Chapter 4
Environmental Consequences

4.1 Introduction

This chapter presents the potential environmental, social and economic impacts from the actions described for each alternative in Chapter 2. This chapter is organized by alternatives with a description of the impacts to each of the resources listed in Chapter 3 presented for each alternative.

The duration of the possible impacts is analyzed and described as either short-term or long-term. As defined in the MT EIS, short-term is up to 5 years and long-term is greater than 5 years. The life of producing wells in the Project area is estimated to be from 10 to 15 years with final abandonment and reclamation to be completed within 2 to 3 years after cessation of production of each well.

Cumulative impacts analysis considers the possible impacts from each alternative in combination with other relevant cumulative activities presented in Section 2.4.

4.1.1 Assumptions used for Analysis

Certain assumptions are used for impact analysis purposes. The assumptions are based upon information in the proposed Project description, the MT EIS, historical data and professional experience. Assumptions used in the analysis of the alternatives in Chapter 2 include:

<u>Access</u>	
Two Track Trails:	12 feet wide
Bladed Route:	12 feet wide
All Weather Road:	12 feet wide travel surface, 25 feet wide with ditches
<u>Well Sites</u>	
Drilling:	1 acre disturbed
Production:	¼ acre disturbed, remaining disturbance reclaimed
Wells:	up to 5 wells per site
Sites:	1 site per 160 acres
<u>Batteries</u>	
Multiple Compressors, 1 Meter House:	2 acres disturbed
<u>Flowlines/Power Lines</u>	
Low pressure gas:	15 feet wide disturbed
Intermediate gas:	25 feet wide disturbed
Water:	15 feet wide disturbed
Aerial power:	10 feet wide disturbed
Buried power:	15 feet wide disturbed

4.2 Impacts of Alternative A—No Action

4.2.1 Impacts on Air Quality from Alternative A

The size of the project is 92 producing wells under Alternative A, the No Action Alternative and 178 producing wells under the Proposed Action, Alternative B, and the Preferred Alternative, Alternative C.

This level of activity is below the 515 producing wells analyzed in the No Action Alternative of the Montana Statewide Final Oil and EIS and Amendment of the Powder River and Billings RMPs (MT EIS) (BLM, 2003). The results of the air quality analysis found in the MT EIS (page 4-20) and Air Quality Appendix (pages AIR-15 through AIR-19) show that impacts are negligible for all air quality impact indicators at that level of development.

Air quality modeling is required for sources if a State of Montana air quality permit is necessary. This modeling is completed to demonstrate compliance with Montana and National Air Quality Standards (MAAQS/NAAQS). A New Source Review – Prevention of Significant Deterioration of Air Quality (PSD) increment analysis is not normally required for CBNG sources. However, as a result of the potential for high levels of CBNG development projected in the MT EIS, the MDEQ determined that CBNG compressor stations must meet PSD increments for NO_x. The MDEQ has found that the NO_x emissions are the limiting pollutant from compressor stations because such emissions are the most likely pollutant to violate any ambient air quality standard or increment. As a result of the MT EIS analysis of CBNG projects comparable in size to the project and MDEQ's findings, additional modeling for this EA was only completed for the pollutant of concern identified by the MDEQ.

At the request of the BLM, the Montana Department of Environmental Quality (MDEQ) reviewed nitric oxide and nitrogen dioxide (NO_x) modeled emissions from all the known CBNG compressor stations in Montana, the Spring Creek and Decker Mines, and the known Wyoming Sources of CBNG development within 20 kilometers of an area near the center (Seven Brothers 35 Battery) of the project area. Analyzed sources and results are grouped by the Montana Sources, Wyoming Sources and All Sources combined (see the Air Quality Technical Report for more details about the modeling completed for this EA). Emission sources include existing, proposed and reasonably foreseeable sources where exact locations and critical analysis parameters are known. The model was prepared for Alternative B only because the number of compressors would not vary by more than two 400 hp compressors across all the alternatives for direct and indirect impacts, and six 400 hp compressors for cumulative impacts, and Alternative B includes the most compressors under consideration. Therefore, the description of impacts under Alternative A and Alternative C only refer to qualitative differences and the reasons for such differences.

4.2.1.1 Direct and Indirect Impacts - Pollutant Concentrations

Background concentrations are determined by monitoring (see Table 3.2.1-1) and are intended to represent overall air quality. Concentrations from industrial development are estimated by computer models that derive modeled concentrations from emission rate, terrain and meteorology. Total concentrations are calculated by adding background concentrations to modeled concentrations.

<u>Nitrogen Dioxide</u>
Nitrogen dioxide (NO_2) concentrations for the Alternative A would be less than the NO_2 concentrations for Alternative B. This is primarily because the Visborg 25 Battery and two 400 hp compressors would not be needed under this alternative and less activity would occur during both the construction and operational phases (see Impacts on Air Quality from Alternative B).

<u>Carbon Monoxide, Sulfur Dioxide and Particulate Matter</u>
As shown in the MT EIS (page 4-20) and MT EIS Air Quality Appendix (pages AIR-15), the impacts from a small coal bed natural gas operation such as would occur under Alternative A would be negligible. Therefore, additional modeling was not conducted to determine concentrations of carbon monoxide, sulfur dioxide and particulate matter.

Concentrations of carbon monoxide, sulfur dioxide and particulate matter would be less than what would occur under Alternative B. This is primarily because the Visborg 25 Battery and two 400 hp compressors

would not be needed under this alternative and less activity would occur during both the construction and operational phases (see Impacts on Air Quality from Alternative B).

4.2.1.2 Direct and Indirect Impacts - Visibility and Atmospheric Deposition

As shown in the MT EIS (pages 4-20, 4-22 and 4-23) and MT EIS Air Quality Appendix (pages AIR-17 through AIR-19) the visibility impairment and atmospheric deposition from a small coal bed natural gas operation would be negligible. Therefore, additional modeling was not conducted for visibility impairment and atmospheric deposition.

Visibility impairment and atmospheric deposition would be less than what would occur under Alternative B. This is primarily because the Visborg 25 Battery and two 400 hp compressors would not be needed under this alternative and less activity would occur during both the construction and operational phases (see Impacts on Air Quality from Alternative B).

4.2.1.3 Cumulative Impacts

Nitrogen Dioxide
Cumulative concentrations of NO_2 for Alternative A are almost identical to the cumulative NO_2 concentrations for Alternative B. This is because of the small variation in the number of emission sources between the two alternatives. Only six more 400 hp compressors are included as emission sources for the cumulative impact analysis under Alternative B.

Carbon Monoxide, Sulfur Dioxide, Particulate Matter and Visibility and Atmospheric Deposition
All of the direct and indirect impacts are negligible for these impact indicators, resulting in negligible contributions to overall cumulative impacts. The MT EIS includes an analysis of regional cumulative air quality impacts under numerous development scenarios. The emission sources included in the cumulative impact analysis completed for the MT EIS includes many sources that are not considered relevant cumulative actions for this analysis (see Section 2.4).

The air quality impacts of some of the cumulative actions considered in this EA are already a part of the background pollutant concentrations considered for the prediction of direct and indirect impacts in the MT EIS. Emissions from the Decker and Spring Creek coal mines are assumed as part of the background pollutant concentrations used in the MT EIS, although potential increases of emissions from the Spring Creek and Decker Mines are also included for the analysis of cumulative impacts in the MT EIS. The potential increases of emissions (Spring Creek Mine only) are based on a projection of the location of mining activity and annual coal production changes between 2000 and 2006, the projected peak emission year used in the MT EIS for CBNG development in Montana and Wyoming.

The modeling completed by the MDEQ for this EA included NO_X emissions from the Decker and Spring Creek coal mines for comparisons with NAAQS and MAAQS. However, the MDEQ does not consider the Spring Creek or Decker coal mines to be increment consuming sources. Therefore, only CBNG sources were included in the increment consumption analysis completed by the MDEQ. The BLM did not complete a regulatory PSD Increment Consumption Analysis for this EA because this type of analysis is an air quality regulatory agency responsibility. However, the MDEQ completed a PSD Increment Consumption Analysis for the compressors permitted in the project area and it is being used along with additional modeling completed by the MDEQ for the disclosure of air quality impacts from NO_x emissions in this EA.

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 this 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 Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (WY EIS) (BLM, 2003b) completed by the Wyoming BLM also considered the far field effects (e.g., Northern Cheyenne Reservation) from a level of CBNG development comparable to the Wyoming CBNG activity considered a cumulative action in this EA. This is because the air quality analysis for the No Action Alternative (Alternative 3) in the WY EIS considers more than 2900 CBNG wells in the Wyoming portion of the Upper Tongue River sub-watershed; and this analysis shows no Class I standards exceeded at the far field receptors including those located on the Northern Cheyenne Reservation (WY EIS, Appendix F, page F-28).

The cumulative impacts from Alternative A 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 modeling for this EA, completed for the pollutant considered most likely to violate any ambient air quality standard or increment.

If continuing expansion of CBNG activity occurs, there would likely be a need to complete more site specific modeling of fugitive dust emission sources. This is because of the potential cumulative impacts disclosed in the MT EIS concerning PM_{10} concentrations compared to the NAAQS, MAAQS and PSD Increments. However, the level of CBM development and other cumulative actions considered as part of the alternatives analyzed in this EA only increases PM_{10} emissions slightly above background conditions. The Record of Decision for the MT EIS stated the BLM and MDEQ would establish an interagency work group, including participation of the Northern Cheyenne Tribe. This group has been established. As a result of concerns related to air quality, an air quality task group has also been formed. This group is actively working on issues directly related to the analysis of air quality impacts. It has identified specific tasks to ensure proper establishment of baseline emission inventories for PSD Increment analyses and analyses of Air Quality Related Values, and the assessment and mitigation of cumulative impacts. This group's efforts are expected to ensure additional analysis of future CBNG projects is completed properly; when the level of CBNG activity warrants additional analysis to supplement the regional cumulative impact analysis completed for the MT EIS or the type of analysis completed for this EA.

4.2.3 Impacts on Lands and Realty from Alternative A

4.2.3.1 Direct and Indirect Impacts

Surface and mineral ownership would remain in the same categories as found in Table 3.4-1. No change in ownership from one category to another is proposed. On private lands there could be a change from one owner to another owner occur.

The BLM right-of-way in Section 26, T. 9 S., R. 40 E. would not be impacted. The right-of-way would remain in effect as long as the annual fees were timely paid and compliance with the terms and conditions was satisfactory. The county road to which the right-of-way applies would receive increased vehicle traffic which would result in faster deterioration without proper maintenance.

4.2.3.2 Cumulative Impacts

Cumulative impacts would not affect the land and mineral ownership in the Project area.

4.2.4 Impacts on Social and Economic Conditions from Alternative A

4.2.4.1 Direct and Indirect Impacts

The 72 private wells and the 20 State wells to be drilled during the development phase represents twelve percent of the approximately 760 wells predicted in the MT EIS to be drilled in Big Horn County and 38% of the total 2000 wells projected during the first two years, (see Table 4-49, page 4-117, Table 4-50, page 4-119 and the Minerals Appendix, page Min-17, MT EIS). The potential direct and indirect impacts include annual increases in government revenues, including property, production and income taxes and State production royalties over the life of the wells. There will be increases to personal income and additional demands on public services due to the few temporary jobs related to the development drilling and production. The employees will most likely commute from the Sheridan, WY area so there would be no impacts on the Reservations.

CBNG would be produced by state and private wells only because federal wells would not be drilled under this alternative. Producing state and private wells adjacent to federal leases would drain CBNG from part of the federal lease area. The total amount of gas produced in the CX Field would be less than if gas production was also occurring from federal leases. Less natural gas would go into the market place without production from federal wells. Royalties that would be paid on production of CBNG produced from federal wells would not be paid which would result in less revenue available to federal, state and county governments.

Environmental Justice

Although American Indian Reservations are located near the project area, they would not be affected because project employees would likely commute from Sheridan, Wyoming, which is located in the opposite direction from the Reservations. Therefore, no adverse human health or environmental effects would be expected to fall disproportionately on minority or low income populations from this alternative.

