discharge will not have any adverse impact to the direct receiving water–Hanging Woman Creek and its tributaries because the discharged water quality is much better than the ambient water quality. The discharge will dilute the receiving water with regard to TDS or EC, SAR; iron, and fluoride, as well as manganese. All the designated uses for the receiving water, including agricultural irrigation water use will be protected. In fact, the discharge will add some positive impact to the water quality. No impact to surface water is significant.
3. AIR QUALITY: Will pollutants or particulate be produced? Is the project influenced by air quality regulations or zones (Class I airshed)?	[N] An intensive air quality modeling technical support document was prepared by Argonne National Laboratory in 2002 (BLM, FS-EIS, 2008) and revised in 2007. A supplemental Air Quality Analysis (SAQA) report was also prepared for the modeling effort conducted on the FS–EIS (BLM, FS-EIS, 2008). Three group of emission sources contributed to the modeled emission results. They are existing emissions, CBNG project-related emissions, and reasonably foreseeable future actions (RFFAs). Cumulative impacts under the preferred Alternative H (scenario 1) for the Montana near-field receptor grid indicated that there are no exceedances of air quality standards predicted. However, the model predicted 1-hour NO_2 concentration does not exceed standard but close enough to have potential for this standard to be exceeded. Two additional air quality models, Wyoming Powder River Basin Coal Review modeling conducted by Wyoming BLM and Cumulative Impact Model conducted by Montana DEQ, are available for reviewing regional air quality. Wyoming PRB Coal Review modeling indicated that coal production in general was anticipated to contribute substantially to impacts on the near-field receptor grid in the project area, especially PM_{10}. However, potential of all criteria pollutants would be below National Ambient Air Quality Standards (NAAQS) and Montana and Wyoming AAQS in 2010, 2015, and 2020 except PM_{10} might impact class I and Class II area visibilities. Montana Department of Environmental Quality cumulative impact model was conducted using EPA approved Industrial Complex Short Term Version (ISCST3) model. This refined dispersion model uses detailed information regarding the region's meteorology, terrain and local emissions sources to estimate ambient air pollutant concentrations. Each emission source identified at all of the CBNG compressor stations was included in the air dispersion model as a point source. The permitted allowable emissions were used for all Montana and Wyoming sources, rather than actual emissions, which is a more conservative approach because not all emissions would be expected to operate at maximum permitted level. Even though, the model results demonstrated that the CBNG development currently complies with the MAAQS/NAAQS and PSD Class I/Class II increments. The Department operates various types of equipments to measure pollutants and meteorological parameters at monitoring sites across Montana. Within the Planning Area, the Department presently maintains five monitoring facilities in the Billings area and has additional permit-required monitoring facilities in and around Colstrip. BLM and the Department both will conduct annual review of available

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	monitoring data. The Department's review includes a cumulative air quality impact model to track air quality impacts of CBNG development. If observed and modeled impacts completed for the annual review by the Department show state or federal regulatory standards or applicable thresholds for air quality related values would be exceeded, BLM would require additional mitigation measures on development. BLM could disapprove additional CBNG APDs development. In such case BLM would first consider mitigation measures that would reduce impacts so that actions would comply with such standards. Some key mitigation measures considered in the FS-EIS include: • To minimize potential air impacts from CBNG operation, the number of wells connected to each compressor could be maximized and natural-gas-fired or electrical compressor or generators would be required. • To reduce dust, operators of federal leases would have to post and enforce speed limits for their employees and contractors, operators would work with local government to use dust suppression techniques on roads. • Access roads, well pads and production facility sites constructed on soils susceptible to wind erosion will be appropriately surfaced to reduce fugitive dust emissions. • Dust inhibitors will be used as necessary on unpaved collector, local and resource roads to reduce fugitive dust emissions to the air and resources adjacent to the road. Therefore, with the modeling results and the mitigation measures, as well as permitting requirement under applicable MAAQS/NAAQS, the impact on air quality shall be considered non-significant.
4. VEGETATION COVER, QUANTITY AND QUALITY: Will vegetative communities be significantly impacted? Are any rare plants or cover types present?	[N] Impact to vegetation would be short term and minor. Disturbances from drilling, pipeline corridors, and compaction from equipment would reduce the amount of vegetation available for livestock or wildlife. Disturbances due to road construction and construction of impoundments would eliminate small areas of vegetation but for a longer time. Vegetative productivity would be restored through reclamation and elimination of vehicle traffic (BLM, Jan. 2005, Dec.2004, and Feb. 2004). All reclamation activities are to be conducted as soon as practical. Seeding of reclaimed areas shall use a prescribed seed mix. The operator shall follow the noxious weed control plan to control invasive species. The operator is required to reclaim and implement a storm water pollution prevention plan to control erosion and sediment migration from disturbed areas. This requirement is pursuant to the storm water authorizations issued under the storm water general discharge permit for construction activities. No threatened plants or vascular species of concern are known to inhabit the project area.
5. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS: Is there substantial use of the area by	[N] It is anticipated that adherence to the established water quality standards will minimize changes to water quality; thus, direct impacts to macroinvertebrates, fish, amphibians and reptiles are also anticipated to be

