

## Cumulative Projects Analysis Powder River Gas-Coal Creek POD

Cumulative projects are those that have the potential to combine with the proposed action to create environmental impacts. For the Powder River Gas – Coal Creek POD the projects outlined below have been considered in detail. The treatment given to each is described in the analysis below.

### PRG-Coal Creek Fee Wells:

There are 10 fee wells and 8 federal CBNG wells within the Coal Creek POD. The fee and federal wells would use the same infrastructure. As such the impacts in terms of disturbance, surface water quality and groundwater drawdown will directly overlap. As such the impacts from these wells will be addressed under the direct impacts section for each alternative. The direct impact from the federal action will be determined by the difference in the magnitude of impact vs. the no federal action alternative.

If these fee and federal wells are determined to have the potential to produce economic quantities of gas, it is reasonably foreseeable that these leases would be commercially developed in the future (as opposed to the exploration testing proposed for this project). If this were to occur it is anticipated that an additional 14 well locations would be developed (28 wells) based on the 80-acre spacing in the POD area.

### Existing Badger Hills POD:

The Badger Hills POD consists of 178 CBNG wells near the Wyoming State Line and east of the Tongue River. The location of this field is shown on the cumulative projects map in the figures section of this report. This project is located approximately 7.5 miles from the Powder River Gas Coal Creek Project, and the CBNG wells are finished in the Deitz, Monarch and Carney coal seams. Further information on this proposal and the completed EA for this project is available on the BLM CBNG website at <http://www.mt.blm.gov/mcfo/cbng/>.

Produced water from this project is managed via the existing Fidelity MPDES permit (MT-0030457) for the discharge of 1,600 gpm of untreated CBNG water to the Tongue River. As such the impacts to surface water will directly overlap with the proposed action to create environmental impacts. The groundwater drawdown associated with these wells will not overlap with the proposed project since the wells are finished in different coal seams, and the coal seams are considered to be confined aquifers due to the presence of shale layers above and below them. As such the impacts from the 1,600 gpm untreated water discharge to the Tongue River used for this project is included as a part of the existing conditions in the surface water section under each alternative. The groundwater drawdown associated with this project is not addressed.

### Existing CX Field CBNG Development:

The existing CX Field is located immediately to the west of the Badger Hills project, and is also being conducted by Fidelity. The location of this field is shown on the cumulative projects map in the figures section of this report. This project is located approximately

5.5 miles from the Powder River Gas Coal Creek Project, and the CBNG wells are finished in the Deitz, Monarch and Carney coal seams. The water produced in the CX Field is also managed through the same existing MPDES permit (MT-0030457) for 1,600 gpm of untreated CBNG water. As such the impacts to surface water will directly overlap with the proposed action to create environmental impacts, and so this discharge is included in the surface water model in determining existing conditions. The groundwater drawdown associated with these wells will not overlap with the proposed project since the wells are finished in different coal seams, and the coal seams are considered to be confined aquifers due to the presence of shale layers above and below them. As such the impacts from the 1,600 gpm untreated water discharge to the Tongue River used for this project is discussed in the surface water cumulative impacts section under each alternative. The groundwater drawdown associated with this project is not addressed.

#### Proposed Fidelity Dry Creek POD (CX Field infield drilling)

Fidelity has submitted a POD to the BLM for the drilling of an additional 40 CBNG wells in the CX Field in T9S, R40E, and in T9S, R39E. The location of this field is shown on the cumulative projects map in the figures section of this report. These wells would be finished in the Dietz, Monarch, and Carney coal seams. According to the POD book there would be 26 new federal wells, 11 state and 3 fee. A total of 17 well sites (12 federal, 3 state and 2 fee) would be used with 1-4 wells completed at each site. Further information on this proposal is available on the BLM CBNG website at <http://www.mt.blm.gov/mcfo/cbng/>.

The Water Management Plan associated with this plan indicates that the produced water would be discharged to the Tongue River under the existing MPDES permit (MT-0030457), piped to the Spring Creek Coal Mine for beneficial use, or, if necessary, stored in an existing off channel impoundment.

As such the impacts to surface water will directly overlap with the proposed action to create environmental impacts. The groundwater drawdown associated with these wells will not overlap with the proposed project since the wells are finished in different coal seams, and the coal seams are considered to be confined aquifers due to the presence of shale layers above and below them. As such the impacts from the 1,600 gpm untreated water discharge to the Tongue River used for this project is included in the surface water model in defining existing conditions. The groundwater drawdown associated with this project is not addressed.

#### Wyoming CBNG Development:

As discussed in the effected environment section of this report, past CBNG discharges into the Tongue River watershed are incorporated into the water quality observed at the USGS station on the state line. The current policy of the WY-DEQ is to not allow any new CBNG discharge into the Tongue River. A small portion of the water produced in Wyoming and stored in on drainage impoundments, or used for irrigation, may eventually infiltrate, flow down gradient through the alluvial aquifers, and eventually join the alluvium of the Tongue River. Since the Tongue River is a losing stream over this reach

it is not anticipated that these potential changes in alluvial water chemistry will affect surface water quality. Since the infiltrated water will partake in the dissolution of soluble salts, and cation exchange processes with clays, the quality of the infiltrated water which eventually enters the alluvium is anticipated to be very similar to the current alluvial groundwater quality. For these reasons, it is not anticipated that CBNG development in Wyoming will combine with the proposed action to create impacts to surface waters.