4.2.4.2 Cumulative Impacts

The project will be an incremental addition to the existing development and the proposed projects in southern Big Horn County. The temporary development and permanent production jobs required for the life of the project will likely come from the Sheridan, Wyoming area labor force. The jobs will offset some of the mining jobs lost due to production declines at the Montana mines as contracts expire and productivity increases. The CBNG production taxes and royalties will also offset some of the reduced coal production taxes and royalties.

Environmental Justice

No adverse human health or environmental effects would be expected to fall disproportionately on minority or low income populations from this alternative. No cumulative impact would occur to minority or low income populations from this alternative.

4.2.5 Impacts on Soils from Alternative A

4.2.5.1 Direct and Indirect Impacts

Soil erosion from wind and water may occur during and shortly after road and well construction. Loss of vegetative cover would allow wind and water erosion at well sites, roads and other disturbed areas. Compaction of soils would occur at and adjacent to these sites due to equipment operation. Once construction is completed and vegetation is reestablished, erosion and compaction should return to natural conditions. Acreage disturbed under this alternative would be less than under the proposed action alternative.

Land Application Areas

Approximately 152 acres of current crop and rangeland would be used in a managed irrigation system to dispose of produced water. The water application would be at an agronomic rate such that all applied water is held in the upper soil profile where it is available for plant uptake and evapotranspiration. Mitigation for potential direct and indirect effects are covered in the Protocol for Evaluating, Designing, Operating and Monitoring Managed Irrigation Systems for Coal Bed Natural Gas Produced Water (Harvey, 2003). Mitigation would include baseline analysis of soil and water characteristics (see Appendix 2). Soils will be sampled on a semi- to annual basis to determine effects to soil physical and chemical characteristics. Water balance projections will be used to determine appropriate water application rates for plant use, evaporation rates and leaching fraction. Geochemical models will be used to predict soil chemistry changes and determine rates of amendment application.

If the irrigation is not managed properly, direct effects would include a vegetative composition change to more salt and water tolerant native species. The existing rangeland species proposed for irrigation are generally xerophytic, drought tolerant and intolerant of excessive soil moisture levels. Woody species, particularly sagebrush, would decrease or be eliminated due to excessive soil moisture and/or increases in soil salt content. Loss of some species could reduce vegetative cover, exposing the site to increased wind and water erosion. Irrigation of these sites after species composition has changed and plant numbers decrease may be the largest source of erosion at these sites.

Soil structural failure could occur as a direct effect of increased sodium content, leading to soil dispersion, swelling and crusting. Soil dispersion would result in a reduction of infiltration keeping water at the surface. This could increase water erosion potential due to off site movement of water. Soil structure destruction would also increase potential for wind erosion.

Irrigation rates would be regulated so that the infiltration rate of the least permeable soil horizon would not be exceeded. If not regulated properly, indirect effects to the land application sites include the potential for elevated groundwater levels in the irrigated and adjacent areas. However, the likelihood of this situation occurring is low by using the managed irrigation system proposed by Fidelity. Soils and geology at the sites must be examined to determine potential fate of irrigation waters below the surface. Elevated groundwater may affect vegetative composition of the native rangeland at or adjacent to the irrigation sites. As species composition changes, species remaining at the site may be less able to utilize the water applied, increasing the potential for elevated groundwater and groundwater movement. Elevated groundwater may result in saline seeps down gradient from the irrigated sites. Saline seeps would have a high salt concentration resulting in soil dispersion at the seeps. Soils dispersion would result in saline bogs forming at these sites.

Regulation of irrigation rates would also result in the applied water flowing vertically into the subsurface where it would be available for plant uptake rather than flowing horizontally as surface runoff. Other

indirect effects include the potential leaching of soluble salts to groundwater or to adjacent surface water. The likelihood of this situation occurring is also low by using the managed irrigation system proposed by Fidelity. The managed irrigation sites would be monitored to determine fate of water and salts at and adjacent to the sites. The potential for elevated groundwater and potential groundwater movement may be reduced by planting domestic species with higher water consumption characteristics. There is also a potential for plant and soil micronutrient imbalances as a consequence of elevated soil salinity levels.

Water Impoundment Areas

During the reservoir site selection, backhoe pits were excavated near the center of each proposed site. Soils were examined and physical and chemical characteristics were analyzed to determine suitability for reservoirs. Soil series and characteristics are described in Fidelity's Plan of Development.

4.2.5.2 Cumulative Impacts

Most direct effects to soils would end with the removal of production facilities and reclamation of the disturbed areas. Most areas would revert to native conditions within a short time frame. Development at various areas in the region would result in soils disturbance at different stages of disturbance and rehabilitation. At the managed irrigation sites, cumulative effects could include future soil failure and subsequent loss of vegetative cover and surface soil stabilization after irrigation has ceased. This may result through rain and snow fall effecting salinity levels and effecting soil chemistry. Long term irrigation of the sites may result in effects that may not be expressed for several years. These sites would have to be monitored for some period after the irrigation ceases to identify soil chemistry changes under natural conditions. Regional development of methane and other activities would have limited effects on the soils of the project area.

4.2.6 Impacts on Water Resources from Alternative A

4.2.6.1 Direct and Indirect Impacts

The direct and indirect impacts result from the drilling and production of the State and private wells in the project area. As the water from these wells would be managed in conjunction with the water produced by the CX field, the water production from the CX field is taken into account in this direct impacts section rather than under the cumulative impacts section.

The beneficial use of 235 gpm of CBNG produced water by the Spring Creek Coal Mine and 370 gpm by Decker Coal Mine for industrial purposes, such as dust control, would not impact surface water or groundwater resources (see Badger Hills Hydrology Technical Report).

Surface Water

For the purpose of this analysis, it is assumed that Fidelity would use its full 1,600 gpm (3.56 cfs) of produced water discharge authorized by it MPDES permit even if the federal wells within the project area are not drilled. Based upon the water balance calculations conducted for this analysis, it is anticipated that the full 1,600 gpm would only be discharged for 3 months under this alternative. The discharge to the Tongue River would be anticipated to return to current levels (984 gpm) in approximately 17 months under this alternative (see Badger Hills Hydrology Technical report).

A surface water model was used to determine the surface water quality that would result from discharges into the Tongue River. This model uses a steady-state, mass-balance approach to estimate values for EC, Na, Ca and Mg after two or more inflows are mixed. This approach assumes complete mixing and so the

results are only valid outside of the mixing zones associated with the outfalls. The maximum permitted discharge of 1,600 gpm (3.56 cfs) was used for the Badger Hills/CX Field. Mixing effects of the Tongue River Reservoir are also assessed. Discharges from the coal mines are included in the reservoir component of the surface water model. SAR values are calculated from resultant ion concentrations. The results of these calculations are shown in Table 4.2.6-1 below. The surface water model used to calculate the resultant surface water quality values is discussed further in the Badger Hills Hydrology Technical Report.

Table 4.2.6-1. Direct Impacts from Badger Hills Discharges

	Tongue River at State Line					
	Existing Conditions (1985-2002)*			Direct Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	35	1,193	1.42	39	1,266	2.37
Low Monthly Mean	176	636	0.70	180	663	0.98
High Monthly Mean	1,638	267	0.26	1,642	270	0.31

	Tongue River Below Dam					
	Existing Conditions (1975-2002)*			Direct Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	23	1,043	1.24	27	1,064	1.58
Low Monthly Mean	173	657	0.70	177	676	1.01
High Monthly Mean	1429	281	0.28	1,433	284	0.31

	Tongue River at Birney Day School					
	Existing Conditions (1979-2002)*			Direct Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	49	1,125	1.56	53	1,146	1.90
Low Monthly Mean	179	717	1.02	183	736	1.33
High Monthly Mean	1,119	379	0.56	1,123	382	0.59

* These values include the effects of CBNG in Wyoming. No new discharges into the Tongue River are being permitted in Wyoming.

The 7Q10 Values for the State Line and Birney Day School Station have changed from the original EA due to updated USGS data.

Actual variations in surface water chemistry would be monitored through the MPDES permitting process and the USGS gaging stations on the Tongue River. If monitoring results indicate that surface water quality standards may be exceeded, the MDEQ may require that appropriate action be taken to ensure that surface water quality standards are met. This may require decreasing or ceasing discharge to the Tongue River until a revised WMP is developed and approved, which ensures that surface water quality standards are met. Under this alternative the BLM would have no regulatory oversight of the project.

The Montana Board of Environmental Quality has established surface water standards for EC and SAR. These standards have been reviewed and approved by the EPA and therefore have Clean Water Act standing. The Northern Cheyenne Tribe has also adopted surface water quality standards for EC and SAR. EPA has not approved these standards and the Northern Cheyenne Tribe has not been granted "Treatment as a State" status by the EPA. As such, the Northern Cheyenne numerical standards do not have Clean Water Act standing; however, they do set out the Tribe's considered determination of the water quality needed to protect irrigated agriculture on the Reservation (Northern Cheyenne Tribe, 2002). The Northern Cheyenne standards provide reasonable criteria against which to compare the resulting

water quality at the southern boundary of the Northern Cheyenne Reservation. These various standards are summarized in Table 4.2.6-2. The standards are in terms of monthly mean values or instantaneous maximum values.

Table 4.2.6-2. Surface Water EC and SAR Standards for the Tongue River

	Monthly Mean SAR	Inst. Max SAR	Monthly Mean EC (µS/cm)	Inst. Max EC (µS/cm)
MDEQ Irrigation Season[1] Standards	3.0	4.5	1,000	1,500
MDEQ Non-Irrigation Season[1] Standards		7.5	1,500	2,500
Northern Cheyenne Irrigation Season[1] Standards; Southern Boundary	---	2.0	1,000	2,000
Northern Cheyenne Non-Irrigation Season[1] Standards; Southern Boundary	---	2.0	---	2,000

1: The Irrigation Season specified by the MDEQ is from March 1st to October 31st while the Irrigation Season specified by the Northern Cheyenne is from April 1st to November 15th.

The high mean monthly and low mean monthly results should be compared to the mean monthly standards, while the 7Q10 result should be compared to the instantaneous maximum standards. The 7Q10 value is a standard regulatory value used to address instantaneous maximum standards. This is appropriate since the 7Q10 is the lowest flow that would be expected to occur for 7 consecutive days over any 10 year period. The 7Q10 flow value is much less than the mean monthly values. For example, in the Tongue River at the state line station, the 7Q10 flow is 35 cfs while the Low Monthly Mean flow is 176 cfs and the High Monthly Mean flow is 1638 cfs.

Comparison of the resultant water quality values to the appropriate standards shows that during high mean monthly and low mean monthly flows, none of the mean monthly standards would be exceeded. During 7Q10 flows, the instantaneous maximum standards are not exceeded. During the 7Q10 flow, the mean monthly irrigation season EC standards would be exceeded for all stations, however, as mentioned above, these are not appropriate standards for comparison. The natural in-stream water quality during 7Q10 flow at all stations also exceeds these standards. The results of this analysis indicate that actions implemented in this alternative would not cause any of the appropriate surface water standards for EC or SAR to be exceeded. Since these standards were adopted for the express purpose of protecting all beneficial uses of the Tongue River, it is anticipated that the beneficial uses of the Tongue River will not be impaired.

The MDEQ has also analyzed the effects of this discharge for all numerical and narrative surface water standards. The MDEQ has determined that the 1,600 gpm discharge will not impact beneficial uses. The MDEQ is currently in the process of reviewing this permit in light of the new EC and SAR standards, particularly with regard to the provision of these standards which call for flow based permitting. The MDEQ must review approved permits to discharge at least once every 5 years.

Under this alternative, the maximum volume of water produced would be approximately 2,257 gpm from the CX Field, including water produced by state and private wells in the project area. The existing MPDES discharge permit (1,600 gpm) and beneficial use of the water for coal mines (605 gpm) along with existing storage in the CX Field would be adequate to manage this produced water; however,

Fidelity has indicated in its POD the proposed impoundments and irrigation areas would still be constructed.