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important wildlife, birds or fish?	minimal. Indirect impacts to avian species, which subsequently forage on some of these species, are also anticipated to be minimal. The majority of the areas impacted by project development are upland grassland and grassland/shrub habitats adjacent to the riparian habitat associated with the river.
6. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES: Are any federally listed threatened or endangered species or identified habitat present? Any wetlands? Species of special concern?	[N]A summary of documented wildlife use of the area is attached (Attachment # 1). No threatened or endangered species were found exist or use the area as habitat. 8 species of concern are known to occupy the area of the proposed project. One reptile, 1 mammal, and 6 avian species of concern have been documented in the area adjacent to the proposed project. The natural heritage ranks of all the species are among S2 to S3, which suggests the species are at risk or potentially at risk due to limited or potentially declining numbers. On the other hand, the global statuses of these species are widespread and not vulnerable in most of its ranges. Activities within the areas frequented by these species, as well as other wildlife species, will be largely in areas that have been previously disturbed. Utility corridors are to be placed adjacent to existing county roads or two-track trails. The constructed outfall structures are the only point impinging on the surface of the creeks, and disturbance related to this construction will be minimized.
7. HISTORICAL AND ARCHAEOLOGICAL SITES: Are any historical, archaeological or paleontological resources present?	[N] As a condition for BLM approval, the operator must conduct a cultural survey of the areas influenced by development. The OW Ranch operator/owner solely own the land surface of the PODs. All the proposed activities will be happened on private lands. No native American cultural resources will be impacted. Since the operator has not apply for drilling permit from BLM yet, no further cultural survey of the area has been conducted. Upon application of the drilling permit, such cultural survey of the area will be required by BLM. Any other cultural or paleontological resources discovered during construction must be reported immediately to the BLM. Construction may not resume until such time that the BLM as inspected and approved disturbances of the site. Given the BLM requirements there will be minimal impacts to cultural resources.
8. AESTHETICS: Is the project on a prominent topographic feature? Will it be visible from populated or scenic areas? Will there be excessive noise or light?	[N] Development of CBNG encompasses large tracts of land. Even though large areas are used in development; relatively small physical areas are occupied. The BOGC sets spacing for oil and gas development to maximize recovery while minimizing surface impact. The operator is to use environmentally compatible colors to blend well houses into the landscape. With the use of concurrent reclamation and seeding with native species, visual impacts will be short term. Long term visual impacts will be realized by road and facility placement.
9. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY: Will the project use resources that are limited in the area? Are there other	[N] During the development phase no increases in environment resources will be needed. All activities will be temporary (drill and construction). In the production phase limited electrical demand will be realized. Additional CBNG will become available for transmission to market. No adverse affect will be realized on this category.

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activities nearby that will affect the project? Will new or upgraded powerline or other energy source be needed)	
10. IMPACTS ON OTHER ENVIRONMENTAL RESOURCES: Are there other activities nearby that will affect the project?	[N] Potential impacts may be realized to coal mining activities in the area. Dewatering of the shallow coals will reduce the amount of water available for internal consumption within the mines. The mine site may have to utilize outside sources, or water rights to obtain adequate volumes.

