Chapter 4
ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

This chapter presents the potential environmental, social and economic effects from the actions described in each Alternative in Chapter 2. This chapter is organized first by Alternative, and then resource in the same sequence they were discussed in Chapter 3.

The duration of the possible effects is analyzed and described as either short-term or long-term. As defined in the MT FEIS, short-term is up to 5 years and long-term is greater than 5 years.

Cumulative effects analysis considers the possible effects from each Alternative in combination with other relevant cumulative activities presented in Section 2.3.

4.1 EFFECTS FROM ALTERNATIVE A—NO ACTION

4.1.1 Air Quality

Direct and Indirect Effects: There would be no change to air quality in the project area due to no drilling or testing of the wells, nor construction of infrastructure and no associated air emitting units would be installed.

Cumulative Effects: There would not be any cumulative effects to air quality due to no drilling or testing of the wells, nor construction of infrastructure and no associated air emitting units would be installed.

4.1.2 Cultural Resources

Direct and Indirect Effects: There would be no impacts to cultural resources due to drilling or testing of the wells, or construction of infrastructure.

Cumulative Effects: There would not be any cumulative effects to cultural resources due to drilling or testing of the wells, or construction of infrastructure. The inventory results would add to the state and BLM databases for acres inventoried and sites located. No new sites would be added to the National Register of Historic Places.

4.1.3 Geology and Minerals

Direct and Indirect Effects: There would be no testing of the coal beds in the project area. The potential for commercial gas production from the federal and private leases would remain unevaluated. There would be no methane migration to water wells, springs, or conventional wells under this alternative. There would be no drainage of Indian mineral resources under this alternative.

Cumulative Effects: Without evaluation of the gas resources proposals for development are unlikely. Federal mineral resources would not be protected from possible drainage of reserves by adjacent private and State wells.

4.1.4 Hydrology

Direct and Indirect Effects to Surface Water-CBNG Water Discharge to Surface Waters: MDEQ would not issue a MPDES permit and therefore, no discharge of produced water would occur. No direct impacts to surface water resources would occur from the No Action Alternative.

Direct and Indirect Effects to Groundwater: No wells would be drilled or tested and therefore, no drawdown of groundwater would occur. Shallow groundwater would also not be impacted. Additional stratigraphic and groundwater data would not be collected since the proposed wells would not be drilled.

Cumulative Effects to Hydrological Resources:
No direct impacts to either surface water or groundwater will result from the No Action alternative; therefore, this alternative will not contribute to cumulative impacts. As such the cumulative surface water quality would be the same as depicted in Table 3.4.1-3. There would be no drawdown of either the Wall or Flowers-Goodale coal seams.

4.1.5 Indian Trust and Native American Concerns

Direct and Indirect Effects: There would be no impact to Indian Trust Assets. There would be no impact from exploration to air quality, and no treated CBM waters would be discharged into the Tongue River. There would be no impact to cultural resources, plant or wildlife resources.

Cumulative Effects: There would not be any cumulative impacts created by the PRG project that could affect Indian trust assets. Concerns expressed by the Northern Cheyenne Tribe on regional CBNG development activities, and non energy related development projects, would continue as described in the MT EIS.

4.1.6 Livestock Grazing

Direct and Indirect Effects: There would be no change in the water available for livestock from CBNG-related activities.

Cumulative Effects: The amount of water for livestock would continue to affect where, when and how much livestock grazing occurs.

4.1.7 Social and Economic Conditions

Direct and Indirect Effects: There would be no direct or indirect effects to social and economic conditions (see Appendix C for Social and Economic Assumptions common to all alternatives). There would be a potential loss of federal royalties if drainage occurs.

Cumulative Effects: There would be no cumulative effects to social and economic conditions.

4.1.8 Soils

Direct and Indirect Effects There would not be any direct or indirect impacts to area soils because there would not be any drilling, construction, or vehicle traffic.

Cumulative Effects: There would not be any cumulative effect to area soils.

4.1.9 Vegetation

Direct and Indirect Effects to Vegetation: There would not be any impacts to vegetation in the project area.

Direct and Indirect Effects to Special Status Species: No changes to the existing vegetation community.

Direct and Indirect Effects to Invasive Species: No changes to the existing vegetation community.

Cumulative Effects: There would not be any cumulative effects to area vegetation.

4.1.10 Wildlife and Fisheries/Aquatics

Direct and Indirect Effects: There would not be any direct or indirect impacts to wildlife and fisheries/aquatics.

Cumulative Effects Wildlife: There would not be any cumulative impacts to wildlife.

Cumulative Effects Fisheries/Aquatic: There would not be any cumulative impacts to fisheries/aquatic; however the existing past and current activities would continue.

4.2 EFFECTS FROM ALTERNATIVE B—NO FEDERAL ACTION

4.2.1 Air Quality

Direct and Indirect Effects: Under this alternative, eight private wells would be drilled and tested, and 2 existing private wells would be tested. Pollutant emissions would result from drilling and testing activities on adjacent fee and state leases. The emissions would potentially impact air quality in the project area, although any impacts would be less than the proposed alternative due to the decreased number of disturbed acres and decreased number of wells that would be drilled and tested. The primary pollutants emitted would be TSP, particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), NO_x, volatile organic compounds (VOC), carbon monoxide (CO), and sulfur dioxide (SO_2). Any

impacts on air quality, including any impacts to the Lame Deer PM_{10} non-attainment area, would be minor because of the relatively small amount of pollutants that would be emitted and because of the short duration of the project. Impacts would be minimized because, although a MAQP would not be required, Powder River Gas, LLC would still need to comply with opacity requirements contained in ARM 17.8.304 (20% opacity averaged over 6 consecutive minutes) and reasonable precaution requirements contained in ARM 17.8.308 (applying water and/or chemical dust suppressant as necessary to comply with opacity requirements).

TSP, PM_{10}, and $PM_{2.5}$ emissions would be emitted from travel on access roads (unpaved roads), wind erosion at disturbed areas, and from the actual drilling of the wells. NO_x, VOC, CO, and SO_2 emissions would result from drill rig engine operations and the emergency flares. Air quality impacts at each well would be temporary - occurring only during the two to three day well construction (8 new wells) and during well testing (2 existing wells and 8 new wells).

Air quality would be impacted in the vicinity of the project during drilling and testing activities. The project would result in a temporary increase in fugitive dust and gaseous emissions. The potential emissions of Alternative B (including secondary emissions that are not included in making a permit determination and considerations of the length of the project (hrs) and gas venting limits (Scfd)) are summarized in the following table:

4.2-1 Emission Inventory –Alternative B

Tons/Project							
Emission Source	*TSP*	PM_{10}	$PM_{2.5}$	NO_x	VOC	CO	SO_x
Drill Rig(s) – (Engine Emissions)	0.00	0.00	0.44	6.25	0.50	1.35	0.41
Drill Rig(s) – (Drilling Emissions)	0.10	0.10	0.10	0.00	0.00	0.00	0.00
Well Testing – (Gas Flaring)	0.00	0.00	0.00	0.89	0.00	1.77	0.00
Fugitive Dust – (Disturbed Acres)	7.65	7.65	7.65	0.00	0.00	0.00	0.00
Vehicle Traffic (non-paved roads)	1.73	0.78	0.78	0.00	0.00	0.00	0.00
Total	9.48	8.53	8.97	7.14	0.50	3.12	0.41

MDEQ determined that any air quality impacts from the no federal action alternative, including any impacts to the Lame Deer PM_{10} non-attainment area, would be minor because of the relatively small amounts of pollutants that would be emitted and because the emissions would be temporary and any impacts would be short-term. The wells to be drilled and tested would be located in an unclassifiable/attainment area, which generally promotes good dispersion characteristics and would not exceed MAQP thresholds. Therefore, MDEQ determined that emissions from Alternative B would not cause or contribute to a violation of any ambient air quality standard. Impacts would be minimized because although a MAQP would not be required, Powder River Gas, LLC would still need to comply with ARM 17.8.304 opacity requirements (20% opacity averaged over 6 consecutive minutes) and ARM 17.8.308 reasonable precautions requirements (applying water and/or chemical dust suppressant as necessary to comply with opacity requirements).

Cumulative Effects: The MT FEIS analyzed cumulative air quality impacts at Class I and Class II areas from emission sources across Montana, particularly in southeastern Montana. The analysis used an approach that included the modeling of existing and proposed regional sources at permitted and planned emission rates.

All of the CBNG proposals and ongoing CBNG activity considered as part of the cumulative actions for this EA, including the activity in Wyoming, does not involve a level of activity large enough to warrant completing additional modeling beyond that completed for the Badger Hills EA and the MT EIS. Representative air quality impacts are already documented in the MT EIS for the level of cumulative Montana CBNG activity included in this EA. This is because the No Action Alternative (Alternative A) in the MT EIS includes 515 producing wells and all the Montana cumulative CBNG activity included in this EA would be very close to this number if further drilling within the CX field occurs, and the Yates and Powder River Gas exploration wells become producing wells.

The cumulative impacts from Alternative B would be in compliance with all of the air quality standards and PSD increments and thresholds for the pollutant impact indicators for mandatory federal Class I PSD areas and sensitive lakes. This conclusion is based on the modeling completed for the MT and WY EISs, and the results of the

cumulative impact analysis for this EA, completed for the pollutant considered most likely to violate any ambient air quality standard or increment.

Any future proposals (drilling and testing of new CBNG wells and production activities and other reasonable foreseeable future actions) that could potentially impact air quality standards would be analyzed by the MDEQ. MDEQ would maintain a modeling database to track CBNG production activity in Montana and the model is updated with each new NO_x emitting facility that locates in the area defined by the MT FEIS. Air quality impacts associated with CBNG production is the major air quality concern because, as demonstrated by the emission inventories completed as part of this review, emissions from CBNG exploration are very small and temporary in nature. MDEQ will continue to model NO_x emitting units that locate in the area defined by the MT FEIS to ensure that the MAAQS/NAAQS and PSD increments are not exceeded.

4.2.2 Cultural Resources

Direct and Indirect Effects: Although there is no action requiring BLM compliance with Section 106 of NHPA, no sites were identified on the private lands/private minerals within areas of direct impact. A feature related to a National Register listed site occurs within the POD boundary, but is away from any proposed development. No TCPs were identified in the project area based on a site field visit on August 4, 2004. There would be some indirect impacts (changes in setting) to Feature 7, the irrigation ditch, of the Lee Homestead Complex. BLM does not view this as an adverse effect to historic properties. The feature is significant for its association with the Lee Family rather than as an architectural property.