The 3 new impoundments (34-3490, 44-3490 and 22-3590) and the 1 existing (33-3390) impoundment have been, or will be, constructed with low permeability clay liners to prevent infiltration. Since evaporative concentration of the water in the pits may occur, the salinity of the water could become quite high, depending on the rates of water addition and removal. If the salinity of the water in the impoundments became too high, it could have adverse impacts on wildlife or livestock. If water were to infiltrate through the liner, it would have the potential to dissolve soluble salts and partake in cation exchange reactions with clays in the underlying bedrock. These reactions are likely to cause the SAR of the water to be decreased and the EC to be increased. These waters would have the potential to flow through permeable bedrock units to outcrop, thereby forming saline seeps. The quality of the water emitting from such seeps would be quite low and impacts to local vegetation could occur. If these seeps occurred near surface waters, there would also be the potential to affect surface water quality. Under this alternative, the required monitoring would be that described in Fidelity's November 25, 2003, letter to MBOGC (see appendix D of the Badger Hills Hydrology Technical Report). This monitoring pertains only to impoundment 44-3490. Impoundments 22-3590 and 34-3490 have no monitoring required by MBOGC.

These impoundments are located off drainage, in headwater areas. As such, they would not intercept a noticeable volume of the water that would normally flow downstream. The only interception would be that from direct precipitation on the impoundments and from the limited areas that drain to them. A summary of the impoundments is provided in Table 4.2.6-3. The impoundments would be constructed and operated to accommodate runoff from a 100-year storm event in 24 hours. An emergency spillway would be installed in each impoundment. As such, it is not anticipated that these impoundments would overflow. If an impoundment were to overflow, the dilution added to the impoundment by the rainfall would decrease the salinity of the water in the impoundment. The volume of flow down-drainage would be the same as if no impoundment were present because the surface area would be the same. The impoundment would not be anticipated to blow-out since an emergency spillway would be present.

Table 4.2.6-3: Badger Hills Off Channel Lined Impoundments

Facility Name	Status	Location				Capacity (Ac-ft)	Surface Area (Acres)	Contributing Drainage Area (Acres)
		Town	Rng	Sec	Qtr			
34-3490	Proposed	9	40	34	SWSE	109	8.2	10.24
44-3490	Proposed	9	40	34	SESE	228.3	14.4	7.68
22-3590	Proposed	9	40	35	SENW	122	7.2	22.4
33-3390	Existing	9	40	33	NWSE	4.14	0.77	21.76

Upon cessation of use, the impoundments would be reclaimed or left in place for livestock or wildlife use, depending on the desires of the surface owner.

Irrigation with the CBNG produced water on the 152 acres is not anticipated to affect surface waters. When irrigation is taking place, monitoring personnel would be present to prevent the direct flow of produced water into Badger Creek. Irrigation rates would be regulated so that the infiltration rate of the least permeable soil horizon would not be exceeded. This would result in the applied water flowing vertically into the subsurface where it would be available for plant uptake rather than flowing horizontally as surface runoff. If excess water were applied along Badger Creek, the infiltrated water could infiltrate and intersect an aquatard and flow horizontally to the stream. If excess water were applied to the irrigation area on the bench, the infiltrated water could intersect an aquatard and flow horizontally to the

outcrop. After these waters had infiltrated, they would have the potential to dissolve soluble salts and partake in cation exchange reactions with clays in the underlying bedrock. Once these waters reached the surface (stream or outcrop), they could form saline seeps. The likelihood of this situation occurring is low using the managed irrigation system proposed by Fidelity. However, because there are no monitoring wells adjacent to the irrigation areas installed under this alternative, it would be difficult to verify that the assumptions used for determining the irrigation rates were correct.

The construction and drilling activities associated with the state and private wells in the project area would cause the disturbance of vegetation and cause corresponding increases in soil erosion rates. Approximately 200 acres of disturbance are anticipated to result in the project area under this alternative. Approximately 79 acres of this disturbance would be short term (< 5 years; well pads and utility corridors), with reclamation occurring following construction activities. The remaining 121 acres are long term (> 5 years) disturbance mainly associated with impoundments, roads (2-track and improved) and gathering/metering facilities. Increased soil erosion could cause increases in suspended sediment loads to local surface waters. The increase in suspended sediments to surface waters resulting from disturbance would be minor, based on the operator's plans and the presence of sediment filtering vegetation between the disturbed areas and live waters.

Groundwater

The state and private wells would be drilled, tested and produced if productive. The removal of water from the coal seams would cause a cone of depression to form around each well.

The radius that the drawdown would extend from the produced field was calculated using the analytical Theis Equation and regional aquifer characteristics. The results of this analysis are shown in Table 4.2.6-4 below. Additional discussion of these drawdown calculations is provided in the Badger Hills Hydrology Technical Report.

The 20 foot drawdown contour that results from the state and private wells within the project area is estimated to extend up to 3.1 miles from the project area boundary. These results compare well with the results of the 3D groundwater model prepared in support of the MT EIS (Wheaton and Metesh, 2002), which indicates that the 20 foot drawdown contour from a simulated 1,082 CBNG well field, with wells finished in 3 coal seams, may extend up to 5 miles from the edge of production. The actual drawdown would be dependent on the site-specific aquifer characteristics and actual pumping rates.

This reduction in hydrostatic head could cause water wells finished in the produced coal seams within the radius of drawdown to have reduced yields. Due to the low vertical hydraulic conductivity of the Tongue River member of the Fort Union Formation, aquifers other than the produced coals are not anticipated to be affected. Water wells would not be anticipated to go dry since during the production of CBNG the coal seam hydrostatic pressure is decreased, but the coal remains saturated. Those springs which emit from the coal seams being produced and are located within the drawdown area would have decreased yield, or may go dry. It has been reported (Billings Gazette, 1/30/04) that 3 domestic water wells have been impacted by CBNG development in Wyoming. These wells lay outside the potential drawdown area of project wells.

Table 4.2.6-4: Summary of Predicted Drawdown for Alternative A.

Years Pumped	Coal Seam	Radius of 20' Drawdown Contour (miles)
1 Year	Dietz 1	0.90
	Dietz 2	0.80
	Dietz 3	0.77
	Monarch	0.86
	Carney	0.88
5 Years	Dietz 1	1.9
	Dietz 2	1.7
	Dietz 3	1.7
	Monarch	1.9
	Carney	1.9
10 Years	Dietz 1	2.6
	Dietz 2	2.3
	Dietz 3	2.3
	Monarch	2.5
	Carney	2.5
20 Years	Dietz 1	3.1
	Dietz 2	2.9
	Dietz 3	2.9
	Monarch	3.1
	Carney	3.1

K = 1.1 feet/day S = $9x10^{-4}$

A total of 378 wells and 1 spring exist within the 3.1 mile buffer zone around the project area. Of these wells, 337 are monitoring wells and 41 are domestic or stock wells. Of these domestic and stock wells, 36 wells are located within the potential drawdown areas associated with the existing CX Field and Wyoming CBNG development. The one spring (Thompson J.W. *14 miles of Big Bend School) is also located within the existing drawdown area. The direct drawdown area under this alternative has a total area of 87 square miles. Only those domestic wells completed in the coal seams being developed would have the potential to be affected by CBNG development. Of the springs in the buffered area, only those that emit from the coal seams being developed would have the potential to be affected. Most springs in this area emit from the clinker deposits found along the ridge tops. A detailed listing of the wells and springs contained within the 3.1 mile drawdown area and a map of these wells and springs are provided in the Badger Hills Hydrology Technical Report.

This reduction in pressure within the coal seams could also cause methane gas (CH_4) to become desorbed more easily from the coal surfaces. In the cases where the pressure is sufficiently reduced to cause desorption by a CBNG well, the methane released would flow towards that CBNG well and be sent to market. In some cases, the drawdown from CBNG development would not be sufficient to cause desorption, however, it does reduce the pressure in the coal seam. In such a case, the water wells completed in the CBNG producing coal seam could cause the desorption of gas at pumping rates which historically would not have caused this gas to be desorbed. Gas released this way may affect quality of water flowing to the domestic well and may affect the usability of these water wells.

Based upon the groundwater modeling conducted in support of the MT EIS, it is anticipated that the

produced coal seams would recover 70% of their hydrostatic head within 5-12 years after the end of production. The exact radius of the drawdown cone and the time required for the head to recover, would depend on the site specific aquifer properties. For additional information on anticipated impacts to groundwater from this alternative, please see the Badger Hills Hydrology Technical Report. For additional general discussion of the anticipated drawdown related impacts, see pages 4-61 to 4-63 of the MT EIS (BLM, 2003) and the associated groundwater modeling reports (Wheaton and Metesh, 2001, Wheaton and Metesh, 2002).

Fidelity has committed in its POD to comply with all applicable Federal, State and Local laws and regulations which includes compliance and requirements of the DNRC's designation of the Powder River Basin Controlled Groundwater area. 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 wells (DNRC, 1999). As such, these agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the production of methane, or a change in water quality.

Fidelity has also committed to provide water well agreements to the owners of record for permitted water wells within the area of influence of the action. The terms of these agreements would be those agreed to by the water source owner and Fidelity. The typical Fidelity water mitigation agreements terminate upon the expiration of the last Oil and Gas Lease or the plugging and abandonment of the last CBNG well to which the agreement applies, whichever is the later date. 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 processes would be effective for replacing water sources since the drawdown from CBNG activity is anticipated to be confined to the coal seam aquifers and not noticeably affect other aquifers (such as sandstones) within the Tongue River Member of the Fort Union Formation. Any such lost water sources would be replaced with a permanent source before the termination of the agreement. The agreement includes a provision to establish a continuing water well program to identify changes in domestic wells and springs. Data from monitoring 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 drawn down by CBNG development. Therefore, the required water mitigation agreements would alleviate the potential impacts from groundwater drawdown, methane migration or changes in groundwater quality.

4.2.6.2 Cumulative Impacts

The cumulative impacts to hydrologic resources are those that would result from the State and private CBNG wells within the project area added to other actions that have the potential to combine to create environmental impacts.

Surface Water

As discussed in the Badger Hills Hydrology Technical Report, those cumulative actions included in this analysis include the existing wells in the CX field, the proposed CX field infield drilling, the proposed Coal Creek POD and the East and West Decker coal mines and relevant CBNG production in Wyoming.

The surface water chemistry of the Tongue River would be affected by the proposed Coal Creek CBNG project which would be discharging treated CBNG water downstream from the Tongue River Dam. The water balance calculations conducted for the Coal Creek POD indicate that a maximum discharge rate of 450 gpm, decreasing at a rate of 20% per year. The discharged water from the Coal Creek project would

have an EC of approximately 493 µS/cm and an SAR of approximately 0.03. As this discharge would be directly into the Tongue River, it is taken into account in the analysis of cumulative impacts to surface waters.

Effects from the water produced by the CX field and by the proposed infield drilling, are discussed under the direct impacts section of this analysis as this water would be managed together. The discharges from the East and West Decker Coal Mines are included in the surface water model for determining the baseline conditions.

The cumulative effects of all of these cumulative discharges are summarized in Table 4.2.6-5. Implementing proposed actions in this alternative would not cause any of the appropriate surface water standards for EC or SAR to be exceeded (see Table 4.2.6-5). These standards were adopted for the express purpose of protecting all beneficial uses of the Tongue River, including agriculture, aquatic life, drinking water, industrial uses and recreational uses. As such, the results of this analysis indicate that the beneficial uses of the Tongue River would not be impaired by the No Action Alternative.