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11. HUMAN HEALTH AND SAFETY: Will this project add to health and safety risks in the area?	[N] No impact is expected in this area. Barring catastrophic events, no additional uses of these resources will be necessary. With development additional transportation facilities will be required; limited risk will be associated with the additional facilities and traffic. Each facility is small and is constructed quickly with stringent engineering controls required to meet code.
12. INDUSTRIAL, COMMERCIAL AND AGRICULTURAL ACTIVITIES AND PRODUCTION: Will the project add to or alter these activities?	[Y] Increased development will bring additional industrial sectors into the local area. With increased development, additional resources will become available within the marketplace. With increased development agricultural production may be potentially impacted (decreased carrying capacity). Should the permittee decide to utilize managed irrigation, incremental increases in production will be realized, in addition to increases in consumable amendments to the soil.
13. QUANTITY AND DISTRIBUTION OF EMPLOYMENT: Will the project create, move or eliminate jobs? If so, estimated number.	[Y] Impact to this area will be short term and minor. Additional employment opportunities will be realized during the construction and development phase only. Total manpower requirements in the long term remain constant. Additional workforce in and around the area will not be required.
14. LOCAL AND STATE TAX BASE AND TAX REVENUES: Will the project create or eliminate tax revenue?	[Y] Development of CBNG resources will increase the revenue to federal, state, and local entities. Leasing of mineral rights will realize initial increases. Production of resources will add additional royalty and production taxes. Additional local activities will increase taxes and consumption in the local areas. By obtaining permits to allow discharges of produced water the operator will continue development, resulting in increased revenue at the federal, state, and local level.
15. DEMAND FOR GOVERNMENT SERVICES: Will substantial traffic be added to existing roads? Will other services (fire protection, police, schools,	[N] No impacts are anticipated in these areas. Any increases in traffic will be short term and minor during the construction phase. In the production phase, since no services are available locally, the workforce will be commuting to and from Sheridan, WY. Since the production facilities are scattering in nature due to the well spacing requirement from the Board of Oil and Gas, it is not realistic

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etc.) be needed?	and necessary to establish new schools or other governmental services. Most of the workforce will stay in temporary houses while the major public services for the families of the workforce will remain in Sheridan, WY.
16. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS: Are there State, County, City, USFS, BLM, Tribal, etc. zoning or management plans in effect?	[N] No local ordinances or plans conflict with issuance of these permits. Stipulations contained in the permits require the operator to acquire all the necessary approvals or permits prior to commencing any activities.
17. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES: Are wilderness or recreational areas nearby or accessed through this tract? Is there recreational potential within the tract?	[N] No wilderness areas are near or within the project area. The land for development is primarily private, which allows no public access to the land surface prior to or after the development. No impacts will be realized to recreational potential within the project due to development.
18. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING: Will the project add to the population and require additional housing?	[N] The development of CBNG from this action impacts a limited population base. The workforce associated with CBNG development in the in the OW Ranch area may need commute to or from Sheridan, WY. The Town of Sheridan has adequate housing to handle increases in the workforce due to this action. However temporary houses may also be needed since the commute to Sheridan WY may take more than 2 hours one way depending specific working field location. Since the overall development will not increase the population substantially, the impact remains minor.
19. SOCIAL STRUCTURES AND MORES: Is some disruption of native or traditional lifestyles or communities' possible?	[N] No impacts are expected in this area. During the project term no significant increase in population is expected. No transient workforce will integrate into the resident population. No additional social services will be necessary.
20. CULTURAL UNIQUENESS AND DIVERSITY: Will the action cause a shift in some unique quality of the area?	[N] No impacts are anticipated in this area. The workforces employed during construction and development phases are native to the area, uniqueness of the culture will be retained.
21. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:	[N] No impacts are anticipated in this area.
22(a). PRIVATE PROPERTY IMPACTS: Are we regulating the use of private property under a regulatory statute adopted pursuant to the police power of the state? (Property management, grants of financial assistance, and the exercise of the power of eminent domain are not within this category.) If not, no further	[N] Issuing the MPDES permits do not regulate the use of private property within the project area.