Cumulative Effects: Cumulative impacts would be similar to Alternative A. There would be some indirect effect to Feature 7 of the Lee Homestead due to changes in setting. The inventory results would continue to add to the BLM and state databases for numbers of sites and acres inventoried. The inventory results from this project, one prehistoric site and five isolated, would add to the total cumulative number of sites identified in the region. None of the inventoried sites were determined to be eligible for the National Register of Historic Places. Compliance with Section 106 of NHPA would still be necessary if other Federal permits such as Section 404 Permits were required. Full development of the leases on fee surface/fee minerals could represent an impact to the cultural landscape. As such, BLM would need to take this into account when approving additional projects on adjacent Federal oil and gas leases and design the project to reduce impacts or develop appropriate mitigation strategies.

4.2.3 Geology and Minerals

Direct and Indirect Effects to Coal Bed Natural Gas: During testing of the private wells, small volumes of gas, would be lost through venting. The testing would not last longer than 6 months or the maximum loss of 1,260,000 cubic feet of gas per well. Ten private wells would be tested, thus the maximum total venting of 12,600,000 cubic feet of gas would occur, assuming all wells produce gas at the maximum level of testing.

There would be no methane migration to water wells, springs, or conventional wells under this alternative. There would be no drainage of Indian mineral resources; however there may be minimal drainage of Federal minerals as a result of this alternative (see Section 3.3.2). The federal drainage would be evaluated on a well by well basis.

Direct and Indirect Effects to Coal: Coal formations would be partially dewatered and small volumes of gas would be removed.

Cumulative Effects: Drilling and testing to determine the productivity of these private leases could prove up the leases and result in future gas production and revenue if the operational phase was approved in the future. At that time, potential for drainage would be mitigated by the drilling of Federal wells where drainage of Federal mineral leases has been shown to occur. If drilling of adjacent federal wells did not occur, the federal production would be lost.

4.2.4 Hydrology

Direct and Indirect Effects to Surface Water-CBNG Water Discharge to Surface Waters: Under Alternative B, the PRG exploration project would discharge 0.56 cfs (250 gpm) of water for up to 6 months. PRG intends to mix treated and untreated water to the degree allowable without causing the EC to exceed 1,000 μS/cm or the SAR to exceed 3 during the irrigation season. Based upon the treated and untreated water quality data contained in the POD book for this project, this mixing would cause the SAR standard of 3 to be met first, at which time the EC

would be 742 µS/cm. The direct effects of this discharge are summarized in Table 4.2.4-1.

Table 4.2.4-1: Direct Impacts to Surface Water from the No Federal Action

		Modeled Existing Conditions			Resultant Surface Water Quality and Quantity (250 gpm from PRG)		
	Flow Conditions	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
Tongue River Below Dam	7Q10	72.3	825	1.17	72.9	825	1.18
	LMM	181.3	658	0.91	181.9	659	0.92
	HMM	1431.3	396	0.53	1431.9	397	0.53
Tongue River at Birney Day School	7Q10	51.3	1149	1.76	51.9	1150	1.77
	LMM	175.3	731	1.15	175.9	731	1.16
	HMM	1121.3	381	0.60	1121.9	381	0.60

Comparison of the direct resultant water quality values with the appropriate standards shows that during HMM and LMM flows, none of the mean monthly standards are exceeded. During 7Q10 flows, the instantaneous maximum standards are not exceeded. These standards were adopted to protect agricultural uses of the Tongue River, which has been determined to be the most sensitive beneficial use of the Tongue River (BLM,2003a). As such, the direct changes in EC and SAR that are anticipated to result from this alternative would not be anticipated to impair the beneficial uses of the Tongue River.

The MDEQ has also conducted an analysis of this discharge in relation to the MPDES permit. This analysis is documented in the SOB, which is included in Appendix B of the Hydrology Technical Report. This analysis included consideration of a wide range of parameters, and the conclusion of this analysis was that the discharge would not cause exceedance of any surface water quality criteria. Chemical monitoring of the discharge and the stream water quality, are also required in the permit. If monitoring shows that any standards are exceeded, the MPDES permit may be reopened by the MDEQ. The MPDES permit also requires chronic whole effluent toxicity (WET) testing of the CBNG discharge water from this project to ensure that adverse impacts to aquatic life will not result from this discharge. According to the EPA, one sample of CBNG water from the Big George coal seam in Wyoming has failed the EPA WET protocol. The MDEQ may require additional monitoring, a toxicity identification evaluation (TIE) analysis, and may reopen the permit if WET testing demonstrates toxicity of the effluent.

Direct and Indirect Effects to Groundwater: The eight proposed fee wells would be drilled. Groundwater would be pumped from these eight new wells and the two existing private wells for up to 6 months. The removal of groundwater from the Wall and Flowers-Goodale coal seams would cause a cone of depression to form around each CBNG well. If drawdown occurs in a water well, the yield of the well may be decreased, depending on well construction and operation. The reduction in hydrostatic pressure may cause the well to become unusable even though some water may remain (CBNG pumps typically pump off the hydrostatic pressure to near the top of the coal seam, while not dewatering the coal seam itself since this would result in much higher water production rates, and cause the cleat within the coal to close, thereby restricting the flow of gas (Wheaton and Metesh, 2002)). Drawdown could also cause the yield from springs which emit from the coal seams to be reduced.

It is anticipated that with ten wells pumping (5 from each seam), the 20 foot drawdown contour may extend up to approximately 0.86 miles from the well field after 6 months of pumping. Since the vertical hydrologic conductivity of the Tongue River Member of the Fort Union Formation is very low (Wheaton and Donato, 2004), the effects of drawdown are expected to be primarily limited to the coal seams being developed, and any drawdown to the adjacent overburden or underburden units, or effects to surface water bodies, including the Tongue River Reservoir, would not be anticipated to be noticeable. The model used to determine these results is discussed in detail in the PRG-Coal Creek–Hydrology Technical Report. It should be noted that this analysis uses the Theis equation, which assumes homogeneity isotropy, and no flow boundaries. Since flow limiting faults are known to exist in this area, these conditions would not be anticipated to be met in all cases, however, since the location of all faults is not

known, this analysis does provide a reasonable analysis of the average distance that drawdown would reach from the well field. In cases where the drawdown cone intersects a fault, the cone will be limited in the fault direction, and would extend asymmetrically away from this flow boundary. In cases where drawdown is within an isolated fault block (flow boundaries on all sides), the drawdown within the block would be greater than calculated due to the lack of recharge but the drawdown would be limited to the block. This Theis equation approach was compared to a simple MODFLOW model of the Wall coal seam. This comparison showed that the Theis approach predicted a greater radius of drawdown than the MODFLOW approach. The major reason for this was that the MODFLOW approach applies a pumping rate to draw the static water level to within 5 feet of the top of the coal (wells represented as constant head cells), while the Theis approach uses the estimate of pumping rates supplied by PRG (25 gpm at start up and a reduction of 20% per year). As the PRG estimate is somewhat greater than the MODFLOW result, the drawdown cone extends further in the Theis analysis. Due to the uncertainty associated with flow boundaries in this area, it is felt that the more conservative Theis approach is appropriate for this analysis.

Recent monitoring data from the existing CBNG fields in Montana (Wheaton and Donato, 2004) is also available online at http://www.mt.blm.gov/mcfo/cbng/CBNG-Monitoring.htm. This monitoring data indicates that "After 4 years of production from the CX field, water levels have been lowered by 20 feet at distances of less than 1 mile to as much as 2 miles outside the production area."

Those wells and springs, which are located within the area of drawdown, and which receive their water from the coal seam being pumped, may be affected by this drawdown. According to MBMG's GWIC database (http://mbmggwic.mtech.edu/), 1 well, and no springs exist within this potential drawdown area. As shown on Table 4 of Appendix C of the Hydrology Technical report, this is the Bill Musgrave well in T. 8 S., R. 41 E., Section 7. Based upon the reported well depth (146 feet), and the elevation of this site based upon topographic maps (3,700 ft-amsl), this well is finished at an elevation of approximately 3,554 ft-amsl. The top of the Wall coal in this area is at approximately 3,100 ft-amsl. Because of the difference in depth of the wells, and the low vertical hydrologic conductivity of the intervening formations, it is not anticipated that the Musgrave well will be impacted as a direct effect of this alternative. Methane migration to this domestic well is also not likely to occur as a direct result of this alternative since the well is not completed in the coal seams to be produced. One spring was identified in this area by Powder River Gas in the POD book for this project. This spring is located in the NW corner of the SW corner (CB) of Section 6, Township 8 S., Range 41 E. (see Map 1.3-2), and has been developed for livestock use. This spring is fed by the clinker deposits along the ridge top in this area. As such, it does not receive its water from the coal seams being developed. This spring is located at an elevation of ~3,820 ft-amsl while the top of the Wall coal seam (the uppermost unit being tested) is at an elevation of ~3,100 ft-amsl in this area. It is not anticipated that this spring will be affected by this alternative.

The operator has certified that water mitigation agreements have been reached with all potentially affected owners of wells and springs in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, 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 affected. This order applies to all wells and springs, not just those which derive their water from the developed coal seams. This Order requires "…prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project…" As such, these agreements would apply to those wells, which experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality. Although the terms of water mitigation agreements are to be "under such conditions as the parties mutually agree upon" (Order 99-99), the replacement of water required by these agreements is anticipated to take the form of reconfiguring existing wells, re-drilling wells, or drilling new wells. These measures would be effective for replacing water sources since the major drawdown from CBNG activity is anticipated to be confined to the coal seam aquifers and to only minimally affect other aquifers (such as sandstones) within the Tongue River Member of the Fort Union Formation. Any lost or diminished water sources would be replaced with a permanent source before the termination of the agreement. The order also requires that "hydrologic conditions in the targeted coal beds must be assessed prior to field development to establish baseline conditions" (Order 99-99). In the POD book for this project, PRG has proposed to monitor existing water resources monthly for the first year, and once per year thereafter. Monitoring data would be provided to the affected water source owner. Impacts would not be expected after the cessation of CBNG development since the aquifer would then be in the recovery phase, with groundwater levels rising in the area that had been drawndown by CBNG testing. It is anticipated that these required water mitigation agreements would mitigate the potential

impacts from groundwater drawdown, methane migration or changes in groundwater quality.

The groundwater modeling conducted in support of the MT FEIS anticipated that, for a hypothetical CBNG field with 1,082 wells on the East Fork of Hanging Woman Creek producing for 20 years, the produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The coal seams analyzed in this model were also in the Tongue River Member of the Fort Union Formation, however, they are not the same coal seams. As such, the results of this model are indicative of the general magnitude and duration of impacts that would result from a similar well field in the project area, however, the exact results would be expected to be somewhat different. It is anticipated that due to the shorter duration of pumping, and the lower number of wells, that recovery for this area would be much more rapid.