Table 4.2.6-5: Cumulative Effect of Discharges

	Tongue River at State Line								
	Existing Conditions (1985-2002)*			Direct Surface Water Impacts			Cumulative Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	35	1,193	1.42	39	1,266	2.37	39	1,266	2.37
Low Monthly Mean	176	636	0.70	179.5	663	0.98	179.5	663	0.98
High Monthly Mean	1,638	267	0.26	1,642	270	0.31	1,642	270	0.31

	Tongue River Below Dam								
	Existing Conditions (1975-2002)*			Direct Surface Water Impacts			Cumulative Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	23	1,043	1.24	27	1,064	1.58	28	1,043	1.54
Low Monthly Mean	173	657	0.70	177	676	1.01	178	675	1.00
High Monthly Mean	1,429	281	0.28	1,433	284	0.31	1,434	284	0.31

	Tongue River at Birney Day School								
	Existing Conditions (1979-2002)*			Direct Surface Water Impacts			Cumulative Surface Water Impacts		
	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR	Flow (cfs)	EC (µS/cm)	SAR
7Q10	49	1,125	1.56	53	1,146	1.90	54	1,134	1.87
Low Monthly Mean	179	717	1.02	183	736	1.33	184	735	1.32
High Monthly Mean	1,119	379	0.56	1,123	382	0.59	1,124	382	0.59

* These values include the effects of CBNG in Wyoming. No new discharges into the Tongue River are being permitted in Wyoming.

The 7Q10 Values for the State Line and Birney Day School Station have changed from the original EA due to updated USGS data.

Groundwater

As discussed in the Badger Hills Hydrology Technical report, those cumulative actions included in this analysis include the CX field, the proposed CX field infield drilling, relevant CBNG development in

Wyoming, the proposed Coal Creek POD and the East and West Decker coal mines.

When all of these projects are combined and a 3.6 mile buffer is applied (the rational for which is discussed under Alternative B), a total of 568 wells and 27 springs exist within the cumulative buffer. Of these wells, 479 are monitoring wells and 89 are domestic or stock wells. Of these domestic or stock wells, 72 are currently located within the potential drawdown areas associated with the CX Field and Wyoming CBNG development. The impacts to these wells and springs would be similar to that described under the direct impacts section of the No Action Alternative analysis, with wells located within the drawdown cone and completed within the produced coal seams experiencing decreased yields and springs located within the drawdown cone and emitting from the produced coal seams having decreased flow, or going dry.

Fidelity has committed in its POD to comply with all applicable Federal, State and Local laws and regulations which includes compliance with requirements of the DNRC's designation of the Powder River Basin Controlled Groundwater area. 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 domestic well adversely affected. These mitigation agreements apply to any spring or well adversely affected by CBNG development (DNRC, 1999). As such, these agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the production of methane, or a change in water quality.

Fidelity has also committed to provide water well agreements to the owners of record for permitted water wells within the area of influence of its CBNG wells. The terms of these agreements would be those agreed to by the water source owner and Fidelity. The typical Fidelity water mitigation agreements terminate upon the expiration of the last Oil and Gas Lease or the plugging and abandonment of the last CBNG well to which the agreement applies, whichever is the later date. 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 processes would be effective for replacing water sources since the drawdown from CBNG activity is anticipated to be confined to the coal seam aquifers and not noticeably affect other aquifers, (such as sandstones) within the Tongue River Member of the Fort Union Formation. Any such lost water sources would be replaced with a permanent source before the termination of the agreement. The agreement includes a provision to establish a continuing water well monitoring program to identify changes in domestic wells and springs. 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 drawn down by CBNG development. Therefore, it is anticipated that mitigation measures and monitoring methods included in the required water well mitigation agreements would alleviate the potential impacts from groundwater drawdown, methane migration or changes in groundwater quality.

4.2.7 Impacts on Vegetation from Alternative A

4.2.7.1 Direct and Indirect Impacts

Vegetation at roads and well sites will be lost, reducing overall vegetative productivity in the area by minor amounts. Compaction by equipment traffic will damage nearby vegetation and affect productivity. Once construction is completed and vegetation is reestablished, erosion and compaction should return to natural conditions. Disturbance acreages under this alternative would be less than the other alternatives.

The areas with the largest potential effects to vegetation are at the managed irrigation system sites covering approximately 152 acres. Of this, 111 acres has been previously cropped and 41 acres is native

rangeland. The existing rangeland species proposed for irrigation are generally xerophytic, drought tolerant and intolerant of excessive soil moisture levels. Direct effects to plant species at the irrigation sites would be a change in species composition to those that can tolerate higher soil moisture and salt levels. Woody species, particularly sagebrush, would decrease or be eliminated due to excessive soil moisture and/or increased salt content. Species composition would change to those expected on saline upland, saline lowland, or silty - saline ecological sites away from the predominately present silty and clayey ecological sites. Dominant species expected to show as this transition occurs would include inland saltgrass and alkali scaton. While not noted in the POD, personal communication with Fidelity indicated the present native rangeland site would be planted with domestic species at some point. Plant productivity and plant morphological characteristics will be directly affected due to increased salt levels in the irrigated areas.

Plant and soil micronutrient imbalances could result indirectly as a consequence of elevated soil solution salinity levels. This may further affect species composition and productivity. Infrastructure related to this project is not expected to interrupt livestock grazing management. New water developments associated with produced water management would improve livestock distribution and vegetation management. Wildfire occurrences may increase as a result of increased facilities and human activities; however, fire fighting capabilities would improve with increased access.

Invasive Species

Areas of native vegetation disturbed by the continued use of existing facilities or by construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread. Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. 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 and perennial pepperweed. However, measures proposed by Fidelity to control noxious weeds would ensure that potential impacts from noxious weeds and invasive plants would be minimal.

4.2.7.2 Cumulative Impacts

Vegetation in the area should recover in a short time after removal of production facilities and rehabilitation outside of the irrigated areas. The irrigated areas would continue to be affected by the salt loading through irrigation and would need to be monitored to determine amounts of amendments applied. The irrigated areas may not revert to pre-irrigation condition productivity due to unmanaged salt added during irrigation for numerous years. These areas would need to be monitored for years after irrigation ceases to monitor recovery. Amendments may be needed to help re-establish desired species and restore productivity at the irrigated sites. Regional development of methane and other activities will have limited effects on the vegetation of the project area.

4.2.8 Impacts on Wildlife from Alternative A

The nature of impacts (i.e., the types of impacting activities) to wildlife resources are similar between Alternatives A and B. The primary difference between the two action alternatives and the no action alternative is the number of well sites and the amount of infrastructure (i.e., amount of new roads, powerlines, pipeline corridors, etc.) related to CBNG development, plus the associated area of influence from development. The impact to a particular species is related to the actual disturbance of each action described above. The amount of disturbance (i.e., length of road, miles of powerline, etc.) is the primary difference between the no action alternative (Alternative A) and the two action alternatives (Alternatives

B and C). As more ancillary structures are installed or constructed, the number of wildlife mortalities or related disturbance associated with these activities would increase. Attempting to quantify the actual number of wildlife mortalities or the amount of disturbance to wildlife is extremely difficult. Most of the types of impacts to wildlife resources described in this alternative also apply to Alternatives B and C.

The types and extent of impacts to wildlife resources from long-term, regional, CBNG development are discussed in detail in the MT EIS (Chapter 4, pages 4-160 to 4-196). Those discussions apply directly to this project and provide a basis for the site specific assessment of impacts to individual species (e.g., sage grouse) and groupings of species (e.g., passerine birds, big game) that would occur from the Fidelity POD.

4.2.8.1 Direct and Indirect Impacts

Threatened and Endangered Species
Direct impacts include the potential for injury or mortality as a result of new roads, increased traffic and overhead powerlines. The taking of a bald eagle may occur from collisions with vehicles and powerlines or electrocution from power lines. Indirect impacts include habitat fragmentation and human disturbance, again resulting from new CBNG infrastructure and construction and operational activities. The BLM Biological Assessment dated January 7, 2004, submitted to FWS, contains a more detailed discussion.

General Wildlife Resources

Direct Impacts
Direct impacts to wildlife resources include loss of habitat from construction of permanent CBNG infrastructure and facilities and direct mortality resulting from collisions with vehicles and power lines. Alternative A includes the construction of 3.4 miles of new, permanent all-weather roads, 9 miles of improved two-track trails, in addition to several production facilities constructed with this action. This would result in the removal of about 30 acres of habitat. There would be about 5.5 miles of above-ground powerlines and about 14 miles of pipeline/buried power corridors with this action. This would result in an additional 25 acres of disturbed habitat. Successful reclamation would stabilize disturbed sites and attempt to restore disturbed areas to predisturbance conditions. Reclamation would not always recreate predisturbance or values. Changing a shrub-grassland with intermingled forbs, to an environment characterized by a dominance of grasses, would affect those species of wildlife which are sagebrush obligates by reducing vital habitat and forage. Some species of passerine birds, some small mammals and reptiles, as well as sage grouse would be affected by this change. Due to the small number of acres directly impacted, this loss of habitat would not affect the long term viability of these species in the project area.

The increase in vehicle traffic because of new roads and trails, and the increased vehicle speeds on improved roads, would result in an increase in collision-related mortalities to all wildlife species. The most notable species impacted include deer, upland and passerine birds, small mammals and reptiles/amphibians. These additional mortalities would not have a noticeable impact on the local populations of the species affected.

Fidelity has committed to constructing aerial power lines following strict raptor protection guidelines throughout the complete project area reguardless of surface/mineral ownership. These guidelines are designed to deter raptors from perching where electrocution could occur. However, raptor mortalities do occur even with properly installed raptor protection devices on new or retrofitted existing poles (S. Milodragovich, personal communication), and could occur under this Alternative. Aerial power lines also pose a collision hazard to all avian species (Al Harmata, personal communication), especially raptors and upland game birds. The number of mortalities of raptor prey species would increase (e.g., prairie dogs

and grouse) because perch opportunities provided by aerial power infrastructure would increase, allowing raptors to be more efficient and drawing additional raptors into the project area. Even following the strictest of construction guidelines and providing state-of-the-art mitigation, aerial powerlines provide an element of risk to raptors.

Indirect Impacts

Approximately 200 acres would be directly impacted by construction activities and approximately one half of the acreage within the project boundary would be indirectly impacted from actions associated with this Alternative. Indirect impacts occur to wildlife species that are sensitive to human activities, require large blocks of uniform cover, or are displaced by other species (MT EIS, pages 4-164, 172 and 173). Examples of species that could be affected include sage grouse and mule deer. Invasive and non-native vegetative species would affect wildlife forage and habitat by changing vegetative conditions which occurred prior to disturbance.

About half of the wildlife habitat that currently is not impacted or lightly impacted by human activities would be impacted by the actions in this alternative. This would result in changes to traditional use and movement patterns, disruption to normal foraging and reproductive habits and increased energy expenditure by most wildlife species in the project area. The species most impacted by habitat fragmentation include those with larger home ranges such as big game, upland birds and raptors. Passerine and other neotropical migrant birds are impacted by interruptions to preferred nesting habitat, improved habitat for undesirable competitors such as brown-headed cowbirds and increased predation factors.

Impacts to prairie dogs and species associated with prairie dog towns (i.e., mountain plover, burrowing owl) would be minimal because no CBNG development is planned within prairie dog towns with this action.

Compressor facilities for this project would be authorized by MDEQ. Actual measured decibel levels from similar compressor facilities in the CBNG development area south of the project area are within the decibel limits established in the MT EIS to effectively reduce impacts of noise to susceptible wildlife species. Therefore, noise impacts should be minimal.

As with any disturbance, some wildlife species and individuals, including big game, can and would acclimate to sustained and regular human contact providing that contact is not perceived as threatening.

Aquatic Species

CBNG produced water would be added directly to the Tongue River as authorized under a MDEQ permit. Under 7Q10 flows, the amount of discharge into the river would not exceed surface water standards for beneficial uses. These standards were developed considering impacts to aquatic resources. Therefore, there would probably not be any impact to aquatic resources inhabiting the river (MT EIS, page 4–187) from the addition of CBNG produced water.

