ATTACHMENT 1

Surface Water Cumulative Hydrologic Impact Assessment
Spring Creek Mine, Application 00183

Cloud Peak Energy proposed a mine plan amendment with revised mining and reclamation plans for the Spring Creek Mine (SCM) near Decker, MT that would result in increased mining disturbance and related revisions to postmine topography (PMT), reclamation and drainage control plans (see Application 00183 submittal package). Details of the proposed changes are discussed below.

Existing and Proposed Mining Disturbance in the Spring Creek/Decker Mine Area

Existing mining disturbance in the Spring Creek/Decker mine area totals approximately 11,313 acres (17.7 mi.^{2}; see Table 1 - data from 2010 Annual Mine Reports), including disturbance from:

- West Decker mine, ~ 5,523 acres (both SCCC and West Decker are west of the Tongue River Reservoir);
- East Decker mine, ~ 2,089 acres (east of the Tongue River Reservoir); and
- Spring Creek mine, ~ 3,702 acres

Proposed life of mine (LOM) surface disturbance from permitted mining in the Spring Creek/Decker mine area totals about 15,740 acres (24.6 mi.^{2}; see Table 2 - approximate LOM disturbance boundaries from permits), including disturbance from:

- West Decker mine, ~ 6,828 acres in the Spring Creek , Pearson Creek and Pond Creek drainages, and adjacent tributaries;
- East Decker mine, ~ 2,898 acres in Coal Creek, Middle Creek and Deer Creek drainages, and adjacent tributaries; and
- Spring Creek mine, ~ 6,022 acres in the Spring Creek drainage.

Proposed Spring Creek Mine Plan Amendment

Spring Creek Mine's (SCM's) proposed mine and reclamation plan revision includes expansion of mining in existing pits in the mainstem and South Fork of Spring Creek and extension of mining to the south into Pearson Creek. If approved, permit disturbance would increase by 1,224 acres (1.91 square miles), for a total Life of Mine (LOM) disturbance of 6022 acres (9.41 square miles) with mining to be extended through year 2022.

Impacts to surface water resources from the proposed SCM mining amendment application would result from increased mining disturbance and related changes to topography, drainage geomorphology, soils and vegetation. Operational and post-reclamation impacts to surface water resources would include changes to surface runoff characteristics, sediment loads and water chemistry.

LOM disturbance to the mainstem Spring Creek drainage (~4.53 square miles; above South Fork, including North Fork disturbance) would affect approximately 20 % of the Spring Creek drainage (23.1 square miles above the South Fork confluence; see Table 2). LOM Disturbance

to the South Fork Spring Creek drainage (~3.88 square miles) would affect approximately 28 % of the South Fork Spring Creek drainage basin (13.9 square miles above its confluence with the mainstem of Spring Creek).

Combined LOM disturbance of the mainstem Spring Creek, South Fork Spring Creek, and lower Spring Creek (below South Fork) would total ~8.42 square miles, or ~22 % of the total Spring Creek drainage basin (37.4 square miles from its headwaters to its confluence with the Tongue River Reservoir).

LOM disturbance to the Pearson Creek drainage (~0.69 square miles) would affect approximately 8% of the Pearson Creek drainage basin area (8.8 square miles above its confluence with the Tongue River Reservoir).

Approximately 0.28 square miles of additional LOM disturbance would occur in adjacent Tongue River interbasin areas.

Cumulative Impact Area

The Cumulative Impact Area for potential surface water impacts includes proposed life of mine (LOM) disturbance areas for the Spring Creek and Decker mines within local drainage basins, and the adjacent Tongue River Reservoir area (see Map 1). Note that Wyoming's reclaimed Big Horn Coal Mine, about fifteen miles up the Tongue River from the West Decker Mine, is not include in this assessment; further discussion can be found in the previous 2006 Written Findings for West Decker Major Revision (Application 00175).