A 2D MODFLOW model was prepared to assess the effects of the proposed action of this project on the Wall coal seam. Although not directly applicable to this alternative, this analysis does provide an indication of the types of impacts that may be expected, and the approximate magnitude and duration. This analysis showed that after 180 days of testing the coal seams, it would require 160 days for the static water levels to return to within 20 feet of pre-testing levels.

The exact radius of the drawdown cone, and the time required for the head to recover, would depend on the site specific aquifer properties, the precise timing of the pumping of each of the wells, and the overall nature of CBNG development in this region. For additional general discussion of the anticipated drawdown related impacts, see pages 4-61 to 4-63 of the MT FEIS (BLM, 2003), and the associated groundwater modeling reports (Wheaton and Metesh 2001, Wheaton and Metesh, 2002).

The potential for cross contamination of aquifers would be avoided by cementing from the top of the target coal seam to the surface, as proposed by the operator. Details on the drilling and cementing program are found in the Drilling Plans for the individual APDs.

Shallow groundwater is not anticipated to be impacted by this alternative because the proposed drilling and cementing programs, and lining the proposed impoundment with a 20 mil polyethylene liner will prevent the introduction of CBNG water into shallow aquifers or the unsaturated zone.

Cumulative Effects to Surface Water-CBNG Water Discharge to Surface Waters: If the wells associated with this alternative were productive, it is reasonably foreseeable that the operator would propose these leases be fully developed and a proportional part of the requested MPDES discharge permit (MT0030660) would be used. The total discharge requested under the MPDES permit is 2.5 cfs. Since the fee wells make up 10 of 18 wells proposed, it is assumed that the maximum discharge to the Tongue River would be 1.39 cfs of treated CBNG water from the PRG Coal Creek Project. The proposed discharge of treated CBNG water upstream from the Tongue River Reservoir is also considered as a cumulative future activity. The results of this scenario are shown on Table 4.2.4-2. Detailed discussion of the model used to determine these results is included in the PRG-Coal Creek–Hydrology Technical Report.

Table 4.2.4-2: Cumulative Impacts to Surface Water from No Federal Action

		Foreseeable Conditions (Non-Project) (0 gpm from PRG)			**Resultant Surface Water Quality and Quantity** (624 gpm from PRG)		
	Flow Conditions	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
Tongue River Below Dam	7Q10	77.4	824	1.30	78.8	825	1.32
	LMM	186.4	664	1.01	187.8	665	1.03
	HMM	1436.4	401	0.56	1437.8	402	0.56
Tongue River at Birney Day School	7Q10	56.4	1149	1.90	57.8	1150	1.92
	LMM	180.4	736	1.25	181.8	738	1.27
	HMM	1126.4	386	0.63	1127.8	386	0.64

Comparison of the resultant water quality values to the appropriate standards shows that during HMM and LMM flows, none of the mean monthly standards would be exceeded. During 7Q10 flows, the instantaneous maximum standards would not be exceeded. The State and Tribal standards were adopted to protect agricultural uses of the Tongue River, which has been determined to be the most sensitive beneficial use of the Tongue River (BLM, 2003a). As such, the cumulative changes in EC and SAR that are anticipated to result from Alternative B would not impair the beneficial uses of the Tongue River.

The MDEQ has also conducted an analysis of this discharge in relation to the MPDES permit. This analysis is documented in the SOB, which is included in Appendix B of the Hydrology Technical Report. This analysis included consideration of a wide range of parameters, and the conclusion of this analysis was that the discharge would not cause exceedance of any surface water quality criteria. Chemical monitoring of the discharge, and in stream water quality, are also required in the permit. If monitoring shows that any standards are exceeded, the MPDES permit may be reopened by the MDEQ. The MPDES permit also requires chronic whole effluent toxicity (WET) testing of the CBNG discharge water from this project to ensure that adverse impacts to aquatic life will not result from this discharge. According to the EPA, one sample of CBNG water from the Big George coal seam in Wyoming has failed the EPA WET protocol. The MDEQ may require additional monitoring, a toxicity identification evaluation (TIE) analysis, and may reopen the permit if WET testing demonstrates toxicity of the effluent.

Cumulative Effects to Groundwater: If the testing of the 10 wells shows these areas to have economic quantities of CBNG, it is foreseeable that development of these leases would be proposed. For this analysis, it is assumed that 13 CBNG wells would be completed in each coal seam (for 26 total wells) and that they would be produced for up to 20 years (BLM, 2003a). A Theis type analysis for this scenario indicates that the maximum cumulative 20 feet drawdown contour extends, on average, approximately 4.0 miles from the project area over this time period (see the PRG-Coal Creek–Hydrology Technical Report). Since flow limiting faults are known to exist in this area, the assumptions for homogeneity isotropy, and no flow boundaries would not be anticipated to be met in all cases, however, since the location of all faults is not known, this analysis does provide a reasonable analysis of the average distance that drawdown would reach from the well field. In cases where the drawdown cone intersects a fault, the cone will be limited in the fault direction, and would extend asymmetrically away from this flow boundary. In cases where drawdown is within an isolated fault block (flow boundaries on all sides), the drawdown within the block would be greater than calculated due to the lack of recharge, but the drawdown would be limited to the block.

Those wells and springs, which are located within the area of drawdown, and which receive their water from the coal seam being pumped, may be affected by this drawdown, with actual impacts also depending on well construction and operation. Since the vertical hydrologic conductivity of the Tongue River Member of the Fort Union Formation is very low (Wheaton and Donato, 2004), the effects of drawdown are expected to be limited to the coal seams being developed and not extend to the adjacent overburden or underburden units, or to effect surface water bodies. There are 22 wells and 15 springs located within the cumulative drawdown area (from 20 years of pumping). These wells and springs are listed in the PRG-Coal Creek–Hydrology Technical Report. These wells are finished at elevations between approximately 3220 ft-amsl and 3,904 ft-amsl. The elevation of the top of the Wall coal in this area varies between approximately 2614 and 3414 ft-amsl, and it is approximately 55 feet thick. The top of the Flowers-Goodale coal is, at its shallowest, approximately 2,591 ft-amsl and it is approximately 20 feet thick. As such, 9 of these wells are finished at elevations where they are within the overall range of the Wall coal seam. Site specific calculations of the elevation of the Wall coal at each of these well sites show that, for all of these wells, the elevations at which they are finished are not consistent with being finished in the Wall coal. Because of the difference in depth of the wells, and the low vertical hydrologic conductivity of the intervening formations, it is not anticipated that any of these wells will be impacted as a cumulative result of this alternative. Since the nearest known outcrop of the Wall Coal seam is approximately 11 miles away, it is not anticipated that any of the springs emit from the coal seams being tested, and they are not anticipated to be impacted by groundwater drawdown.

The operator has certified that water mitigation agreements have been reached with all potentially affected water right holders in accordance with the requirements of MBOGC Order No. 99-99. As discussed under the direct impacts section, these agreements would mitigate impacts from groundwater drawdown.

The groundwater modeling conducted in support of the MT FEIS anticipated that, for a hypothetical CBNG field

with 1,082 wells on the East Fork of Hanging Woman Creek producing for 20 years, the produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The coal seams analyzed in this model were also in the Tongue River Member of the Fort Union Formation, however, they are not the same coal seams. As such, the results of this model are indicative of the general magnitude and duration of impacts that would result from a similar well field in the project area, however, the exact results would be expected to be somewhat different. It is anticipated that, due to the lower number of wells, the recovery for this area would be more rapid.

The exact radius of the drawdown cone, and the time required for the head to recover, would depend on the site specific aquifer properties, the precise timing of the pumping of each of the wells, and the overall nature of CBNG development in this region. For additional general discussion of the anticipated drawdown related impacts, please see pages 4-61 to 4-63 of the MT FEIS, and the associated groundwater modeling reports (Wheaton and Metesh 2001, Wheaton and Metesh, 2002).

4.2.5 Indian Trust and Native American Concerns

Direct and Indirect Effects: Impacts to Indian Trust Assets would not be addressed since there is no direct Federal involvement and the State of Montana does not have equivalent trust responsibilities. Concerns raised by the Northern Cheyenne Tribe over potential impacts to air quality, water quality; cultural resources and wildlife are addressed in the respective sections of the EA.

Cumulative Effects: If production were to result from the exploration project, it would add incrementally to the impacts to resources of concern to the Northern Cheyenne Tribe.

4.2.6 Livestock Grazing

Direct and Indirect Effects: There would be minimal disturbances to livestock operations during drilling. After the produced water is treated, it may become available to the surface owners and livestock operators for watering livestock and /or irrigation purposes. Treated water that is discharged into the Tongue River would also be available for wildlife and agricultural purposes. Additional water sources would give the livestock operations more flexibility in how they use their grazing land. Additional water sources could enable the establishment of grazing rotation systems for livestock operators. Available water and better forage could result in increased weight gains for calves.

Cumulative Effects: Following reclamation after drilling, less than 1 AUM would remain unavailable to livestock. If these wells were to go to the production phase and additional wells were drilled, it is reasonably foreseeable to conclude that approximately 2 AUMs would become unavailable to livestock. According to the MT FEIS, over the next 20 years, disturbances from CBNG development, conventional oil and gas development and surface coal mining activities could result in approximately 6,904 AUMs becoming unavailable to livestock during their production phases.

4.2.7 Social and Economic Conditions

Direct and Indirect Effects: The MBOGC would approve the drilling and testing of eight private wells and associated infrastructure. There would be no commercial production; there would not be any production taxes or royalties paid. There would be short term employment and income resulting from the drilling and testing. Drilling would require 3 to 5 days per well, while testing could last up to 6 months. Drilling, testing and reclamation of the 8 wells would provide jobs with an estimated income of 71 thousand dollars. The jobs would be filled by company employees and subcontractors from the Sheridan area.

Direct and Indirect Effects to Environmental Justice: The project area is located ten miles east of the Crow Reservation, 12.5 miles south of the Northern Cheyenne Reservation, and thirty-five miles by paved road from Sheridan, Wyoming. It is expected that project jobs would be filled by company employees and subcontractors from the Sheridan area, which is located in the opposite direction from the Reservations. There would not be any production taxes or royalties paid to the mineral owners or the State. No adverse human health or environmental effects would occur to tribal resources and none would fall disproportionately on minority or low income populations.