Produced water storage reservoirs would provide a winter environment for localized populations of amphibians, such as tiger salamanders. Data for water produced from CBNG wells in the CX Field shows the produced water quality is within limits for domestic livestock uses as required by MDEQ. This same water, which contains about 3 times the salinity levels (as measured by electrical conductivity (EC), Chapter 3, Hydrology) of average Tongue River watershed conditions, may harm aquatic organisms adapted to local conditions. Because of the relative small scale of this project, this would not be a major impact to local amphibian populations.

Water from the storage reservoirs would be piped to irrigation systems to be applied on nearby native hayfields and rangelands during the growing season. The storage reservoirs would provide water and habitat that may benefit some species (i.e., big game, waterfowl, shorebirds, etc.). Crops and increased forage produced from the irrigated fields may benefit some species, primarily deer, antelope and sage grouse, by providing additional forage.

West Nile Virus

There is no evidence that treatment, either through the use of larvicides or malithion, on a site specific or basin-wide scale would have any effect on the overall spread of the disease. State agencies have not instituted nor are they requiring treatment of mosquitoes at this time. Cumulatively, there are many sources of standing water, beyond CBNG discharge that add to the potential for mosquito habitat.

4.2.8.2 Cumulative Impacts

Direct cumulative impacts would include wildlife injuries and mortalities, and the loss of habitat. Wildlife injuries and mortalities would increase from pre-project levels due to the increase of vehicles associated with the projects, and from installation of facilities such as aerial power lines. Habitat loss would increase from construction activities and installation of facilities. Certain species that depend on a specific geographic site or area that is lost by long term (> 5 years) surface disturbance may suffer mortalities or a population decline. Wildlife mortalities would increase as the size and level of disturbance increases. Habitat loss, direct and indirect, over the life of all of the projects considered in the cumulative impact analysis could approach thousands of acres until completion of reclamation. Reclamation would not always recreate predisturbed conditions or values. Therefore, some wildlife populations would not recover to pre-disturbance levels. Some species, such as sage grouse and probably mule deer, would not recover to the population levels that were present prior to disturbance. Examples include sagebrush obligate species such as sage grouse and passerine birds dependent in some way on sagebrush habitat.

Indirect cumulative impacts would include disturbance to, or displacement of, certain wildlife species from human activities, habitat loss or possible degraded water quality. Some wildlife species would be indirectly impacted as far away as two miles from an activity (MT EIS, page 4-173). The area of potential indirect impacts from activities associated with all but one of the projects considered in the cumulative impact analysis would be around 148,000 acres**.** (Note: this acreage estimate was based on a computer GIS model derived by delineating the external project boundary of each project considered in the cumulative effects analysis (Chapter 2.4), applying a two mile "buffer" to each of these projects and delineating an external boundary of all projects combined, thus creating one overall polygon encompassing all projects. 148,000 acres is the calculated internal area of this polygon. No acres were included in the overall calculation that was not part of an existing project as they were buffered. The Yates exploratory project was not considered in the acreage figure because of the limited impacts from the project).

Local populations of certain wildlife species groups may be impacted by the cumulative effects of current and foreseeable development in this area. These would include groups such as big game, upland game birds, raptors, reptiles/amphibians, 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 aquatic species.

4.3 Impacts of Alternative B—Fidelity Proposed POD

4.3.1 Impacts on Air Quality from Alternative B

4.3.1.1 Direct and Indirect Impacts

As previously stated, the pollutant sources used for this section include all the known (including those planned for future development) CBNG compressor stations in Montana, not just those proposed for the project area.

Nitrogen Dioxide
Annual total NO_2 concentrations in the project area would be well below Montana and National air quality standards (MAAQS, NAAQS). Total concentrations from nearby coal bed natural gas operations would be less than 29% of applicable ambient air quality standards (see Air Quality Appendix Figure 4.3.1-1).

One hour total NO_2 concentrations in the project area would be in compliance with applicable MAAQS and NAAQS. Total concentrations from nearby coal bed natural gas operations would be less than 59% of applicable ambient air quality standards (see Air Quality Appendix Figure 4.3.1-2).

Modeled NO_2 concentrations in the Northern Cheyenne Reservation are less than 5% of the PSD Class I increment (see Air Quality Appendix Figure 4.3.1-3). Modeled NO_2 concentrations in the project area are just less than 85% of the PSD Class II increment (see Air Quality Appendix Figure 4.3.1-4).

Carbon Monoxide
Project comparable CO concentrations were estimated for the MT EIS. In that study, the EIS No Action Alternative assumed 515 producing coal bed natural gas wells in Montana. Since Alternative B would consist of a similar number of wells and would be in a nearby location, the MT EIS concentrations are representative of the level of concentrations expected under this alternative. The MT EIS reported CO concentrations would be well below MAAQS and NAAQS:

- 8 hour CO concentrations: 66 % of the MAAQS and NAAQS
- 1 hour CO concentrations: 59 % of the MAAQS and NAAQS

Sulfur Dioxide
Project comparable SO_2 concentrations were estimated for the MT EIS. In that study, the EIS No Action Alternative assumed 515 producing coal bed natural gas wells in Montana. Since Alternative B would consist of a similar number of wells and would be in a nearby location, the MT EIS concentrations are representative of the level of concentrations expected under this alternative. The MT EIS reported SO_2 concentrations would be well below MAAQS and NAAQS:

- Annual SO_2 concentrations: 27 % of the MAAQS and NAAQS
- 24 hour SO_2 concentrations: 28 % of the MAAQS and NAAQS
- 3 hour SO_2 concentrations: 23 % of the MAAQS and NAAQS
- 1 hour SO_2 concentrations: 51 % of the MAAQS and NAAQS

The MT EIS also shows compliance with sulfur dioxide Class I and II PSD increments.

Particulate Matter
Project comparable PM_{10} concentrations were estimated for the MT EIS. In that study, the EIS No Action Alternative assumed 515 producing coal bed natural gas wells in Montana. Since Alternative B would consist of a similar number of wells and would be in a nearby location, the MT EIS concentrations are

representative of the level of concentrations expected under this alternative. The MT EIS reported annual and 24 hour PM_{10} concentrations would be well below the MAAQS and NAAQS.

- Annual PM_{10} concentrations: 62 % of the MAAQS and NAAQS
- 24 hour PM_{10} concentrations: 71 % of the MAAQS and NAAQS

The MT EIS also shows compliance with particulate matter Class I and II PSD increments.

4.3.1.2 Direct and Indirect Impacts - Visibility and Atmospheric Deposition

Visibility impairment was estimated for the MT EIS. In that study, the EIS No Action Alternative assumed 515 producing coal bed natural gas wells in Montana. Since Alternative B would consist of a similar number of wells and would be in a nearby location, the MT EIS findings are representative of the level of impairment expected under this alternative. The MT EIS reported no visibility impairment with the refined analysis at any Class I or Class II PSD areas except for 2 days visibility impairment greater than 1 dV at the Crow Reservation, a federal Class II PSD area.

Atmospheric deposition was estimated for the MT EIS. In that study, the EIS No Action Alternative assumed 515 producing coal bed natural gas wells in Montana. Since Alternative B would consist of a similar number of wells and would be in a nearby location, the MT EIS findings are representative of the level of atmospheric deposition expected under this alternative. The MT EIS reported atmospheric deposition well below established thresholds.

4.3.1.3 Cumulative Impacts

<u>Nitrogen Dioxide</u>
Annual total NO_2 concentrations in the project area are well below Montana and federal air quality standards (MAAQS, NAAQS). Total concentrations from coal bed natural gas operations in Montana and Wyoming and coal operations at the Spring Creek and Decker Mines are less than 32% of applicable ambient air quality standards (see Air Quality Appendix Figure 4.3.1-1).

One hour total NO_2 concentrations in the project area are in compliance with applicable MAAQS and NAAQS. Total concentrations from coal bed natural gas operations in Montana and Wyoming and coal operations at the Spring Creek and Decker Mines are less than 60% of applicable ambient air quality standards (see Air Quality Appendix Figure 4.3.1-2).

Modeled NO_2 concentrations in the Northern Cheyenne Reservation are 21% of the PSD Class I increment (see Air Quality Appendix Figure 4.3.1-3). Modeled NO_2 concentrations in the project area are 90% of the PSD Class II increment (see Air Quality Appendix Figure 4.3.1-4).

<u>Carbon Monoxide, Sulfur Dioxide, Particulate Matter and Visibility and Atmospheric Deposition</u>
All of the direct and indirect impacts from Alternative B are negligible for these impact indicators, resulting in negligible contributions to overall cumulative impacts. The cumulative impacts from Alternative B would be in compliance with all of the air quality standards and PDS 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 modeling for this EA, completed for the pollutant considered most likely to violate any ambient air quality standard or increment.

4.3.2 Impacts on Cultural Resources from Alternative B

4.3.2.1 Direct and Indirect Impacts

Direct and indirect impacts to Cultural Resources would be the same as those described in Alternative A for private and state managed surface and minerals. No cultural resources on Federally owned surface would be affected by the proposed wells or associated development. Sites located on Federal minerals within or adjacent to the POD would be avoided. Unanticipated discoveries of cultural material would be dealt with on Federal lands and Federal minerals by implementing measures that require notification in the event of important discoveries and suspension of construction activity to prevent any loss of important cultural values. Two eligible sites on private surface may be affected by proposed private well and an infrastructure corridor (BLM Cultural Resources Report, Melton, 2004).

4.3.2.2 Cumulative Impacts

The MT EIS predicts that CBNG development under the preferred alternative would locate 5,135 cultural sites and between 517 and 735 sites would be eligible for listing on the National Register of Historic Places. Site density was estimated at between 6 and 7 sites per section. The portion of the POD that is on Federal minerals would not add to the number of eligible sites predicted for the life of the development. When the POD and previously recorded sites are taken as a whole, the site density is between 1 and 2 sites per section, which is lower than that predicted in the EIS. Four sites within the POD boundaries are potentially eligible or have been determined eligible. This falls within the predicted 10%-14.55% number of eligible sites predicted in the EIS.

Yates Petroleum has proposed drilling 14 exploratory CBNG wells northwest of the present POD. Cultural resource inventories have been conducted for these wells and associated access roads. These investigations were conducted in 2001 and 2002 by Gar C. Wood and Associates and by BLM Cultural Resources Staff and Lone Wolf Archaeology in 2003. Cultural resources were reported from only one of the proposed well locations. Additional work is required at this location. If the wells are successful and the leases are developed, additional cultural resource work would be required.

The Dry Creek project occurs west of the project area. Cultural Resource Inventories have recently been completed for this action. The inventories covered 460 acres and the inventory resulted in the relocation and updating of 8 previously recorded sites and recording of 2 newly located sites. Mitigation requirements would be the same as those for the project. BLM has received the report for the inventory for development on the Federal portion of the Dry Creek POD, but has not yet begun to process the report. The state has also required a cultural resource inventory for proposed wells and associated development on state lands. BLM has not received the results of these investigations.
Powder River Gas has proposed the Coal Creek POD. The POD is located northwest of the Tongue River Dam. Cultural resource inventories for this work covered 647 block acres and 50 linear acres. One site was located in the inventoried POD area. The report covered the proposed access, wells and infrastructure. Additional inventory is expected east of the present POD.

Spring Creek and Decker Mines: Cultural Resource Investigations at both mines have gone on since the early 1970's and continue to present. Sites located in the mines have either been avoided or they could not be avoided so they have been excavated. The CX Decker Mine was proposed in the 1970's. Inventories occurred in the late 1970's and 1980's. These inventories covered over 30,000 acres and located over 100 sites. Inventories for this mine overlap with the Tongue River and Dry Creek PODs. This data is incorporated into the overall cultural resource statistics for the MT EIS. Sites identified in these actions would not be impacted by the proposed developments for this project.

The Northern Cheyenne Tribe is aware of the two proposed CBNG projects. BLM provided a briefing to tribal members at the Miles City Field Office on October 16, 2003. Copies of the cultural resources reports were provided to the Northern Cheyenne THPO on November 5, 2003. BLM has not received comments from the Tribe or THPO on the reports.