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analysis is required.	
22(b). PRIVATE PROPERTY IMPACTS: Is the agency proposing to deny the application or condition the approval in a way that restricts the use of the regulated person's private property? If not, no further analysis is required.	[N]
22(c). PRIVATE PROPERTY IMPACTS: If the answer to 22(b) is affirmative, does the agency have legal discretion to impose or not impose the proposed restriction or discretion as to how the restriction will be imposed? If not, no further analysis is required. If so, the agency must determine if there are alternatives that would reduce, minimize or eliminate the restriction on the use of private property, and analyze such alternatives. The agency must disclose the potential costs of identified restrictions.	[N]

23. Description of and Impacts of other Alternatives Considered:

A. No Action: Under the "No Action" alternative, the Department would not issue MPDES permit MT0031593. Any produced water from CBNG development would need to be impounded away from state waters or land applied without regulatory conditions.

B. Approval with modification: The Department has tentatively decided to issue MPDES permits MT0031593 to the operator of the OW Ranch. Under this alternative the permittee will be required to be compliant with all the terms and conditions identified in the permits. Discharge treated water to Hanging Woman Creek and Tongue River with the limitations, and BMP plan requirements for land application set forth in the permit would result in less impact to ground water, surface water, soils and wildlife habitat than impounding or land applying the wastewater on the surface without permit requirements. Should the operator fail to meet permit limits, the permit may be reopened and modified to provide additional protection to the receiving water. Enforcement actions may impose corrective measures

24. Summary of Magnitude and Significance of Potential Impacts: Issuance of the permits ensures that water quality standards and non-degradation criteria will be met. WQBEL

developed based on 7Q10 flow condition of a high quality water–the Tongue River is protective of beneficial uses in Hanging Woman Creeks and its tributaries as well as in the Tongue River. Therefore impacts are minor, non-significant, and positive in some aspects.

25. Cumulative Effects: Cumulative Impacts have been included in the permit development process when setting WQBEL based on Tongue River water quality standards and ambient water quality. This EA summarized the process. No further cumulative impacts analysis is needed and no impact should exist since all the potentially impacted waters have been considered in the permit limits development. If the ambient water quality changes appreciably, the permits may be reopened or reevaluated during the permit renewal period.

26. Preferred Action Alternative and Rationale: The Department recommends approving the permit issuance with the proposed effluent limitations. This action is preferred because the permit program provides a regulatory mechanism for protecting and improving water quality by applying permit limitations on the point source discharges.

Recommendation for Further Environmental Analysis:

[ ] EIS [ ] More Detailed EA [X] No Further Analysis

27. Public Involvement: This draft EA will be open for public comment during a 45-day public comment period. It will be posted on the Department's web page at http://www.deq.state.mt.ea.asp or commenters may contact Barb Sharpe at the Water Protection Bureau at (406) 444-2838. For copies of the Draft EA or to submit comments, write or call the Montana Department of Environmental Quality, Water Protection Bureau, PO Box 200901, Helena MT 59620-0901, (406) 444-3080. Comments will be received for 45-day after the date of the signature below.

The Department maintains a list of persons who have expressed an interest in all environmental water quality related issues. The Department will send a copy of this document to all persons who have submitted their name, address, and telephone number to the Department for the purpose of being included on the water quality interested parties mailing list.

28. Persons and agencies consulted in the preparation of this analysis:
Tom Reid, DEQ WPB, Senior Environmental Specialist
Christine Weaver, DEQ WPB, Environmental Specialist
Martin Miller, MT Natural Heritage Program

EA Checklist Prepared By:

_Hanxue Qiu_____ _June 18, 2009_____
(Name) Date

Approved By:

_____
(Print: name & title)

_____ _____
Signature Date

References:

ARM Title 17, Chapter 30, Sub-chapter 6 - Surface Water Quality Standards

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality

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Attachment 1

Wildlife

Species of Special Concern

A Montana Natural Heritage Program database search identified 8 species that are listed at various level of Species of Concern (SOC). They include one reptile, one mammal, and eight bird species. Table 1 summarizes these species of special concern (MTNHP 2008).