Cumulative Effects: The temporary exploration jobs, and the related supplies required to service the wells over the life of the projects would likely come from the Sheridan, Wyoming area. The economic effects would be within the scope of the analysis found in the MT FEIS (2003) pages 4-116 to 4-123. Permanent jobs associated with future

production could offset some of the mining jobs lost due to production declines at the Montana mines as contracts expire and productivity increases.

4.2.8 Soils

Direct and Indirect Effects: Under this alternative, eight private wells at four sites would be drilled (see Table 2.5-1). Surface soil disturbance would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (approximate size of 25 feet wide x 40 feet long), and compaction from vehicles driving or parking at the drill site. Estimated soil disturbance associated with these four sites would involve approximately one acre at each site for four total acres. Approximately 0.3 miles of existing two track trails would be used for access, and approximately 0.1mile of new two track trails would be established. Approximately 0.5 miles of existing road would be upgraded to an all weather road. The area disturbed for the water treatment complex would be approximately 1.5 acres. A corridor of 100 feet long by 12 feet wide would be needed for part of the flowline from the treatment facility to the outfall.

The majority of proposed pipelines (gas and water) would be located in "disturbance corridors." Disturbance corridors involve the combining of two or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts.

Direct and indirect effects resulting from well pad, access roads, pipelines and treatment facility may include removal of vegetation, exposure of soil, mixing of horizons, soil compaction, loss of soil productivity, and increased susceptibility of the soil to wind and water erosion. Soil productivity would be eliminated along improved roads and severely restricted along two track trails

Soil erosion would affect soil health and productivity. The soils in the area are moderately susceptible to wind and water erosion. The Revised Universal Soil Loss Equation, Version 2 was used to examine potential erosion in the area. Erosion rates are site specific and are dependent on soil, climate, topography, and cover. Examining one of the common soils upon which activities would occur, the Kim loam, erosion rates on eight percent 200 foot slopes, covered by cool season grasses is calculated at 0.0013 t/ac/yr and could be considered a natural rate of erosion . Erosion rates on the same slope under bare ground conditions calculates to a loss of 3.2 t/ac/yr. Kim loam has a T value of 5, which means that the soil can sustain soil loss at a rate of 5.0 t/ac/yr and still maintain a medium for plant growth (see soil technical report). It is not expected that the proposed activities would result in totally bare ground and soil loss would be less than calculated under bare ground conditions. Loss of 1/32 of an inch represents a five t/ac/yr soil loss.

Reclamation and mitigation measures for soil disturbances in the Plan of Development includes: in areas of construction, topsoil would be stockpiled separately from other material and be reused in reclamation of the disturbed areas; construction activities would be restricted during wet or muddy conditions; construction activities would be designed following BMP's to control erosion and sedimentation; erosion control measures would be maintained and continued until adequate vegetation cover is re-established; vegetation would be removed only when necessary; topsoil removed by construction activities would be stockpiled for reclamation; sensitive habitat areas would not be used for topsoil storage; topsoil piles may be required to be seeded following the BLM seeding policy; and cuts and fills for new roads would be sloped to prevent erosion and to facilitate revegetation.

Expedient reclamation of disturbed land with topsoil salvage, proper seedbed preparation techniques, and appropriate seed mixes, along with use of erosion control measures (e.g., waterbars, water wings, silt fences, culverts, rip-rap, gabions etc.) would ensure soil productivity and stability is regained in the shortest time frame. Mitigation measures would limit impacts from soil disturbances. It is anticipated that less than 3 acres would remain disturbed following interim reclamation.

Cumulative Effects: It is anticipated that less than 3 acres of disturbance would remain following interim reclamation on the proposed project. Also, the reasonable foreseeable development from Coal Creek production could have an additional 4 acres of disturbance following reclamation. During the next 20 years, regional disturbances from CBNG development, conventional oil and gas development, coal mining, and other projects considered under the cumulative effects analysis would result in the short-term disturbance of about 132,000 acres of soil. These disturbances would be reduced to about 92,200 acres during the production phase of CBNG, conventional oil and gas activities and coal mining. Cumulative effects may include soil compaction, mixing of

horizons, loss of soil structure, exposure of soil, loss of soil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts may result in decreased soil productivity, decreased soil health and potential change in surface flora and subsurface flora and fauna on these disturbed areas. In much of this acreage, soils would be taken out of production or require long periods before they can regain productivity.

4.2.9 Vegetation

Direct and Indirect Effects to Vegetation: Disturbance caused from drilling and construction of access roads, pipeline corridors, and the water treatment facility site would remove vegetation from approximately 7 acres in the project area. Removal of this vegetation would remove the soil cover in these disturbed areas and reduce the amount of vegetation available to livestock and wildlife. Compaction by equipment traffic would damage vegetation and affect productivity. Vegetative productivity would be restored through reclamation and elimination of vehicle travel. Species composition of some areas may be altered as a result of treated water becoming available to livestock operations. Favorable effects could result in areas where a grazing rotation system is implemented due to the available water allowing rest for areas currently receiving constant use because it is the sole water source. Negative effects could result from grazing without adequate deferment in areas that are currently ungrazed.

Direct and Indirect Effects to Special Status Species: Montana Species of Special Concern would be minimally affected by CBNG activity. Habitat for Nuttall's desert-parsley (*Lomatium nuttallii*) and Woolly twinpod *(Physaria didymocarpa* var. *lanata*) include open rocky slopes in pine woodlands. Barr's milkvetch (*Astragalus barrii*) can occur on slopes, gumbo knobs or hilltops. Wells are usually located in areas that are easily accessible to drilling rigs and other equipment. Where possible, pipeline corridors for water, power and gas would be located along existing two tracks.

Direct and Indirect Effects to Invasive Species: Surface disturbance associated with construction of proposed access roads, pipelines and water management facilities would present opportunities for weed invasion and spread. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants, such as salt cedar, Canada thistle, leafy spurge. All equipment and vehicles entering and leaving the project area are encouraged to be washed to restrict any introduction of noxious weed infestations.

Cumulative Effects: Following reclamation after drilling, vegetation on less than 3 acres would remain displaced. If these wells were to go to the production phase and additional wells were drilled, it is reasonably foreseeable to conclude that vegetation on 4 additional acres would remain disturbed following reclamation. According to the MT FEIS, approximately 74,000 acres could be disturbed as a result of future CBNG development.

4.2.10 Wildlife and Fisheries/Aquatics

Direct and Indirect Effects Wildlife: Direct impacts to wildlife resources include loss of habitat through construction activities and permanent CBNG infrastructure and mortalities resulting from collisions with vehicles and powerlines. Indirect impacts would include habitat fragmentation and displacement related to CBNG infrastructure and human-related disturbance and activities.

New CBNG infrastructure would result in the direct loss of about 1 to 3 acres of habitat. All species of wildlife inhabiting the project area would be impacted by vehicle collisions resulting from new roads and increased traffic. Using ½ and 2 mile buffers to address impacts to wildlife sensitive to disturbance/displacement, there would be about 1,400 to 11,600 acres impacted by the proposed action. The MT FEIS (pages 4-172 & 4-173) describes, in detail, the rationale for using buffers to describe indirect impacts to wildlife resources.

Sharp-tailed grouse would be impacted by this project from habitat disturbance/fragmentation. Roads, vehicles, structures and human activity would displace some grouse nesting activity and reduce habitat availability for brood rearing. Mortality would increase as a result of collisions with vehicles. A limited amount of marginal sage grouse habitat is located on the extreme west end of the project area. However, the landowner has taken a very active approach in reducing sagebrush vegetation with chemical applications therefore greatly reducing habitat values to sage grouse. Additionally, this area would only be impacted by an existing access trail as no drilling activity is scheduled in this area.

As mentioned in section 3.10.1, there is an active bald eagle nest located about ½ mile from the project area along

the banks of the Tongue River. Several human-related disturbances are located nearby (i.e., roadway, traffic, powerline). Although this eagle pair is habituated to this disturbance, BLM in consultation with FWS, has determined this project is "likely to adversely affect" bald eagles/habitat in this area (see Biological Opinion). This determination was made considering the increased traffic and human disturbance. With no known additional raptor nesting activity in the area, and very limited nesting habitat, this project would have minimal impact to local raptor populations.

Waterfowl, especially migrants, would be impacted by the proposed action primarily from direct human disturbance and increased traffic. This would be a minimal impact as the project area is small and the birds have considerable alternative habitat which to use. These migrant populations seem to habituate to local disturbance factors in the area.

As discussed in section 3.10.6, there are at least 104 species of birds known to use this area of southeastern Montana. With the resultant CBNG-related infrastructure (i.e., roads), habitat fragmentation and increased human disturbance, it is reasonable to assume there would be impacts to nesting and migrating neotropical bird species. The primary impacts to these species would be related to disturbance of preferred nesting habitats and increased vehicle collisions. The primary habitat types affected by the proposed action are short-grass prairie and scattered sagebrush. Species associated with short-grass prairie habitats that might be negatively impacted due to loss of this habitat are western meadowlark, Brewer's sparrow, and grasshopper sparrow (these species would likely be positively impacted by a loss of sagebrush habitats). Those species which might be positively affected by loss of short-grass prairie habitat are mountain plover and horned lark. However, little of the area provides habitat for mountain plover. There is limited sagebrush habitat but those species which would be negatively impacted by a loss of sagebrush habitat would be the greater sage grouse, sharp-tailed grouse and sage sparrow. Some positive affects could result from newly disturbed ground from pipelines and buried power lines allowing easier expansion of black-tailed prairie dog colonies or from newly rehabilitated drilling sites providing potential nesting sites for mountain plovers.

Direct and Indirect Effects to Fisheries and Aquatics: Potential impacts to aquatic species include: increased erosion from road, pipeline, reservoirs and well pad construction; and changes in water quality and streamflows due to the discharge of produced CBNG water into the Tongue River. There would be "no effect" to the endangered pallid sturgeon (BLM letter to USFWS 2003). This is due to: (1) No habitat present in the project area (nearest habitat is located within the Yellowstone River, which is approximately 180 miles downstream), and (2) The low amount of discharged flow and drainage area affected when compared to the flow and drainage area of the Yellowstone River.

Increased erosion: Effects on aquatic species from increased erosion would be minor due to no on-drainage impoundments (reservoirs), design criteria for road, pipeline and reservoir construction and mitigation measures that are designed to reduce erosion.

Changes in water quality (temperature): Proposed produced water discharge within this project is located approximately two miles downstream of the dam. Proposed discharge at this site would be between 55 and 61 degrees F. This water meets State standards and is actually at a more desirable temperature for rainbow and brown trout than what is currently in the Tongue River in the summer months (refer to Section 3.10.5). Therefore, effects would be minor and not detrimental.