Collectively, the FY 2003 inventories for CBNG development add to the acres inventoried, but do not add to the total number of eligible sites predicted for the High CBNG Potential Area. No large or conspicuous paleontological remains on Federal surface or minerals would be impacted by the proposed projects.

4.3.3 Impacts on Lands and Realty from Alternative B

4.3.3.1 Direct and Indirect Impacts

Surface and mineral ownership would remain in the same categories as found in Table 3.4-1. No change in ownership from one category to another is proposed or would occur as a result of implementing this alternative. Change from one owner to another owner could occur.

The BLM right-of-way in Section 26, T. 9 S., R. 40 E. would not be impacted. The right-of-way would remain in effect as long as the annual fees were timely paid and compliance with the terms and conditions was satisfactory. The county road to which the right-of-way applies would receive increased vehicle traffic that could cause faster deterioration without proper maintenance.

4.3.3.2 Cumulative Impacts

Same as Alternative A

4.3.4 Impacts on Social and Economic Conditions from Alternative B

4.3.4.1 Direct and Indirect Impacts

The 85 federal wells to be drilled during the development phase represents eleven percent of the approximately 760 to be drilled in Big Horn County, 38% of the total 2000 wells projected, during the first two years, (see Table 4-49 page 4-117, Table 4-50 page 4-119 and the Minerals Appendix page Min-17, MT EIS). The average annual production from these wells would increase annual production approximately 30 percent from Alternative A. The potential direct and indirect impacts include annual increases in government revenues, including property, production and income taxes and State and Federal production royalties over the life of the wells. There would be increases to personal income and could be additional demands on public services due to the few temporary jobs related to the development drilling and production. The employees would most likely commute from the Sheridan, WY area which is 25 miles south of the project areas and fifty miles south of the Northern Cheyenne Reservation. As a result, there would be little social or economic impact to the Reservations.

Landowner concerns regarding knowing when the permits would be issued have been addressed. In addition, the compressors would be located at least one mile from any occupied dwelling so the effects of noise from the compressors would be mitigated.

Placing federal wells on production would protect federal CBNG from being drained by wells on adjacent private and state leases. CBNG production from federal wells would increase the total amount of gas produced in the CX Field which would provide more natural gas into the market place. Royalties paid on CBNG produced from federal wells would be shared between the federal, state and county governments.

Environmental Justice

As there are no disproportionate impacts to low income or minority populations the impacts would be the same as described under Alternative A.

4.3.4.2 Cumulative Impacts

The project would be an incremental addition to the existing development and proposed projects in southern Big Horn County. The temporary development and permanent production jobs required for the life of the project would likely come from the Sheridan, Wyoming area labor force. The jobs would offset some of the coal mining jobs lost due to production declines at the Montana mines as contracts expire and productivity increases. The CBNG production taxes and royalties would also offset some of the reduced coal production taxes and royalties paid to the state.

Environmental Justice

Impacts would be the same as described under Alternative A.

4.3.5 Impacts on Soils from Alternative B

4.3.5.1 Direct and Indirect Impacts

Soil erosion from wind and water could occur during and shortly after road and well construction. Loss of vegetative cover could allow wind and water erosion at well sites, roads and other disturbed areas. Compaction of soils will occur at and adjacent to these sites due to equipment operation. All of the 85 proposed wells can be drilled without a well pad being constructed. As such, minor surface disturbance would occur with the drilling of these wells. This disturbance would only involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 10 x 30 feet) and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 85 wells would involve approximately 1 acre per well site for 85 total acres during the drilling phase. This should be a short term, minor impact. After completion of the wells for production, the unused portions of the well site would be reclaimed as per the POD Surface Use Plan.

Approximately 4.4 miles of improved roads would be constructed to provide access to various production facilities. Approximately 10 miles of new and 12 miles of existing two-track trails would be used to access well sites. Soil productivity would be eliminated along improved roads and severely restricted along two tracks. The majority of proposed pipelines (gas and water) have been located in “disturbance corridors.” Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. Approximately 3.5 miles of pipeline would be constructed outside of corridors as no additional utility lines would be needed for a "corridor" placement. Short term soil erosion by wind and water could affect soil health and productivity. The disturbed areas would be reclaimed with stockpiled topsoil, proper seedbed preparation techniques and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions, etc.) immediately after completion of operations. Successful reclamation would ensure effects to soil productivity and stability is minimized.

Land Application Areas

Approximately 152 acres will be used for managed irrigation areas to dispose of produced water. Of this acreage, 41 acres is currently native rangeland and the remainder is presently cropland. The water application would be at an agronomic rate such that all applied water is held in the upper soil profile

where it is available for plant uptake and evapotranspiration. Mitigation for potential direct and indirect effects are covered in the Protocol for Evaluating, Designing, Operating and Monitoring Managed Irrigation Systems for Coal Bed Natural Gas Produced Water (Harvey, 2003). Mitigation would include baseline analysis of soil and water characteristics (see Appendix 2). Soils will be sampled on a semi- to annual basis to determine effects to soil physical and chemical characteristics. Water balance projections will be used to determine appropriate water application rates for plant use, evaporation rates and leaching fraction. Geochemical models will be used to predict soil chemistry changes and determine rates of amendment application.

If irrigation is not properly managed, direct effects on the rangeland would include a vegetative composition change to more salt and water tolerant native species. The existing rangeland species proposed for irrigation are generally xerophytic, drought tolerant and intolerant of excessive soil moisture levels. Woody species, particularly sagebrush, would decrease or be eliminated due to excessive soil moisture and/or increases in soil salt content. Loss of some species could reduce vegetative cover, exposing the site to increased wind and water erosion. Irrigation of these sites after species composition has changed and plant numbers decreased may be the largest source of erosion at these sites.

Soil structural failure could occur as a direct effect of increased sodium content, leading to soil dispersion, swelling and crusting. Soil dispersion results in a reduction of infiltration keeping water at the surface. This could increase potential of water erosion potential due to off site movement of water. Soil structure destruction will also increase potential for wind erosion

Irrigation rates would be regulated so that the infiltration rate of the least permeable soil horizon would not be exceeded. If not regulated properly, indirect effects to the land application sites include the potential for elevated groundwater levels in the irrigated and adjacent areas. However, the likelihood of this situation occurring is low by using the managed irrigation system proposed by Fidelity Soils and geology at the sites must be examined to determine potential fate of irrigation waters below the surface. Elevated groundwater may affect vegetative composition of the native rangeland at or adjacent to the irrigation sites. As species composition changes, species remaining at the site may be less able to utilize the water applied, increasing the potential for elevated groundwater and groundwater movement. Elevated groundwater may result in saline seeps down gradient from the irrigated sites.

Regulation of irrigation rates would also result in the applied water flowing vertically into the subsurface where it would be available for plant uptake rather than flowing horizontally as surface runoff. Other indirect effects include the potential leaching of soluble salts to groundwater or to adjacent surface water. The likelihood of this situation occurring is also low by using the managed irrigation system proposed by Fidelity. The managed irrigation sites will be monitored to determine fate of water and salts at and adjacent to the sites. The potential for elevated groundwater and potential groundwater movement may be reduced by planting domestic species with higher water consumption characteristics. There is also a potential for plant and soil micronutrient imbalances as a consequence of elevated soil salinity levels.

Water Impoundment Areas

During the reservoir site selection, backhoe pits were excavated near the center of each proposed site. Soils were examined and physical and chemical characteristics were analyzed to determine suitability for reservoirs. Soil series and characteristics are described in Fidelity's Plan of Development.

4.3.5.2 Cumulative Impacts

Most direct effects to soils would end once production facilities were removed and rehabilitated. Most areas will revert to native conditions within a short time frame. Development at various areas in the

region will result in soils disturbance at different stages of disturbance and rehabilitation. At the managed irrigation sites, cumulative effects could include future soil failure and subsequent loss of vegetative cover and surface soil stabilization after irrigation has ceased. This may result through rain and snow fall affecting salinity levels and affecting soil chemistry. Long term irrigation of the sites may result in effects that may not be expressed for several years. These sites will have to be monitored for some period after the irrigation ceases to identify soil chemistry changes under natural conditions. Regional development of methane and other activities would have limited effects on the soils of the project area.

4.3.6 Impacts on Water Resources from Alternative B

4.3.6.1 Direct and Indirect Impacts

Surface Water

Water produced from federal, state and private CBNG wells in the project area would be discharged into the Tongue River upstream from the Tongue River Reservoir under Fidelity's existing MPDES discharge permit. The permit includes a limit of a maximum of 1,600 gpm (3.56 cfs) of CBNG produced water discharged into the Tongue River by Fidelity from the CX Field. Energy dispersing outfall structures have been or would be constructed to prevent erosion at the discharge points. As discussed in the affected environment section above, the EC of this water is anticipated to be approximately 1,987 µS/cm and the SAR is anticipated to be approximately 54.

This 1,600 gpm is the same volume and quality of water as would be discharged under Alternative A. The in-stream water quality that would result from this discharge is depicted in Table 4.2.6-1 in the No Action section of this report. The direct impact of the proposed action on surface waters would be to increase the duration of these potential effects. According to the water balance calculations conducted for this analysis, this volume of discharge would be needed for 17 months under this alternative rather than the 3 months required by Alternative B. Discharge volumes would return to current levels (984 cfs) after approximately 22 months under the Proposed Alternative as opposed to 17 months under Alternative A (see Hydrology Technical Report).

As with Alternative A, implementation of the proposed action would not cause any of the appropriate surface water standards for EC or SAR to be exceeded (see Table 4.2.6-2). These standards were adopted for the express purpose of protecting all beneficial uses of the Tongue River, including agriculture, aquatic life, drinking water, industrial uses and recreational uses. As such, the results of this analysis indicate that the beneficial uses of the Tongue River would not be impaired by implementation of the proposed action under this alternative. If monitoring under the MPDES program or from the USGS stations indicates that surface water quality standards may be exceeded, appropriate action would be needed to ensure that water quality standards are met. This may require the BLM to shut in federal wells until a modified WMP can be developed which ensures that surface water quality standards are met.

The impacts from the impoundments and the irrigation areas would be the same as described under Alternative A.

Implementation of the proposed action would also cause disturbance of vegetation with corresponding increases in soil erosion rates. Approximately 298 acres of disturbance are anticipated to result from the proposed action. Approximately 138 acres of this disturbance would be long term (> 5 years), of which 80 acres are associated with the impoundments, which would not yield sediment downstream. The remaining 160 acres would be reclaimed as per the operator's reclamation plan in the POD. The remaining 58 acres of long term disturbance are mainly associated with roads (2-track and improved) and gathering/metering facilities. Increased soil erosion could cause increases in suspended sediment loads to

local surface waters. The increase in suspended sediments to surface waters resulting from disturbance should be minor, based on the operator's plans, site locations and the presence of sediment filtering vegetation between the disturbed areas and live waters. The direct impact of the proposed action would increase long term (> 5 years) disturbance by 17 acres and increase short term disturbance by 82 acres as compared to Alternative A.

Groundwater

All proposed federal, state and private wells would be drilled, tested and produced, if productive. Using the same methods discussed in Alternative A, the distance that drawdown would extend from the project area was estimated for this alternative. The major difference between these alternatives is that more wells would be pumping gas and water from each coal seam under Alternative B than under Alternative A, and so the radius of drawdown would increase under this alternative. The results of this analysis are shown in Table 4.3.6-1 below. Additional discussion of these drawdown calculations is provided in the Badger Hills Hydrology Technical Report.