According to the Wyoming Oil and Gas Commission database (<http://wogcc.state.wy.us/>) the CBNG wells in Wyoming near the state line in the Tongue River watershed are producing from the Dietz, Monarch and Carney coal seams. The location of this development is shown on the cumulative potential drawdown map in the figures section of this report. Since these wells are producing from different coal seams than the Powder River Gas-Coal Creek POD, and the coal seams are considered to be confined aquifers due to the presence of shale layers above and below them, the drawdown related impacts from this development does not have the potential to overlap with the Powder River Gas Coal Creek POD, and the drawdown related impacts from this project are not addressed in this report.

#### Proposed Yates Exploration CBNG Wells (14 Wells)

Yates Petroleum has submitted APDs for the drilling and testing of 14 exploratory CBNG wells in Rosebud and Big Horn Counties. The locations of these wells are shown on the cumulative projects map in the figures section of this report. One well would be drilled at each location. The Wall, Flowers-Goodale and Brewster Arnold coal seams would be tested for CBNG potential under Yates' proposal. Further information on this proposal is available on the BLM CBNG website at <http://www.mt.blm.gov/mcfo/cbng/>.

The action taken at each well site would include the drilling and completion of the well, pumping that well for ~5 days to determine the quantity of CBNG present (if any), and the reintroduction of the produced water back into the coal seam from which it was pumped via gravity feed down the well. Pumping rates and the head in the well will be monitored during both the pumping and reintroduction (slug) phases in order to obtain hydrogeologic information.

As the duration of this pumping activity would be short, and the water would be reintroduced into the coal seam, it is not anticipated that groundwater impacts from this project will extend beyond the immediate vicinity of the wells being tested. Thus this project is not addressed in the cumulative groundwater portion of this report. This project is not anticipated to affect surface water.

#### Proposed Fidelity Coal Creek POD

Fidelity has submitted a POD proposal for the completion of 222 new CBNG wells on 160 acre well spacing in townships 9S,41E and 9S40E. The location of this POD is shown on the cumulative projects map in the figures section of this report. 144 of these proposed wells would be federal, 16 would be state wells, and 62 would be fee. These wells would be finished in the Dietz, Monarch, and Carney coal seams. Further

information on this proposal is available on the BLM CBNG website at <http://www.mt.blm.gov/mcfo/cbng/>.

The preferred water management method for the water produced from these wells would be through treatment. A Higgins Loop type ion exchange water treatment facility will be constructed, and the effluent will be discharged directly into the Tongue River under a MPDES discharge permit. An application for this permit has been submitted to the MDEQ and is currently under review. The residual brine produced by this process would be shipped off site and disposed of in a properly permitted injection well. The MPDES application for this facility is for a maximum discharge rate of 1700 gpm (3.8 cfs). The treated discharge water would have an EC of less than 1000  $\mu\text{S}/\text{cm}$  and an SAR of less than 3. As this discharge will be directly into the Tongue River it is taken into account in the analysis of cumulative impacts to surface waters.

Fidelity has also proposed an alternative set of water management practices as a contingency plan if a MPDES permit is not issued. These practices include storage of the produced water in lined off channel impoundments during the winter and managed irrigation during the summer. Any environmental impacts from these practices would be local in nature and would not have the potential to overlap with impacts from the PRG-Coal Creek POD; therefore impacts from these activities are not analyzed in this report.

#### East Decker, West Decker, and Spring Creek Coal Mines

East Decker and West Decker coal mines have permits to discharge water derived from dewatering coal seams into the Tongue River. As discussed in the surface water model narrative, the effects of these discharges have already been incorporated into the model to determine the effected environment, and as such they are addressed in the cumulative analysis. Spring Creek coal mine has only a storm water discharge permit, since it is a dry mine. The chemistry of this storm water is not anticipated to be substantially different than the storm water entering the river from any other drainage; therefore the effects of this discharge are not evaluated in the surface water model. The drawdown associated with pumping the East and West Decker mine will be limited to the Dietz (Anderson-Dietz of MBMG) coal seams which are being mined. As these coal seams are not proposed for development in the PRG-Coal Creek POD this drawdown does not have the potential to overlap with the proposed action to create environmental impacts.

#### Summary

The impacts from drilling the fee and state wells within the PRG-Coal Creek POD will be analyzed as a part of the direct impacts analysis for both surface water and groundwater. Cumulative impacts to surface water from the Fidelity PODs which have discharge of both treated and untreated water to the Tongue River, and the discharges associated with the coal mines are addressed. CBNG development in Wyoming, and the Yates Exploration proposal are not anticipated to have environmental impacts that will overlap with the proposed action.

## Cumulative Actions and Potential to Affect Hydrological Resources

	Surface Water		Groundwater	
	Yes	No	Yes	No
PRG-Coal Creek Fee Wells	X		X	
Fidelity Badger Hills POD	X			X
Fidelity CX Field	X			X
Fidelity Dry Creek	X			X
Wyoming CBNG		X		X
Yates Exploration Wells		X		X
Fidelity Coal Creek	X			X
Coal Mines	X			X