Changes in water quality (Other water quality parameters): The water would be treated to meet state standards (i.e. EC, SAR), which provide protection and limit effects to aquatic life. The EC, SAR, and other water quality parameters (such as bicarbonate, ammonia and total dissolved solids, etc.) meet state water quality standards (Refer to Section 3.41 Hydrology). In addition, Montana DEQ (MTDEQ) is requiring Whole Effluent Toxicity (WET) testing to be conducted on discharged CBNG water. The testing would consist of both acute and chronic toxicity tests on a water flea (*Ceriodaphia dubia)* No Acute toxicity would be allowed in any portion of the mixing zone, except for limited circumstance. Chronic toxicity may be allowed only when uses are not threatened or impaired. Because the permit contains numeric effluent limits for aquatic life, based on non-degradation level, no chronic or acute toxicity is expected. At a minimum, annual chronic and acute toxicity testing would be required to determine if additional constituents are present in the discharge that may cause toxicity (MT DEQ MPDES Permit).

Increased streamflows: Effects from increased streamflows would be minor and not detrimental. The water discharged (0.56 cfs) is minor when compared to the flows in the Tongue River (At the low monthly 7Q10 (70 cfs below the dam), the discharge would only constitute 0.8 percent of the flow).

Determination: Impacts to aquatic species that inhabit these areas would be minor and not detrimental for the following reasons. (1) Only treated water, as approved by MDEQ, would be added to the river. (2) MDEQ is requiring acute and chronic toxicity testing of a water flea (*Ceriodaphia dubia).* No Acute toxicity would be allowed in any portion of the mixing zone, except for limited circumstance. Chronic toxicity may be allowed only when uses are not threatened or impaired. (3) The water discharged (0.56 cfs) is not expected to influence instream temperatures, dissolved oxygen or other water quality parameters due the amount of discharged flow when compared to the flows in the Tongue River (At the low monthly 7Q10 (70 cfs below the dam), the discharge would only constitute 0.8 percent of the flow). (4) Mitigation measures that are designed to reduce potential erosion and ensure adequate dissolved oxygen and temperature for aquatic life. (5) No on-drainage impoundments (reservoirs) would be constructed with this project.

Additional, impacts to wildlife resources related to CBNG development are discussed in detail in the MT FEIS, Chapter 4, pages 4-160 to 4-196.

Cumulative Effects to Wildlife: The impacts to wildlife resources from cumulative impacts would be the same or similar as described above except on a much larger scale. There would be direct habitat loss from construction activities, roads and other facilities. Mortalities would occur from vehicle and powerline collisions. Indirect impacts would occur from habitat disturbance, human presence and possible diminished water quality. Between 1,400 and 11,600 acres would indirectly be impacted by this project. Additionally, between 100,000 to 200,000 acres of wildlife habitat are indirectly impacted by existing CBNG and coal mine developments in Wyoming and Montana.

Local populations of certain wildlife species groups may be impacted by the cumulative effects of current and foreseeable developments in this area. These would include species such as mule deer, sage grouse, eagles, etc. These species are somewhat localized to the area and rely on very key habitat areas during critical times of the year. This may include winter range for big game, nesting and brood rearing habitat for grouse and raptors and the Tongue River corridor for migratory species.

Although difficult to quantify in numerical terms, it is reasonable to assume that, with the magnitude of cumulative industrial development in this somewhat localized landscape, there would be some impacts to most wildlife species residing in the area that cannot be avoided.

Cumulative effects to Fisheries/Aquatics: Potential Cumulative effects could occur from the relevant past, present and reasonably foreseeable future actions. The past and current actions are discussed in section 3.10.5. The cumulative actions occur in various degrees throughout the Tongue River drainage which influences the degree at which aquatic life is affected. Water quality, erosion and streamflows are identified as parameters that could be changed or impacted and subsequently result in potential effects to aquatic life.

Wolf Mountain Coal, Inc. Proposal: Wolf Mountain Coal Inc. proposes to build a coal processing plant on private land for retail sales of coal. No mining would occur at the site. Potential effects are increased erosion from construction activities, but this would be limited and not detrimental to aquatic species habitat and populations.

CBNG development: CBNG has the potential to affect water quality, erosion and streamflows. CBNG development in Montana currently encompasses 35,840 acres (1% of the Tongue River drainage). It has the potential to expand to 143,600 - 392,000 acres (based on MT FEIS 3,500 – 9,800 wells predicted over the next 20 years (a calculation of 16 wells per 640 acres was used), which is between 4 and 11 percent of the Tongue River Drainage (This does not include Wyoming activity). Currently, there is a discharge permit of 1600 gpm (3.56 cfs) for CBNG produced untreated water (approximately 5 percent of the flow at the low monthly 7Q10 (70 cfs) below the dam). Another 0.56 cfs of treated water would occur in this alternative with the potential of an additional 1.94 cfs in the foreseeable future (this amount is included in the MPDES permit but not a part of this alternative). In addition, 3.87 cfs of treated water is proposed under another permit. All of the current and future discharges are approved by MDEQ and would meet state water quality standards. Future discharges, which could equal up to 30 cfs (approx. 43% at the low monthly 7Q10 flow below the dam), may occur in the future. This development could have potential effects on

habitat or populations.

The degree of cumulative effects from the combination of the above activities within the Tongue River drainage depends on a variety of factors, some of which are natural. Drought conditions have affected aquatic habitat and populations within the drainage for the past several years. Local geology, severe wildfire, soil composition also influence water quality, streamflows, and erosion. The amount of future CBNG development, amount of water withdrawal for irrigation purposes, etc. are other factors that influence the degree of cumulative effect.

Of the above activities, CBNG development has the potential cumulative effects to aquatic habitat and populations. The Wolf Mountain Coal, Inc. proposal is not expected to have detrimental cumulative effects. As a result, there would be an increased potential for cumulative effects on aquatic species and habitat greater than that identified in Alternative A.

West Nile Virus

There is potential to increase mosquito habitat with this alternative through the use of reservoir storage. As a result, West Nile Virus could increase, however, this project is only scheduled to operate for six months. This amount of time will limit the effect this project can have on mosquito populations. Future development (beyond these six months) will be analyzed under another environmental analysis.

4.3 EFFECTS FROM ALTERNATIVE C—THE PROPOSED ACTION

4.3.1 Air Quality

Direct and Indirect Effects: Under this alternative, eight private wells and eight federal wells would be drilled and tested and 2 existing private wells would be tested. Pollutant emissions would result from drilling and testing activities and these emissions would potentially impact air quality in the project area. The primary pollutants emitted would be TSP, PM_{10}, $PM_{2.5}$, NO_x, VOC, CO, and SO_2. Any impacts on air quality, including any impacts to the Lame Deer PM_{10} non-attainment area, would be minor because of the relatively small amount of pollutants that would be emitted and because of the short duration of the project. Impacts would be minimized because, although a MAQP would not be required, Powder River Gas, LLC would still need to comply with opacity requirements contained in ARM 17.8.304 (20% opacity averaged over 6 consecutive minutes) and reasonable precaution requirements contained in ARM 17.8.308 (applying water and/or chemical dust suppressant as necessary to comply with opacity requirements). In addition, BLM conditions of approval for suppression of fugitive dust and control of vehicle speeds would also reduce emissions up to 65%.

TSP, PM_{10} and $PM_{2.5}$ emissions would be emitted from travel on access roads ((unpaved roads), wind erosion at disturbed areas, and from the actual drilling of the wells. NO_x, VOC, CO, and SO_2 emissions would occur from drilling engine operations and from the emergency flares. Air quality impacts at each well would be temporary - occurring during the two to three day well construction (16 new wells) and during well testing (2 existing wells and 16 new wells).

Air quality would be impacted in the vicinity of the project during drilling and testing activities. The project would result in a temporary increase in fugitive dust and gaseous emissions. The potential emissions of Alternative C (including secondary emissions that are not included in making a permit determination and considerations of the length of the project (hrs) and gas venting limits (Scfd)) are summarized in the following table:

4.3-1 Emission Inventory –Alternative C

Tons/Project							
Emission Source	*TSP*	PM_{10}	$PM_{2.5}$	NO_x	VOC	CO	SO_x
Drill Rig(s) – (Engine Emissions)	0.00	0.00	0.44	6.25	0.50	1.35	0.41
Drill Rig(s) – (Drilling Emissions)	0.20	0.20	0.20	0.00	0.00	0.00	0.00
Well Testing – (Gas Flaring)	0.00	0.00	0.00	1.60	0.00	3.19	0.00
Fugitive Dust – (Disturbed Acres)	15.30	15.30	15.30	0.00	0.00	0.00	0.00
Vehicle Traffic (non-paved roads)	1.73	0.78	0.78	0.00	0.00	0.00	0.00
Total	17.22	16.27	16.72	7.85	0.50	4.54	0.41

MDEQ determined that any air quality impacts from the proposed action, including any impacts to the Lame Deer PM_{10} non-attainment area, would be minor because of the relatively small amounts of pollutants that would be emitted and because the emissions would be temporary and any impacts would be short-term. The wells to be drilled and tested would be located in an unclassifiable/attainment area, which generally promotes good dispersion characteristics and would not exceed MAQP thresholds. Therefore, MDEQ determined that emissions from Alternative C would not cause or contribute to a violation of any ambient air quality standard. Impacts would be minimized because although a MAQP would not be required, Powder River Gas, LLC would still need to comply with opacity requirements contained in ARM 17.8.304 (20% opacity averaged over 6 consecutive minutes) and reasonable precaution requirements contained in ARM 17.8.308 (applying water and/or chemical dust suppressant as necessary to comply with opacity requirements).

Cumulative Effects: The MT FEIS analyzed cumulative air quality impacts at Class I and Class II areas from emission sources across Montana, particularly in southeastern Montana. The analysis used an approach that included the modeling of existing and proposed regional sources at permitted and planned emission rates.

All of the CBNG proposals and ongoing CBNG activity considered as part of the cumulative actions for this EA, including the activity in Wyoming, does not involve a level of activity large enough to warrant completing additional modeling beyond that completed for the Badger Hills EA and the MT EIS. Representative air quality impacts are already documented in the MT EIS for the level of cumulative Montana CBNG activity included in this EA. This is because the No Action Alternative (Alternative A) in the MT EIS includes 515 producing wells and all the Montana cumulative CBNG activity included in this EA would be very close to this number if further drilling within the CX field occurs, and the Yates and Powder River Gas exploration wells become producing wells.