Table 4.3.6-1. Summary of Predicted Drawdown

		Drawdown Radius(miles)	
Years Pumped	Coal Seam	No Action	Proposed Action
		20 foot	20 foot
1 Year	Dietz 1	0.90	0.94
	Dietz 2	0.80	0.83
	Dietz 3	0.77	0.79
	Monarch	0.86	0.89
	Carney	0.88	0.91
5 Years	Dietz 1	1.9	2.0
	Dietz 2	1.7	1.8
	Dietz 3	1.7	1.7
	Monarch	1.9	1.9
	Carney	1.9	2.0
10 Years	Dietz 1	2.6	2.8
	Dietz 2	2.3	2.5
	Dietz 3	2.3	2.4
	Monarch	2.5	2.7
	Carney	2.5	2.7
20 Years	Dietz 1	3.1	3.6
	Dietz 2	2.9	3.3
	Dietz 3	2.9	3.2
	Monarch	3.1	3.5
	Carney	3.1	3.6

K = 1.1 feet/day S = $9x10^{-4}$

As shown, under this alternative, the 20 foot drawdown contour may extend up to 3.6 miles from the produced field. The direct impact of the Proposed Action is to cause the radius of 20 foot drawdown contour to be increased by approximately ½ mile, from 3.1 miles to 3.6 miles. These results compare well with the results of the 3D groundwater model prepared in support of the MT EIS (Wheaton and Metesh, 2002), which indicates that the 20 foot drawdown contour may extend up to 5 miles from the

edge of production. The actual drawdown would be dependent on the site specific aquifer characteristics and actual pumping rates.

Impacts from drawdown would be similar to those described under Alternative A. Wells located within the drawdown cone and completed within the produced coal seams would experience decreased yields and springs located within the drawdown cone and emitting from the produced coal seams would experience decreased flow, or go dry. In this alternative, the area within the 20' drawdown contour is larger by approximately 18 square miles than in Alternative A. This increase in area causes 4 more domestic or stock wells to be within the potential drawdown area in this Alternative compared to Alternative A. The additional wells are listed in the Badger Hills Hydrology Technical Report.

This reduction in pressure within the coal seams could also cause methane gas (CH_4) to become desorbed more easily from the coal surfaces. In the cases where the pressure is sufficiently reduced to cause desorption by a CBNG well, the methane released would flow towards that CBNG well and be sent to market. In some cases, the drawdown from CBNG development would not be sufficient to cause desorption, however it does reduce the pressure in the coal seam. In such a case, the water wells finished in the produced coal seam could cause the desorption of gas at pumping rates which historically would not have caused this gas to be desorbed. Gas released this way may affect quality of water flowing to the domestic well and may affect the usability of these water wells.

Recovery of aquifers following development would be similar to that described in Alternative A, with 70% recovery of hydrostatic head within 5-12 years after the end of production. The exact radius of the drawdown cone and the time required for the head to recover, would depend on the site specific aquifer properties. For additional information on anticipated impacts to groundwater, see the Badger Hills Hydrology Technical Report. For additional general discussion of the anticipated drawdown related impacts, see pages 4-61 to 4-63 of the MT EIS (BLM, 2003) and the associated groundwater modeling reports (Wheaton and Metesh 2001, Wheaton and Metesh, 2002).

Fidelity has committed in its POD to comply with all applicable Federal, State and Local laws and regulations, including the DNRC's designation of the Powder River Basin Controlled Groundwater area. As discussed in the No Action Alternative, the water mitigation agreements required by the State are designed to provide mitigation options to compensate the owner of a domestic water well or spring that has been adversely affected by CBNG development. The lining of the impoundments with compacted clay material would prevent leakage of stored water from the impoundments and therefore prevent any impacts to groundwater resources.

The produced water to be applied in the managed irrigation areas is not likely to impact groundwater as the water would be applied to the irrigation areas at rates that would allow the water to infiltrate vertically through the least permeable of the underlying soil units, yet not at such a high rate as to result in saturated flow into the underlying shallow groundwater units. Fidelity's irrigation system is designed to operate in a manner that those constituents, which could impact either vegetation or groundwater are "parked" or deposited just below the root zone, yet above the water table. If this infiltrated water were to reach the groundwater table it would dissolve some of the soluble minerals that exist within the soil and bedrock materials and partake in ion exchange reactions with clays as it infiltrates. These reactions would cause the infiltrated water to have a geochemical signature similar to the existing groundwater. As such, the use of these irrigation areas is not anticipated to result in adverse impacts. However, because there are no monitoring wells adjacent to the irrigation area, it would be difficult to verify that the assumptions used for determining the irrigation rates were correct until after impacts to vegetation or adjacent water resources occurred.

The potential for cross contamination of aquifers would be avoided by cementing from the top of the produced coal zone to the surface. For further details on the drilling and cementing program, see the Master Drilling Plan in the POD.

4.3.6.2 Cumulative Impacts

The cumulative impacts in this alternative would be the same as described for Alternative A, with the addition of the direct impacts resulting from the Proposed Action.

The magnitude of impacts to surface waters would be the same as described in Alternative A; however, the duration of these impacts would be longer, as described in the direct impacts section for this alternative. These impacts do not cause surface water quality standards to be exceeded and therefore, beneficial uses would not be degraded.

The impacts to groundwater would be of the same type described in Alternative A, however, the radius of the drawdown is greater by approximately ½ mile. This increase in radius causes one more domestic or stock well to be included in the potential drawdown area than under Alternative A. The implementation of the requirements of the Powder River Basin Controlled Groundwater Area designation would mitigate the impacts that may result from groundwater drawdown.

4.3.7 Impacts on Vegetation from Alternative B

4.3.7.1 Direct and Indirect Impacts

Construction of roads, well and facility sites would remove vegetation which would reduce vegetative availability and productivity in the area by minor amounts. Compaction by equipment traffic would damage vegetation and affect productivity.

The areas with the largest potential affects to vegetation are at the managed irrigation system sites covering approximately 152 acres. Of this, 111 acres has been previously cropped and 41 acres is native rangeland. The existing rangeland species proposed for irrigation are generally xerophytic, drought tolerant and intolerant of excessive soil moisture levels. Direct effects to plant species at the irrigation sites would be a change in species composition to those that can tolerate higher soil moisture and salt levels. Woody species, particularly sagebrush would, decrease or be eliminated due to excessive soil moisture and/or increased salt content. Species composition would change to those expected on saline upland, saline lowland, or silty - saline ecological sites away from the predominately present silty and clayey ecological sites. Dominant species expected to show as this transition occurs would include inland saltgrass and alkali scaton. While not noted in the POD, personal communication with Fidelity indicated the present native rangeland site would be planted with domestic species at some point. Plant productivity and plant morphological characteristics would be directly affected due to increased salt levels in the irrigated areas.

Plant and soil micronutrient imbalances could result indirectly as a consequence of elevated soil solution salinity levels. This may further affect species composition and productivity

Invasive Species

Utilization of existing facilities and surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread. Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. 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 and perennial pepperweed. However, measures proposed by Fidelity to control noxious weeds would ensure that potential impacts from noxious weeds and invasive plants would be minimal.

4.3.7.2 Cumulative Impacts

Vegetation in the area would recover in a short time after removal of production facilities and rehabilitation outside of the irrigated areas. The irrigated areas may continue to be affected by the salt loading through irrigation and would need to be monitored to determine if amendments should be continued. The irrigated areas may not revert to pre-condition species and productivity due to salt added during irrigation for numerous years. These areas would need to be monitored for years after irrigation ceases to monitor recovery. Amendments may be needed to help re-establish desired species and restore productivity at the irrigated sites. Regional development of methane and other activities will have limited effects on the vegetation of the project area.

4.3.8 Impacts on Wildlife from Alternative B

The nature of impacts (i.e., the types of impacting activities) to wildlife resources is similar between Alternatives A and B. The primary difference between Alternative B and Alternative A is the number of well sites and the amount of infrastructure (i.e., amount of new roads, powerlines, pipeline corridors, etc.) related to CBNG development, plus the associated area of influence from development. The impact to a particular species is related to the actual disturbance of each action described above. The amount of disturbance (i.e., length of road, miles of powerline, etc.) is the primary difference between the no action alternative (Alternative A) and the two action alternatives (Alternatives B and C). As more ancillary structures are installed or constructed, the number of wildlife mortalities or related disturbance associated with these activities would increase. However, attempting to quantify the actual number of wildlife mortalities or the amount of disturbance to wildlife is extremely difficult. Therefore, only the impacts to wildlife resources that are notable differences from those described in Alternative A, are included in the following discussions.

4.3.8.1 Direct and Indirect Impacts

<u>Threatened and Endangered Species</u>
As discussed in Alternative A, the only T/E species or habitat in this project area is the bald eagle. The primary direct impacts to bald eagles are injuries or deaths from vehicle collisions and electrocution from power lines. Injuries and deaths would result from increased traffic and extensive overhead powerlines. Installation of raptor protection devices would reduce the number of electrocutions. Indirect impacts include habitat fragmentation and human disturbance from new CBNG infrastructure and construction and operational activities. BLM determined this action is “likely to adversely effect” bald eagles in the project area (letter dated 1/7/04 to FWS, BLM files). Mitigation measures to protect bald eagles are outlined in the Biological Opinion provided by FWS to the MT EIS (MT EIS, Volume II, Wildlife Appendix) and to this specific project (February 3, 2004). Compliance with requirements set forth in the WMPP and Terms and Conditions as required by the FWS in the Biological Opinion would minimize impacts to bald eagles in the project area and reduce the likelihood of take.

<u>General Wildlife Resources</u>
Direct impacts to wildlife resources include loss of habitat through construction activities, location of CBNG infrastructure and facilities and mortalities resulting from collisions with vehicles and power lines. There would be about 4.4 miles of new, permanent all-weather roads, 17 miles of improved two-track trails in addition to several production facilities constructed with this action. This equates to a direct loss

of about 45 acres of habitat (this figure does not include habitat lost to containment basins). In addition, there would be about 8 miles of above-ground powerlines and about 22 miles of pipeline/buried power corridors with this action. This would result in an additional 45 acres of heavily disturbed habitat. It is recognized that required reclamation procedures do not mimic natural habitat values. When considering direct impacts to wildlife habitat, the increases in CBNG infrastructure resulting from this alternative, increases impacts to wildlife resources over that described for Alternative A. Attempting to quantify the actual mortalities is extremely difficult.

All above-ground power facilities would be constructed following strict raptor protection guidelines. The operator is committed to following road corridors when possible, avoiding sensitive wildlife habitats when feasible and minimizing overhead lines across landscapes by using the most direct route possible. The operator has also committed to following the recommended guidelines for power line construction for the complete project; therefore, types of impacts to wildlife are the similar to those described in Alternative A.

Approximately 300 acres would be directly impacted by construction activities and approximately two-thirds of the acreage within the delineated project boundary would be influenced by indirect disturbance and development as opposed to about one half of the overall project area being impacted in Alternative A.. This would increase the disturbed and fragmented habitat described in Alternative A, but would not result in notable differences from that alternative.

This alternative requires implementation and compliance with special stipulations to protect select wildlife species. These stipulations include protections to species or habitats including big game winter range, raptor nest territories and sage and sharp-tailed grouse leks and nesting habitat, as described in the Wildlife Monitoring and Protection Plan (WMPP) in the FEIS. These stipulations would offer increased protection and lessen stress levels to those species listed by restricting activities during critical time periods to avoid disturbance on winter range and disturbance during breeding and nesting. As a result of these protections, impacts to area-wide populations of these species during development is reduced or minimized.

Compressor facilities for this project would be authorized by MDEQ. Actual measured decibel levels from similar compressor facilities in the CBNG development area south of the project area are within the decibel limits established in the MT EIS to effectively reduce impacts of noise to susceptible wildlife species. Therefore, noise impacts should be minimal.

Aquatic Species

CBNG produced water will be added directly to the Tongue River as authorized under a Montana DEQ permit. Under 7Q10 flows, the amount of discharge into the river will not exceed surface water standards for beneficial uses. These standards were developed considering impacts to aquatic resources. Therefore, there should be no negative impact to aquatic resources by this action (MT EIS, 4 – 187). Produced water storage reservoirs, as described above, may have a direct impact to local populations of amphibians (i.e., tiger salamanders) by providing, at a minimum, new over-wintering habitat. Although water quality parameters for CBNG produced water are within limits for domestic livestock uses as required by MDEQ, these same values (about 3X that of average Tongue River watershed conditions, Chapter 3, Hydrology), are assumed to be of some determent to aquatic organisms locally adapted to local conditions. Because of the relative small scale of this project, this is not considered a major impact to local amphibian populations.