Table. 1 Species of Concern found from Montana Natural Heritage Program

[1]Common Name	[1]Scientific Name	[2]MNHP Rank	[3]USFWS Status	[4]USFS Status	[5]BLM Status
Reptiles					
Greater short-horned lizard	*Phrynosoma hernandesi*	S3		S	S
Mammal					
Black-tailed Prairie Dog	*Cynomys ludovicianus*	S3		S	S
Birds					
Greater Sage-Grouse	*Gentrocercus urophasianus*	S2		S	S
Burrowing Owl	*Athene cunicularia*	S2B		S	S
Sage Thrasher	*Oreoscoptes Montanus*	S3B			S
Brewer's Sparrow	*Spizella breweri*	S2B			S
Loggerhead Shrike	*Lanius Ludovicianus*	S3B			S
Lark Bunting	*Pelecanus erythrorhynchos*	S3B			

1 Scientific and common names according to MTNHP 2004.
2 Montana Natural Heritage Program state ranking as determined by MTNHP and MFWP biologists: S2 = imperiled – very limited and/or declining numbers, range and/or habitat; S3 = potentially at risk because of limited and/or declining numbers, range and/or habitat, may be locally abundant. B/N = State rank modifiers indicating the breeding status for a migratory species; B = Breeding, N = Non-breeding.
3 US Fish and Wildlife Service Status: T = Threatened; E = Endangered; C = Candidate (species for which the USFWS has sufficient information on biological status and threats to propose listing as threatened or endangered).
4 USDA, US Forest Service Region 1 Status: (S) = USFS Sensitive Species.
5 USDI, Bureau of Land Management Status: S = BLM Sensitive Species.

Potential Impacts

It is anticipated that both direct and indirect impacts will occur due to the implementation of the proposed project. Construction activities during the nesting and breading season could cause the habitat disturbance. However, the permitted discharge will improve the water quality in Hanging

Woman Creeks and its tributaries, add more available and stable flowing water in lower Hanging Woman Creek, which may positively affect the availability and distribution of macroinvertebrates and fish, improving the availability of food for bird and other species.

A BLM report states, "No evident relationship between water quality parameters and amphibian and reptile detections is apparent from the data collected. Higher pH and EC values for certain sample sites did not appear to preclude the presence of herptiles. However, the six sites that were chosen as exhibiting particularly high-quality structural or vegetative habitat characteristics, such as shallows and good vegetative cover, exhibited the highest diversity of aquatic species, the widest range of life stages, and the most individuals. Conversely, sites that were lacking these high quality characteristics produced fewer, and sometimes zero, herptile observations. This suggests that wetland structure and vegetative cover may currently be as strong an indicator of herptile presence and population viability as water quality parameters within the Study Area. However, insufficient water quality and quantity data was collected to assess any effects of water quality on herptiles within the study area" (BLM, 2005).

Sage-grouse is previously considered a possible candidate for listing under ESA, USFWS determined the sage grouse is not warranted for listing, because the species is not likely to become endangered or threatened in the foreseeable future. Counts of sage grouse males on leks have been used to provide an index of relative size and trends of the breeding populations of sage-grouse in Montana (Montana Sage-grouse Work Group, 2005). Statewide, sage-grouse numbers decline sharply from 1991 through 1996 but increased through 2000. In the Billings Planning Area, numbers increased in 1997 and remain stable until 2001, numbers in 2002 to 2004 were lower than the previous period but stable.

Montana Sage-grouse Work Group, a cooperative membership of state, federal, tribal and private entities, prepared a conservation and management plan for sag-grouse in Montana (2005). The plan established a process to achieve sage-grouse management objectives and provides a framework to guide local management efforts and coordinated management across jurisdictional boundaries. The overall goal of the plan is to "provide a long term conservation and enhancement of the sagebrush steppe/mixed-grass prairie complex within Montana in a manner that supports sage-grouse and a healthy diversity and abundance of wildlife species and human uses.

Early counts indicated that Black-tailed Prairie Dog were abundant and widely distributed east pf Continental Divide in grasslands and sagebrush-grasslands. USFWS originally considered, but later on removed this specie from consideration of list of candidate species in ESA because it is not likely to become endangered or threatened within the foreseeable future. Burrowing owls is one of the species that with close association to prairie dogs.

Protection

Wildlife protection for this project will follow the guidance documents and requirements outlined in the CBNG Programmatic Wildlife Monitoring and Protection Plan for the Montana Statewide EIS, BLM (2003).

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