The cumulative impacts from Alternative C would be in compliance with all of the air quality standards and PSD increments and thresholds for the pollutant impact indicators for mandatory federal Class I PSD areas and sensitive lakes. This conclusion is based on the modeling completed for the MT and WY EISs, and the results of the cumulative impact analysis for this EA, completed for the pollutant considered most likely to violate any ambient air quality standard or increment.

Any future proposals (drilling and testing of new CBNG wells and production activities and other reasonable foreseeable future actions) that could potentially impact air quality standards would be analyzed by the MDEQ. The MDEQ would maintain a modeling database to track CBNG production activity in Montana and the model is updated with each new NO_x emitting facility that locates in the area defined by the MT FEIS. Air quality impacts associated with CBNG production is the major air quality concern because, as demonstrated by the emission inventories completed as part of this review, emissions from CBNG exploration are very small and temporary in nature. MDEQ will continue to model NO_x emitting units that locate in the area defined by the MT FEIS to ensure that the MAAQS/NAAQS and PSD increments are not exceeded.

4.3.2 Cultural Resources

Direct and Indirect Effects: The cultural resource inventories did not identify any sites that would be directly impacted by the proposed action. Indirect effects would include the increased possibility of impacting sites through collection activity and unanticipated discoveries made during installation of infrastructure for the project. A review with the Northern Cheyenne THPO on August 4, 2004 did not identify any TCPs in the project area and none would be impacted. Unanticipated discoveries found during construction of roads, the water treatment facility, and buried infrastructure would be addressed through the condition to approval to monitor surface disturbing actions using a Tribal monitor.

A feature associated with the Lee Homestead, a site listed on the National Register of Historic Places, is partially within the southeast corner of the project area. It is opposite the proposed outflow location, but would not be impacted since it is across the river.

Cumulative Effects: The MT FEIS identified the potential for 5,135 cultural sites to occur in the CBM areas of Montana, resulting in 515 to 735 sites that could be eligible for listing on the National Register of Historic Places. Most of the sites would be expected to be prehistoric sites that contain dateable deposits in a secure context and would be eligible under Criterion D of 36 CFR 60.4. The inventory results from this project, one prehistoric site and five isolated, would add to the total cumulative number of sites identified in the region. None of the inventoried

sites were determined to be eligible for the National Register of Historic Places. Indirect cumulative effects would be visual impacts to Feature 7 of Site 24BH2349.

Full development of the federal and private leases within and adjacent to the POD could have an impact to cultural resources including cultural landscapes. BLM would develop mitigation strategies and project designs that would eliminate or reduce impacts to cultural resources from full development including additional consultation with Native American groups and the Montana SHPO. Compliance with Section 106 of NHPA would still be necessary if other Federal permits such as Section 404 Permits were required. Full development of the leases on fee surface/fee minerals could represent an impact to the cultural landscape. As such, BLM would need to take this into account when approving additional projects on adjacent Federal oil and gas leases and design the project to reduce impacts or develop appropriate mitigation strategies.

4.3.3 Geology and Minerals

Direct and Indirect Effects to Coal Bed Natural Gas: The private and federal wells would be drilled and tested for a short period of time, but not produced. During testing of these wells, small amounts of gas would be lost through venting. The testing would not last longer than 6 months or the maximum of 1,260,000 cubic feet of gas per well, whichever comes first. Ten private and eight federal wells would be tested, thus the maximum total venting of 22,680,000 cubic feet of gas would occur, assuming all wells would produce gas at the maximum level each day of testing.

There would be no methane migration to water wells, springs, or conventional wells under this alternative. There would be no drainage of Indian mineral resources as a result of this alternative (see Section 3.3.2).

Direct and Indirect Effects to Coal: Coal formations would be partially dewatered and small volumes of gas would be removed.

Cumulative Effects: Drilling and testing to determine the productivity of these federal and private leases could prove up the leases and result in future gas production and revenue if the operational phase was approved in the future.

4.3.4 Hydrology

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. This WMP is summarized in Chapter 2 of this EA. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence to the plan would minimize project area and downstream potential impacts from proposed water management activities. The MDEQ has assumed primacy from the United States Environmental Protection Agency for issuing waste water discharge permits in the state.

The operator has proposed a variety of potential beneficial uses, including dust abatement and drilling activities. The treated water would be suitable for all of the proposed beneficial uses. Therefore no direct, indirect, or cumulative effects would be anticipated to result from these uses. For the following analysis, it will be assumed that all produced water would be treated and discharged to the Tongue River since any beneficial uses in and around the Coal Creek POD area would simply decrease the magnitude of the predicted direct, indirect, and cumulative impacts. If specific beneficial uses are identified, they will be submitted at that time via Sundry notice to the BLM, and analyzed through NEPA to ensure compliance with Onshore Order Number 7, the CWA, and all other applicable Federal, State or local laws, including the requirement to obtain a water right for waters put to beneficial use.

Direct and Indirect Effects to Surface Water-CBNG Water Discharge to Surface Waters: Under this alternative, the PRG Coal Creek project would discharge 1.0 cfs (450 gpm) of water. PRG intends to mix treated and untreated water to the degree allowable without causing the EC to exceed 1,000 μS/cm or the SAR to exceed 3 during the irrigation season. Based upon the treated and untreated water quality data contained in the POD book for this project, this mixing would cause the SAR standard of 3 to be met first, at which time the EC would be 742 μS/cm. The direct effects of this discharge are summarized in Table 4.3.4-1. Detailed discussion of the model used to determine these results is included in the PRG Coal Creek - Hydrology Technical Report. The SOB contained in Appendix B of the Hydrology Technical Report for this project includes analysis of potential for all parameters for

which surface water quality criteria exist to exceed those criteria.

Table 4.3.4-1: Direct Impacts to Surface Water from the Proposed Action

		Modeled Existing Conditions			Resultant Surface Water Quality and Quantity (250 gpm from PRG)		
	Flow Conditions	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
Tongue River Below Dam	7Q10	72.3	825	1.17	73.3	825	1.18
	LMM	181.3	658	0.91	182.3	659	0.92
	HMM	1431.3	396	0.53	1432.3	397	0.53
Tongue River at Birney Day School	7Q10	51.3	1149	1.76	52.3	1150	1.78
	LMM	175.3	731	1.15	176.3	732	1.17
	HMM	1121.3	381	0.60	1122.3	381	0.60

Comparison of the direct resultant water quality values in this alternative to the appropriate standards shows that during HMM and LMM flows, none of the mean monthly standards would be exceeded. During 7Q10 flows, the instantaneous maximum standards would not be exceeded. These standards were adopted to protect agricultural uses of the Tongue River, which has been determined to be the most sensitive beneficial use of the Tongue River (BLM,2003a). As such, the direct changes in EC and SAR that are anticipated to result from the Proposed Action alternative would not be anticipated to impair the beneficial uses of the Tongue River.

The MDEQ has also conducted an analysis of this discharge in relation to the MPDES permit. This analysis is documented in the SOB, which is included in Appendix B of the Hydrology Technical Report. This analysis included consideration of a wide range of parameters, and the conclusion of this analysis was that the discharge would not cause exceedance of any surface water quality criteria. Chemical monitoring of the discharge, and in stream water quality, are also required in the permit. If monitoring shows that any standards are exceeded, the MPDES permit may be reopened by the MDEQ. The MPDES permit also requires chronic whole effluent toxicity (WET) testing of the CBNG discharge water from this project to ensure that adverse impacts to aquatic life will not result from this discharge. According to the EPA, one sample of CBNG water from the Big George coal seam in Wyoming has failed the EPA WET protocol. The MDEQ may require additional monitoring, a toxicity identification evaluation (TIE) analysis, and may reopen the permit if WET testing demonstrates toxicity of the effluent.

Direct and Indirect Effects to Groundwater: Under this alternative, the eight proposed private wells and the 8 proposed federal wells would be drilled. These sixteen new wells and the two existing private wells would be tested for CBNG potential. This testing may last for up to 6 months. The removal of water from the Wall and Flowers-Goodale coal seams would cause a cone of depression to form around each well. If drawdown is experienced in a water well, the yield of the well may be decreased, depending on well construction and operation. This reduction in hydrostatic pressure may cause the well to become unusable even though some water may remain (CBNG pumps typically pump off the hydrostatic pressure to near the top of the coal seam, while not dewatering the coal seam itself since this would result in much higher water production rates, and cause the cleat within the coal to close, thereby restricting the flow of gas (Wheaton and Metesh, 2002)). Drawdown could also cause the yield from springs, which emit from the coal seams to be reduced.

It is anticipated that with 18 wells pumping (9 wells from each seam), the 20 foot drawdown contour would extend, on average, approximately 1.11 miles from the POD area after 6 months of pumping. Since the vertical hydrologic conductivity of the Tongue River Member of the Fort Union Formation is very low (Wheaton and Donato, 2004), the effects of drawdown are expected to be limited to the coal seams being developed and not extend to the adjacent overburden or underburden units, or to affect surface water bodies, including the Tongue River Reservoir. The model used to determine these results is discussed in detail in the PRG-Coal Creek–Hydrology Technical Report. It should be noted that this analysis uses the Theis equation, which assumes homogeneity isotropy, no flow boundaries, and no recharge to the aquifer. Since flow limiting faults are known to exist in this area, these conditions would not be anticipated to be met in all cases, however, since the location of all faults is not known, this

analysis does provide a reasonable analysis of the average distance that drawdown would reach from the well field. In cases where the drawdown cone intersects a fault, the cone will be limited in the fault direction, and would extend asymmetrically away from this flow boundary. In cases where drawdown is within an isolated fault block (flow boundaries on all sides), the drawdown within the block would be greater than calculated due to the lack of recharge, but the drawdown would be limited to the block. This Theis equation approach was compared to a simple MODFLOW model of the Wall coal seam. This comparison showed that the Theis approach predicted a greater radius of drawdown than the MODFLOW approach. The major reason for this was that the MODFLOW approach applies a pumping rate to draw the static water level to within 5 feet of the top of the coal (wells represented as constant head cells), while the Theis approach uses the estimate of pumping rates supplied by PRG (25 gpm at start up and a reduction of 20% per year). As the PRG estimate is somewhat greater than the MODFLOW result, the drawdown cone extends further in the Theis analysis. Due to the uncertainty associated with flow boundaries in this area, it is felt that the more conservative Theis approach is appropriate for this analysis.

Recent monitoring data from the existing CBNG fields in Montana (Wheaton and Donato, 2004) is also available online at http://www.mt.blm.gov/mcfo/cbng/CBNG-Monitoring.htm. This monitoring data indicates that "After 4 years of production from the CX field, water levels have been lowered by 20 feet at distances of less than 1 mile to as much as 2 miles outside the production area."