Compressor facilities for this project will be authorized by MDEQ. Decibel limits on CBM facilities were established in the MT EIS that effectively reduces impacts of noise to susceptible wildlife species. Therefore, noise impacts should be minimal with this action.

As described above, CBNG produced water will be pumped into three storage reservoirs, stored through the winter period and applied with irrigation systems to nearby hayfields and rangelands during the growing season. The storage reservoirs will provide water and habitat that may benefit some species (i.e., big game, waterfowl, shorebirds, etc.). Crops and increased forage produced from the irrigated fields may benefit some species, primarily deer, antelope and sage grouse, by providing additional forage.

Similar to Alternative A, some wildlife species and individuals, including big game, can and will acclimate to sustained and regular human contact providing that contact is not perceived as threatening.

West Nile Virus

BLM is in consultation with researchers studying the dynamics of the spread of the disease and its effects in Montana. There is no evidence that treatment, either through the use of larvicides or malithion, on a site specific or basin-wide scale will have any effect on the overall spread of the disease. State agencies have not instituted, nor are they requiring treatment of, mosquitoes at this time. Cumulatively, there are many sources of standing water beyond CBNG discharge that add to the potential for mosquito habitat. BLM will continue to monitor this issue in cooperation with the State agencies and researchers. If new information leads to the development of BMPs, corrective measures will be applied. Based on the current information, there is not evidence to definitively say this project would affect the spread of WNV in this area.

Wildlife Monitoring and Protection Plan

In this alternative, BLM would require Fidelity to implement a wildlife monitoring and protection plan (WMPP). In implementing the WMPP, Fidelity is committing to many actions that would reduce impacts to wildlife resources. These actions include reducing activities on critical big game winter ranges and elk calving areas, reducing disturbance on sage and sharp-tailed grouse nesting habitat, avoiding degradation of prairie dog towns with water storage structures, avoiding road and above-ground powerline construction in mountain plover habitat, posting of and adherence to speed limits, burying powerlines near grouse leks where possible and developing a comprehensive road management plan to minimize disturbance/habitat fragmentation to wildlife resources. Fidelity employees would be prohibited from possessing firearms on the project.

The previous discussions in Alternative A and B have disclosed a certain amount of unavoidable impacts to the wildlife species inhabiting the project area. Compliance and commitment to the WMPP, including Terms and Conditions of the Biological Opinion required with this project, would greatly reduce and/or minimize the overall negative impacts to wildlife resources.

4.3.8.2 Cumulative Impacts

The types of impacts described for Alternative A are similar to the types of impacts that would occur under Alternative B. As more ancillary structures are installed or constructed, the number of wildlife mortalities associated with these activities would also increase. Attempting to quantify the actual number of wildlife mortalities is extremely difficult.

4.4 Impacts of Alternative C—Proposed POD with Additional Mitigation

4.4.1 Impacts on Air Quality from Alternative C

4.4.1.1 Direct and Indirect Impacts – Pollutant Concentrations

Nitrogen Dioxide
The NO_2 concentrations would be similar to what would occur under Alternative B. Nitrogen dioxide concentrations would be in compliance with MAAQS and NAAQS, and PSD Increments.

Carbon Monoxide
The CO concentrations would be similar to what would occur under Alternative B. Carbon monoxide concentrations would be in compliance with MAAQS and NAAQS.

Sulfur Dioxide
The SO_2 concentrations would be similar to what would occur under Alternative B. Sulfur dioxide concentrations would be in compliance with MAAQS and NAAQS, and PSD Increments.

Particulate Matter
The PM_{10} concentration would be less than concentrations under Alternative B. Several features of Alternative C designed to reduce fugitive dust emissions account for this reduction of impacts. The dust reduction effectiveness objectives are included as part of the measure that would be required under this alternative. Page AIR-32 in the MT EIS Air Quality Modeling Appendix discloses the effectiveness of various dust control measures. The measures imposed under this alternative would achieve up to a 65% reduction in uncontrolled dust emissions. Particulate matter concentrations would be in compliance with MAAQS and NAAQS, and PSD Increments.

4.4.1.2 Direct and Indirect Impacts - Visibility and Atmospheric Deposition

Visibility impairment would be slightly improved compared to what would occur under Alternative B as a result of the provisions designed to control fugitive dust emissions.

Atmospheric deposition conditions would be similar to those under Alternative B.

4.4.1.3 Cumulative Impacts

Nitrogen Dioxide
Cumulative NO_2 concentration would be similar to concentrations under Alternative B. Nitrogen dioxide concentrations would be in compliance with MAAQS and NAAQS, and PSD Increments.

Carbon Monoxide, Sulfur Dioxide, Particulate Matter and Visibility and Atmospheric Deposition
All of the direct and indirect impacts of Alternative C are negligible for these impact indicators, resulting in negligible contributions to overall cumulative impacts. 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 modeling for this EA, completed for the pollutant considered most likely to violate any ambient air quality standard or increment.

4.4.2 Impacts on Cultural Resources from Alternative C

4.4.2.1 Direct and Indirect Impacts

Direct and indirect impacts to cultural resources would be the same as those in Alternative B. No historic properties on Federal surface or minerals would be affected by the proposed developments. BLM would monitor the two eligible sites to determine if they exist and part of the proposal would need to be moved to avoid impacts to the site. Avoidance of impacts to cultural resources would be the preferred form of mitigation for cultural resources. Unanticipated discoveries of cultural material would be dealt with on Federal lands and Federal minerals by implementing measures that require notification in the event of important discoveries and suspension of construction activity to prevent any loss of important cultural values. Two eligible sites on private surface may be affected by proposed private well and an infrastructure corridor (BLM Cultural Resources Report, Melton, 2004).

4.4.2.2 Cumulative Impacts

Cumulative Impacts to cultural resources would be the same as those described under Alternative B.

4.4.3 Impacts on Lands and Realty from Alternative C

4.4.3.1 Direct and Indirect Impacts

Surface and mineral ownership would remain in the same categories as found in Table 3.4-1. No change in ownership from one category to another is proposed or would occur as a result of implementing this alternative. Change from one owner to another owner could occur.

The BLM right-of-way in Section 26, T. 9 S., R. 40 E. would not be impacted. The right-of-way would remain in effect as long as the annual fees were timely paid and compliance with the terms and conditions was satisfactory. The county road to which the right-of-way applies would receive increased vehicle traffic that could cause faster deterioration without proper maintenance.

4.4.3.2 Cumulative Impacts

Same as Alternative A.

4.4.4 Impacts on Social and Economic Conditions from Alternative C

4.4.4.1 Direct and Indirect Impacts

Same as Alternative B.

4.4.4.2 Cumulative Impacts

Same as Alternative B.

4.4.5 Impacts on Soils from Alternative C

4.4.5.1 Direct and Indirect Impacts

Impacts to soils would be less than under Alternative B. The BLM applied mitigation measures would limit the impacts to vegetation and improve vegetative recovery which would limit impacts to soils outside of the managed irrigation areas.

Land Application Areas

Impacts to soils would be less than under Alternative B. The BLM applied mitigation measures would reduce or limit impacts to soils. Monitoring of land application sites through review of soil and water data collected would allow determination of effects on these sites. Irrigation application rates and/or amendments would then be adjusted, as necessary, to reduce the impacts to area soils. These areas would be monitored after produced water irrigation ceases and intensively managed to return productivity to surface owner approved levels. Monitoring wells would determine if land application sites have affected off site soils and vegetation.

Water Impoundment Areas

Impacts to soils would be less than under Alternative B. The BLM applied mitigation measures would reduce or limit impacts to soils by providing for the early identification of impacts and requiring changes in the operation of impoundment areas.

4.4.5.2 Cumulative Impacts

Impacts to soils would be less than under Alternative B. The BLM applied mitigation measures would reduce or limit impacts to soils. Most direct effects to soils outside of the managed irrigation areas would end once production facilities were removed and rehabilitated. Most areas would revert to native conditions within a short time frame. Development of various areas in the region would result in soils at different stages of disturbance and rehabilitation. Regional development of methane and other activities would have little potential for cumulative effects on the soils in the project area. This is because the surface disturbance associated with the cumulative actions does not coincide with project area activities.

4.4.6 Impacts on Water Resources from Alternative C

4.4.6.1 Direct and Indirect Impacts

Surface Water

Impacts to surface water resources would be the same as described in Alternative B except that the BLM applied mitigation measures would allow for the adequacy of management practices to be monitored and allow modification of management practices if adverse monitoring results are observed. For water resources, these mitigation measures apply to the impoundments and irrigation areas.

The impacts from the impoundments and the irrigation areas to surface water resources would be the same as described under Alternative A, except that the monitoring requirements identified in Section I.B of the MDEQ Draft General Discharge Permit for CBNG, the monitoring wells adjacent to the impoundments and the monitoring wells associated with the irrigation areas would be added as COAs to the APDs. This additional monitoring, which would not be applied under Alternatives A and B, provides for the ability to modify management practices, if needed and would be adequate to prevent adverse

impacts from the impoundments. Additionally, the effluent limitations for the impoundments would ensure that adequate reclamation of these sites would be attainable following their use. In particular, it is required that the sediments be sampled any time the annual average TDS of the water in the impoundment is in excess of 5,000 mg/L. If the salinity, as measured by EC in a paste extract, exceeds 20 millimhos/cm in the impoundment sediments, a reclamation plan must be developed and implemented to ensure that the land is returned to its previous utility and stability.

Groundwater

Impacts to groundwater resources would be the same as described in Alternative B except that the BLM applied mitigation measures would allow for the adequacy of management practices to be monitored and allow modification of management practices if adverse monitoring results are observed. For water resources, these mitigation measures apply to the impoundments and irrigation areas.

As discussed in Alternative A, the lining of the impoundments is expected to prevent leakage from the impoundments and therefore prevent any impacts to groundwater resources. The BLM applied COAs for monitoring will ensure that these impoundments do not adversely affect groundwater.

As discussed in Alternative B, the application of produced water to irrigation areas is not likely to adversely affect groundwater. This is because the application would be conducted at rates designed to prevent the saturated flow of applied water into the underlying groundwater. If this infiltrated water were to reach the groundwater table it would dissolve some of the soluble minerals that exist within the soil and bedrock materials and partake in ion exchange reactions with clays as it infiltrates. These reactions would cause the infiltrated water to have a geochemical signature similar to the existing groundwater. The monitoring wells adjacent to the irrigation areas, required as part of this alternative, would provide for early detection of any adverse impacts to groundwater resources. Corrective measures such as modifying or discontinuing the irrigation, would then be required in order to correct irrigation operations so as to not affect groundwater. Therefore, irrigation with produced water as proposed by Fidelity, in combination with the monitoring--response actions that would be required under this alternative, would not impact groundwater resources beneath or adjacent to the land application areas.

4.4.6.2 Cumulative Impacts

The cumulative impacts to surface water and groundwater resources are expected to be the same as those described in Alternative B. BLM applied mitigation measures for the impoundments and irrigation areas would allow for the evaluation of the adequacy of management practices and to modify practices if adverse monitoring results are observed.

4.4.7 Impacts on Vegetation from Alternative C

4.4.7.1 Direct and Indirect Impacts

Invasive Species

Same as Alternative B.

4.4.7.2 Cumulative Impacts

Same as Alternative B.

4.4.8 Impacts on Wildlife from Alternative C

The additional mitigation measures added in Alternative C (EA Section 2.3.3) would not provide a substantial increase in protections to wildlife over and above those already included in Alternative B. Therefore, the impacts that would occur under Alternative C are nearly the same as those described for Alternative B and require no further analysis.

4.4.8.1 Direct and Indirect Impacts

Same as Alternative B.

4.4.8.2 Cumulative Impacts

Same as Alternative B.