Wyoming Department of Environmental Quality (WDEQ), Water Quality Division, WYPDES Permitting Program
Watershed-Based Permitting for the Powder River Basin, Wyoming
State Innovation Grant Program – PI978078-01
Final Report
July 21, 2010

Project Synopsis:

One of the many facets of WYPDES permitting within the state of Wyoming is the permitting of produced water discharged during the production of coal-bed methane gas (CBM). To produce CBM, producers partially dewater the coal seam in order to allow the CBM to desorb from the coal matrix. The coal seam water, which is essentially unaltered groundwater, is typically discharged on the surface to waters of the state. Such discharges require WYPDES permits. The Powder, Little Powder, Belle Fourche, Cheyenne, and Tongue River drainages will collectively be referred to as the "Greater Powder River Basin" for the remainder of this report. According to CBM development forecasts provided to the WQD by the Bureau of Land Management (BLM) in March, 2007, about 57,000 CBM wells remain to be drilled within the Greater Powder River Basin. By the year 2020, 97,500 CBM wells will have been drilled within the Greater Powder River Basin. In 2007, WQD issued 505 new, major modifications, and renewals of CBM surface discharge permits, or an average of 42 per month. In addition to a large permitting load for new CBM surface discharges, the WQD expects each WYPDES CBM permit to be renewed between 2 and 3 times, and to be modified between 2 and 10 times before being allowed to expire.

Typically, untreated CBM discharges are higher in salts and sodium than perennial streams within the Greater Powder River Basin. Therefore, large-scale discharges of untreated CBM produced water have the potential to increase salt and sodium in the Greater Powder River Basin to levels damaging to existing uses (primarily agriculture). In addition to salts and sodium, some CBM untreated discharges contain concentrations of other pollutants above the maximum concentrations allowed by state standard (primarily dissolved iron, total radium 226, total barium, and pH. Occasionally, discharges are reported that are high in various heavy metals).

The WQD was allocated grant funds in June, 2005 in the amount of $198,000.00 from the EPA to assist in the implementation of watershed permitting for CBM discharges within the Greater Powder River Basin. The grant period expired on June 30, 2010, and only a small portion of grant funds have not been utilized as of the date of this report. To date, a project of this type and scope has not been attempted by any other permitting entity within the United States. Initially, the WQD had a very aggressive, optimistic schedule for CBM watershed-permitting implementation within the Greater Powder River drainage from the outset in 2005. Three watersheds went through the complete watershed-based permitting process – Pumpkin Creek, Willow Creek, and Fourmile Creek (which was not a general permit, but individual permits issued under a watershed-based permitting plan). Due to appeals filed on the Pumpkin Creek and Willow Creek Watershed-Based permits, the WQD put a temporary hold on watershed permitting in order to determine what the outcome of the appeals would be and how the appeal decisions would impact further watershed permitting. At the time of this first permitting hold, there were several other watersheds at various stages in the watershed-based permitting process – Clear Creek, Fence Creek, Dead Horse Creek, Bitter Creek, Crazy Woman Creek, and Lower Tongue River. To date, permits for these watersheds have not been approved, even though several of the watersheds have been advertised in public notice. The Pumpkin and Willow

Creek permits were upheld in appeal, but since then, WYPDES CBM permits utilizing Wyoming's current Agricultural Use Policy as a basis for sodium adsorption, specific conductance, and/or dissolved sodium limits have been appealed by EPA, which put an additional hold on CBM permitting in drainages requiring agricultural use protection (which is the majority of drainages in the Powder River Basin where CBM development has and is occurring).

To date, this secondary hold has not been resolved, and watershed-based permitting has not resumed. However, the state of Wyoming, based upon the result of the appeals, will most likely re-implement watershed-based permitting once differences between EPA and the state have been resolved. This will occur whether or not additional funding from EPA can be obtained, because WDEQ believes that there are significant advantages that can be realized by implementing watershed-based permitting, at no cost to water quality. Chief among these advantages are:

Streamlined permitting process – permittees will be able to get permits in a more timely fashion and WDEQ staff will spend less time "reinventing the wheel".

More consistent permitting process for both DEQ staff and permittees – everyone will know what to expect and what steps to take.

More reliable permitting process – permittees and landowners will know what's required up front

More consistent permits - WDEQ staff will make fewer mistakes, and permittees and the general public will know what their requirements are up front.

Evaluation of potential environmental impacts (if any) will be easier and more reliable. If changes to authorizations need to be made based on impacts, these changes will be easier to implement.

Scope of Work (SOW) for Project – Goals and Status as of Project End:

Goal	Status
Assess cumulative impacts from CBM development within each drainage.	Attained in the drainages that have at least begun the watershed-based permitting process, methodology for assessing impacts in place.
Provide baseline water quality assessment for the entire Powder River basin to establish end goals such as flow, concentrations, and loads for the project areas	Attained in the drainages that have at least begun the watershed-based permitting process, water quality monitoring network in place through USGS.
Identify pollutants of concern for each watershed.	Attained in the drainages that have at least begun the watershed-based permitting process.
Identify water quality parameters with the greatest sensitivity (parameters first to exhibit a detectable response to effluent discharges0.	Attained
Compile and interpret data related to pollutants of concern and pollutants with greatest sensitivity.	Attained in the drainages that have at least begun the watershed-based permitting process, methodology for assessing pollutants of concern in place.

Goal	Status
Develop ArcHydro model platform to assess cumulative impacts regarding flow and parameter concentrations.	Determined that the ArcHydro model platform was not suitable for this project, utilized a Feature Analyst platform instead. All drainages within the target area have had Feature Analyst data extractions performed (ArcGIS shapefiles created identifying potentially-irrigated acreage), will perform data extraction on later color infrared imagery and compare with earlier imagery. Also tested a Hec-Ras model to attempt to address flow issues in the drainage, determined that the Hec-Ras model was not appropriate for this modeling effort.
Quantify existing and reasonably foreseeable potential future CBM development.	Attained, developed a spreadsheet model that utilizes BLM forecasted CBM development. Have updated the model twice since the inception of this project, will update it again shortly, waiting on latest BLM projections due July 2010.
Identification of potential Powder River assimilative capacity for total dissolved solids and dissolved sodium.	Attained
Conceptual outline for Powder River assimilative capacity allocation.	Attained
Develop a tracking process for Powder River assimilative capacity.	Attained, Powder River Salinity Control project fully implemented and working efficiently.
Develop an appropriate watershed-based permitting mechanism.	Attained, but under appeal, mechanism may be modified based upon appeal outcomes.
Synchronize WYPDES CBM permitting.	Attained
Document outcomes of the watershed-based permitting process so that process can be transferred to other drainages.	Attained

Financial Report

Expenditure Summary

Budget Category	Obj	Spent this Quarter	Cumulative to Date
Data Process Hardwre	0242	$ 0.0	$ 1,449.25
External Maintenance Agree – Oth	0292	$ 0.0	$ 6,269.60
Grants	0626	$ 0.0	$ 174,047.30
Management Services	0901	$ 0.0	$ 7,822.00
Total Obligated Funds			$ 189,588.15
Unobligated Funds			$ 8,411.85
Total Grant Monies			$ 198,000.00