The groundwater modeling conducted in support of the MT FEIS anticipated that, for a hypothetical CBNG field with 1,082 wells on the East Fork of Hanging Woman Creek producing for 20 years, the produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The coal seams analyzed in this model were also in the Tongue River Member of the Fort Union Formation, however, they are not the same coal seams. As such, the results of this model are indicative of the general magnitude and duration of impacts that would result from a similar well field in the project area, however, the exact results would be expected to be somewhat different. It is anticipated that, due to the shorter duration of pumping and the lower number of wells, recovery for this area would be much more rapid.

A 2D MODFLOW model was prepared to assess the effects of the proposed action of this project on the Wall coal seam. This analysis showed that, after 180 days of testing the coal seams, it would require 160 days for the static water levels to return to within 20' of pre-testing levels.

Those wells and springs, which are located within the area of drawdown, and which receive their water from the coal seam being pumped, may be affected by this drawdown. According to MBMG's GWIC database (http://mbmggwic.mtech.edu/), three wells and two springs are located within the direct drawdown area for this alternative. Of these wells, none are completed at an elevation that would be consistent with being finished in the Wall coal. Since the nearest known outcrop of the Wall Coal seam is approximately 11 miles away, it is not anticipated that any of the springs emit from the coal seams being tested, and they are not anticipated to be impacted by groundwater drawdown.

The operator has certified that water mitigation agreements have been reached with all potentially affected water right holders in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, 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 affected. These mitigation agreements apply to any spring or well adversely impacted by CBNG development in the designated Groundwater Area, regardless of which aquifer they are finished in. As such, these agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality. Although the terms of water mitigation agreements are to be "under such conditions as the parties mutually agree upon" (Order 99-99), the replacement of water required by these agreements is anticipated to take the form of reconfiguring existing wells, re-drilling wells, or drilling new wells. These measures would be effective for replacing water sources since the major drawdown from CBNG activity is anticipated to be confined to the coal seam aquifers and to only minimally affect other aquifers (such as sandstones) within the Tongue River Member of the Fort Union Formation. Any lost or diminished water sources would be replaced with a permanent source before the termination of the agreement. The order also requires the monitoring of water sources by the CBNG operator. In the POD book for this project, PRG has proposed to monitor existing water resources monthly for the first year, and once per year thereafter. Monitoring data would be provided to the affected water source owner. Impacts would not be expected

after the cessation of CBNG development since the aquifer would then be in the recovery phase, with groundwater levels rising in the area that had been drawndown by CBNG testing. Therefore, it is anticipated that these required water mitigation agreements would mitigate the potential impacts from groundwater drawdown, methane migration or changes in groundwater quality.

The groundwater modeling conducted in support of the MT FEIS anticipated that, for a hypothetical CBNG field with 1,082 wells on the East Fork of Hanging Woman Creek producing for 20 years, the produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The coal seams analyzed in this model were also in the Tongue River Member of the Fort Union Formation, however, they are not the same coal seams. As such, the results of this model are indicative of the general magnitude and duration of impacts that would result from a similar well field in the project area, however, the exact results would be expected to be somewhat different. It is anticipated that, due to the shorter duration of pumping and the lower number of wells, that recovery for this area would be much more rapid.

A 2D MODFLOW model was prepared to assess the effects of the proposed action of this project on the Wall coal seam. Although not directly applicable to this alternative, this analysis does provide an indication of the types of impacts that may be expected, and the approximate magnitude and duration. This analysis showed that, after 180 days of testing the coal seams, it would require 160 days for the static water levels to return to within 20 feet of pre-testing levels.

The exact radius of the drawdown cone, and the time required for the head to recover, would depend on the site specific aquifer properties, the precise timing of the pumping of each of the wells, and the overall nature of CBNG development in this region. For additional general discussion of the anticipated drawdown related impacts, see pages 4-61 to 4-63 of the MT FEIS (BLM, 2003), and the associated groundwater modeling reports (Wheaton and Metesh 2001, Wheaton and Metesh, 2002). Recent monitoring data from the existing CBNG fields in Montana (Wheaton and Donato, 2004) is also available online at http://www.mt.blm.gov/mcfo/cbng/CBNG-Monitoring.htm.

The potential for cross contamination of aquifers would be avoided by cementing from the top of the target coal seam to the surface, as proposed by the operator. Details on the drilling and cementing program are found in the Master Drilling Plan submitted with the Plan of Development.

Shallow groundwater is not anticipated to be impacted by this alternative because the proposed drilling and cementing programs, and lining the proposed impoundment with a 20 mil polyethylene liner will prevent the introduction of CBNG water into shallow aquifers or the unsaturated zone.

Cumulative Effects to Surface Water-CBNG Water Discharge to Surface Waters: If the wells associated with this alternative are productive, it is reasonably foreseeable that the total discharge requested under the MPDES permit (MT0030660) would be used. Therefore, it is assumed that under this alternative, 2.5 cfs of treated CBNG water would be cumulatively discharged from the PRG Coal Creek Project. The proposed discharge of treated CBNG water upstream from the Tongue River Reservoir (MT0030724) would also occur as a cumulative activity. The results of this scenario are shown in the table below. Detailed discussion of the model used to determine these results is included in the PRG-Coal Creek–Hydrology Technical Report.

Table 4.3.4-2: Cumulative Impacts to Surface Water from the Proposed Action

		Foreseeable Conditions (Non-Project) (0 gpm from PRG)			**Resultant Surface Water Quality and Quantity** (1,122 gpm from PRG)		
	Flow Conditions	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
Tongue River Below Dam	7Q10	77.4	824	1.30	79.9	826	1.34
	LMM	186.4	664	1.01	188.9	667	1.04
	HMM	1436.4	401	0.56	1438.9	402	0.57
Tongue River at Birney Day School	7Q10	56.4	1149	1.90	58.9	1150	1.93
	LMM	180.4	736	1.25	182.9	740	1.28
	HMM	1126.4	386	0.63	1128.9	387	0.64

Comparison of the cumulative resultant water quality values for this alternative to the appropriate standards shows that during HMM and LMM flows, none of the mean monthly standards are exceeded. During 7Q10 flows, the instantaneous maximum standards are not exceeded. These standards were adopted to protect agricultural uses of the Tongue River, which has been determined to be the most sensitive beneficial use of the Tongue River (BLM,2003a). As such, the cumulative changes in EC and SAR that are anticipated to result from the Proposed Action alternative would not be anticipated to impair the beneficial uses of the Tongue River.

The MDEQ has also conducted an analysis of this discharge in relation to the MPDES permit. This analysis is documented in the SOB, which is included in Appendix B of the Hydrology Technical Report. This analysis included consideration of a wide range of parameters, and the conclusion of this analysis was that the discharge would not cause exceedance of any surface water quality criteria. Chemical monitoring of the discharge, and in stream water quality, are also required in the permit. If monitoring shows that any standards are exceeded, the MPDES permit may be reopened by the MDEQ. The MPDES permit also requires chronic whole effluent toxicity (WET) testing of the CBNG discharge water from this project to ensure that adverse impacts to aquatic life will not result from this discharge. According to the EPA, one sample of CBNG water from the Big George coal seam in Wyoming has failed the EPA WET protocol. The MDEQ may require additional monitoring, a toxicity identification evaluation (TIE) analysis, and may reopen the permit if WET testing demonstrates toxicity of the effluent.

Cumulative Effects to Groundwater: If the 18 wells associated with this alternative are productive, it is reasonably foreseeable that these leases would be further produced. For this analysis, it is assumed that 23 CBNG wells would be completed in each coal seam under the Proposed Action alternative, and that they would be produced for up to 20 years (BLM, 2003a). A Theis type analysis for this scenario indicates that the maximum cumulative 20 foot drawdown contour extends, on average; approximately 5.4 miles from the project area over this time period (see the PRG-Coal Creek–Hydrology Technical Report). Since flow limiting faults are known to exist in this area, the assumptions for homogeneity isotropy, and no flow boundaries would not be anticipated to be met in all cases, however, since the location of all faults is not known, this analysis does provide a reasonable analysis of the average distance that drawdown would reach from the well field. In cases where the drawdown cone intersects a fault, the cone will be limited in the fault direction, and would extend asymmetrically away from this flow boundary. In cases where drawdown is within an isolated fault block (flow boundaries on all sides), the drawdown within the block would be greater than calculated due to the lack of recharge, but the drawdown would be limited to the block.

Those wells and springs, which are located within the area of drawdown, and which receive their water from the coal seam being pumped, may be affected by this drawdown, with actual impacts also depending on well construction and operation. Since the vertical hydrologic conductivity of the Tongue River Member of the Fort Union Formation is very low (Wheaton and Donato, 2004), the effects of drawdown are expected to be limited to the coal seams being developed and not extend to the adjacent overburden or underburden units, or to affect surface water bodies. There are 35 wells and 24 springs located within the cumulative drawdown area that result under this alternative with 20 years of pumping. These wells and springs are listed in the PRG-Coal Creek–Hydrology Technical Report. These wells are finished at elevations between approximately 2,897 ft-amsl and 3,973 ft-amsl.

The elevation of the top of the Wall coal in this area varies between approximately 2614 and 3414 ft-amsl, and it is approximately 55 feet thick. The top of the Flowers-Goodale coal is, at its shallowest, approximately 2,591 ft-amsl and it is approximately 20 feet thick. As such, 17 of these wells are finished at elevations where they are within the overall range of the Wall coal seam. Site specific calculations of the elevation of the Wall coal at each of these well sites show that, for all but two of these wells, the elevations at which they are finished are not consistent with being finished in the Wall coal. The two wells that are within the appropriate range are the two Peterson wells located along the Tongue River in Section 22, T. 7 S. R. 41 E. These Peterson wells are 43 and 44 feet deep, and are reported as being finished in the alluvium rather than in a coal. Because of the difference in depth of the wells, and the low vertical hydrologic conductivity of the intervening formations, it is not anticipated that any of these wells will be impacted as a cumulative result of this alternative. Since the nearest known outcrop of the Wall Coal seam is approximately 11 miles away, it is not anticipated that any of the springs emit from the coal seams being tested, and they are not anticipated to be impacted by groundwater drawdown.

The operator has certified that water mitigation agreements have been reached with all potentially affected water right holders in accordance with the requirements of MBOGC Order No. 99-99. As discussed under the direct impacts section, these agreements would mitigate impacts from groundwater drawdown.

The groundwater modeling conducted in support of the MT FEIS anticipated that, for a hypothetical CBNG field with 1,082 wells on the East Fork of Hanging Woman Creek producing for 20 years, the produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The coal seams analyzed in this model were also in the Tongue River Member of the Fort Union Formation, however, they are not the same coal seams. As such, the results of this model are indicative of the general magnitude and duration of impacts that would result from a similar well field in the project area, however, the exact results would be expected to be somewhat different. It is anticipated that, due to the lower number of wells, recovery for this area would be more rapid.

The exact radius of the drawdown cone, and the time required for the head to recover, would depend on the site specific aquifer properties, the precise timing of the pumping of each of the wells, and the overall nature of CBNG development in this region. For additional general discussion of the anticipated drawdown related impacts, please see pages 4-61 to 4-63 of the MT FEIS, and the associated groundwater modeling reports (Wheaton and Metesh 2001, Wheaton and Metesh, 2002).

4.3.5 Indian Trust and Native American Concerns

Direct and Indirect Effects: Impacts would be similar to those identified in Alternative B. Compliance with the approved MPDES permit would ensure that the project would not impair water quality on the Tongue River. The MDEQ determined the PRG project would not exceed air quality standards or impact the Northern Cheyenne Class I Airshed.

Cumulative Effects: The proposed action would incrementally add to the concerns about CBNG development identified by the Northern Cheyenne Tribe. Cumulative impacts would be similar to those identified in Alternative B. BLM has developed mitigation measures to protect the Northern Cheyenne resources in the MT FEIS and this EA.

4.3.6 Livestock Grazing

Direct and Indirect Effects: Same as Alternative B.

Cumulative Effects: Same as Alternative B.

4.3.7 Social and Economic Conditions

Direct and Indirect Effects: Eight Federal and eight private exploration wells would be drilled, tested and shut-in for the near term. There would be no commercial production, production taxes or royalties. There would be short term employment and income resulting from the drilling and testing. Drilling would require 3 to 5 days per well, while testing would last up to 6 months after which each well would be shut-in by closing the well at the surface. Drilling, testing and reclamation of the 16 wells would provide jobs with an estimated income of 142 thousand dollars, which would enhance the social well being of those receiving this income. The jobs would be filled by company employees and subcontractors from the Sheridan area.

Direct and Indirect Effects to Environmental Justice: The project area is located ten miles east of the Crow Reservation, 12.5 miles south of the Northern Cheyenne Reservation, and thirty-five miles by paved road from Sheridan, Wyoming. It is expected that project jobs would be filled by company employees and subcontractors from the Sheridan area, which is located in the opposite direction from the Reservations. There would not be any production taxes or royalties paid to the mineral owners or the State. Therefore, no adverse human health or environmental effects would be expected to fall disproportionately on minority or low income populations.

Cumulative Effects: The temporary exploration jobs, and the related supplies required to service the wells over the life of the projects would likely come from the Sheridan, Wyoming area. The economic effects would be within the scope of the analysis found in the MT FEIS (2003) pages 4-116 to 4-123. Permanent jobs associated with future production could offset some of the mining jobs lost due to production declines at the Montana mines as contracts expire and productivity increases.

4.3.8 Soils

Direct and Indirect Effects: Under this alternative, well pads would be constructed for sixteen private and federal wells at eight sites. Estimated soil disturbance associated with these well sites would involve approximately one acre per location for eight total acres. Surface disturbance would occur with drilling of the wells. This disturbance would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 25 feet wide x 40 feet long), and compaction from vehicles driving or parking at the drill site. Approximately 5.6 miles of existing two track trails would be used for access, and approximately 1.4 miles of new two track trail would be established. Approximately 0.5 miles of an existing road would be upgraded to an all weather road. The area needed for the water treatment would be approximately 1.5 acres. A corridor of 100 feet long x 12 feet wide would be needed for part of the flowline from the treatment facility to the outfall. The majority of proposed pipelines (gas and water) would be located in disturbance corridors. Disturbance corridors involve the combining of two or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Approximately 1.5 acres will be disturbed for the water treatment facility.

Direct and indirect effects resulting from well pad, access roads, pipelines and treatment facility may include removal of vegetation, exposure of soil, mixing of horizons, soil compaction, loss of soil productivity, and increased susceptibility of the soil to wind and water erosion. Soil productivity would be eliminated along improved roads and severely restricted along two track trails.

Soil erosion would affect soil health and productivity. The soils in the area are moderately susceptible to wind and water erosion. The Revised Universal Soil Loss Equation, version 2 was used to examine potential erosion in the area. Erosion rates are site specific and are dependent on soil, climate, topography, and cover. Examining one of the common soils in the area, the Kim loam, erosion rates on eight percent 200 foot slopes, covered by cool season grasses is calculated at 0.0013 t/ac/yr and could be considered a natural rate of erosion. Erosion rates on the same slope under bare ground conditions calculate to a loss of 3.2 t/ac/yr. Kim loam has a T value of 5 which means that the soil can sustain soil loss at a rate of 5.0 t/ac/yr and still maintain a medium for plant growth (see Soil Technical Report). It is not expected that the proposed activities would result in totally bare ground and soil loss would be less than calculated under bare ground conditions. Loss of 1/32 of an inch represents a five t/ac/yr soil loss.

Reclamation and mitigation measures for soil disturbances are addressed in the Plan of Development. Mitigation includes: in areas of construction, topsoil would be stockpiled separately from other material and be reused in reclamation of the disturbed areas; construction activities would be restricted during wet or muddy conditions; construction activities would be designed following BMP's to control erosion and sedimentation; erosion control measures would be maintained and continued until adequate vegetation cover is re-established; vegetation would be removed only when necessary; topsoil removed by construction activities would be stockpiled for reclamation; sensitive habitat areas would not be used for topsoil storage; topsoil piles may be required to be seeded following the BLM seeding policy; and cuts and fills for new roads would be sloped to prevent erosion and to facilitate revegetation.

Expedient reclamation of disturbed land with topsoil salvage, proper seedbed preparation techniques, and appropriate seed mixes, along with use of erosion control measures (e.g., waterbars, water wings, silt fences, culverts, rip-rap, gabions etc.) would ensure soil productivity and stability is regained in the shortest time frame.

Mitigation measures would limit impacts from soil disturbances. It is anticipated that approximately 4 acres would remain disturbed following interim reclamation.

Cumulative Effects: It is anticipated that approximately 4 acres of disturbance would remain following interim reclamation on the proposed project. Also, the reasonable foreseeable development from Coal Creek production could have an additional 4 acres of disturbance following reclamation. During the next 20 years, soil disturbances from CBNG development, conventional oil and gas development, coal mining, and other projects considered under the cumulative effects analysis would result in the short-term disturbance of about 132,000 acres of soil. These disturbances would be reduced to about 92,200 acres during the production phase of CBNG, conventional oil and gas activities and coal mining. Cumulative effects may include soil compaction, mixing of horizons, loss of soil structure, exposure of soil, loss of soil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts may result in decreased soil productivity, decreased soil health and potential change in surface flora and subsurface flora and fauna on these disturbed areas. In much of this acreage, soils would be taken out of production or require long periods before they can regain productivity.

4.3.9 Vegetation

Direct and Indirect Effects to Vegetation: Impacts would be similar to Alternative B, however approximately 17 acres of disturbance would be associated with the addition of the federal wells and two track trails.

Direct and Indirect Effects to Special Status Species: Same as Alternative B.

Direct and Indirect Effects to Invasive Species: Impacts would be the same as Alternative B.

Cumulative Effects: Similar to Alternative B, however approximately 4 acres of vegetation would remain disturbed following reclamation.

4.3.10 Wildlife and Fisheries/Aquatics

Direct and Indirect Effects to Wildlife: Impacts to wildlife resources with this alternative are essentially the same as those described in Alternative B. The increased disturbances with this alternative when compared to those in Alt. B, ie., 3 acres of lost habitat vs. 7 acres of lost habitat, 1 mile of road vs. 3 miles of roads, etc are not considered significant enough to warrant additional analysis.

However, in order to ensure the maximum protection to wildlife habitat, this alternative requires a Wildlife Monitoring and Protection Plan (WMPP) be implemented. As required in this plan, key wildlife species would by monitored annually throughout the life of the project, power lines would be buried throughout the project area, and additional standards outlined in the Biological Opinion: signing, speed limits, or speed bumps would be placed on all project access roads to reduce mortality and disturbance caused by vehicle traffic and temporary and permanent access roads would be avoided on south-facing slopes within big game winter range.

Additionally, many of the requirements in the MT FEIS and CBNG Preparation Guidebook were designed to reduce impacts to wildlife and other natural resources. Examples of the requirements outlined in the above mentioned documents include measures, such as burying power lines wherever possible, minimizing road and well pad construction, and the use of disturbance corridors for combining utility lines and access roads. Powder River Gas LLC., has offered as part of the proposed action, and the BLM has recommended that all CBNG wells use remote monitoring. The use of remote monitoring would minimize the need to visit well locations, resulting in fewer disturbances to wildlife and their habitat.

Direct and Indirect Effects to Fisheries and Aquatics: Potential impacts from Alternative C would be similar to Alternative B. There would be a slight potential for increased erosion and changes in water quality and streamflows. The potential for a slight change in impacts is attributed to constructing additional access roads, pipelines, reservoirs and well pads; and the amount of treated discharge of CBNG produced water into the Tongue River, which is a total of 1 cfs (0.44 cfs increase over Alternative B).

There would be “no effect” to the endangered pallid sturgeon (BLM letter to USFWS 2003). This is due to: (1) no habitat present in the project area (nearest habitat is located within the Yellowstone River, which is approximately 180 miles downstream) and (2) the low amount of discharged flow and drainage area affected when compared to the

flow and drainage area of the Yellowstone River.

Cumulative Effects to Wildlife: The increase in impacts to wildlife resources from cumulative effects under this alternative would occur in addition to those described in the cumulative impacts described under Alternative B (see Wildlife 4.2.10). In addition, an estimated 2,560 to 20,480 acres of habitat would be indirectly impacted by this project, utilizing ½ and 2 mile buffers.

Cumulative Effects to Fisheries/Aquatics: The only difference from Alternative B and this alternative is the 0.44 cfs of treated water and the constructing of additional access roads, reservoirs, pipelines, and well pads associated with the federal portion of the proposed project. As a result, there would be a slight increased potential for cumulative effects on aquatic species and habitat above those identified in Alternative B.

West Nile Virus

There is potential to increase mosquito habitat with this alternative above the effect identified in Alternative B (through the use of reservoir storage). As a result, West Nile Virus could increase. However, this project is only scheduled to operate for six months. This amount of time will limit the effect this project can have on mosquito populations. Future development (beyond these six months) will be analyzed under another environmental analysis.