Further information on cumulative hydrologic impacts related to coal mining in the Decker/Spring Creek mine area is discussed in previous MDEQ documents, including:

- 2008 Written Findings for West Decker Mine (Application 00182)
- 2007 Written Findings for Spring Creek Mine (Application 000174),
- 2006 Written Findings for West Decker Major Revision (Application 00175),
- 2001 Written Findings for Spring Creek Mine - Carbone amendment (Application 00164),
- 1999 Written Findings for East Decker Major Revision (Application 00152);

and Wyoming DEQ's:

- 1996 Probable Hydrologic Consequences for Big Horn Coal Mine (permit number 213-T4; WDEQ, 1996).

Proposed Spring Creek Mining and Reclamation Plan Revision (Application 183)

Proposed mining and reclamation revisions for the Spring Creek mine include changes in mining, postmine topography (PMT), and surface drainage control.

Existing and proposed mining would primarily disturb ephemeral mainstem and tributary drainages of Spring Creek (including the lower portion of North Fork Spring Creek), South Fork Spring Creek, and Pearson Creek. A relatively small portion of LOM disturbance would include road and rail disturbance NE and SE of the mine in adjacent Tongue River interbasin areas and

Monument Creek. SCM disturbance also includes limited disturbance/reclamation associated with a coalbed methane water-supply line and access road in upper Pond Creek and Squirrel Creek drainages, SE of the mine.

The proposed Application 00183 amendment and mine plan revisions would result in an increase in mine pit area from the currently approved mine plan. The primary mining changes would be additional mining in the mainstem Spring Creek drainage (NW portion of the mine in Pit 4), and in South Fork Spring Creek and Pearson Creek drainages (SE portion of the mine in Pit 2), where mining would be extended further south. A portion of additional mining would occur within previously approved life of mine (LOM) disturbance limit for the SCM (see Map 2).

Note that LOM surface disturbance limits are generally mapped approximately (and with differing disturbance assumptions for each mine). Because of these mining disturbance assumptions, proposed LOM disturbance limits are generally overestimates of eventual LOM surface disturbance (for the proposed mine plan), often broadly delineated and including outlying surface disturbances (e.g. soil stockpiles, access roads).

Related postmine topography (PMT) changes would adjust for the revised mining plan, with additional surface disturbance in the NW and SE portions of the SCM in mainstem and South Fork Spring Creek and Pearson Creek drainages.

Proposed Spring Creek Mine PMT would generally approximate the premine landscape. Topographic differences in premine and postmine topography within LOM disturbance areas include changes in drainage basin divides (including ridge areas and upland tributaries), drainage channels and valley bottom topography (including channel, floodplain, terraces and side slope features), and a general loss of slope complexity. Some locally extensive elevation changes would occur along with shifts in premine ridge and valley locations. These changes are often related to spoil material placement (by dragline and truck/shovel operations) during mining, and in some cases are associated with excessive displacement of material near boxcut and final pit areas.

In addition to the approximate PMT proposed on Spring Creek's maps, SCM's reclamation plan includes commitments to approximate premine slopes, including a variety of terrain and habitat features (e.g. knobs, scarps, snow catchment areas, and rock ledges; e.g. permit Sections 17.24.313 and 501).

Mining-Related Hydrologic Impacts and Reclamation

During mining, a variety of sediment control measures such as sediment ponds, traps, ditches and silt fences are employed to treat disturbed area runoff and retain excess sediment and suspended solids within disturbance limits. Some runoff is also intercepted and/or redirected by active pits, mine spoils, roads and soil stripping edges. Where any excess groundwater is encountered during mining, it is pumped from the pits and treated as needed in the sediment control system. Because sediment ponds are generally designed and managed to contain runoff from 10-year, 24-hour precipitation events (approximately 2.4 inches in the Spring Creek mine area), direct discharges of runoff are uncommon except during larger snowmelt or back-to-back

storm events. The ponding can significantly alter the rate and timing of normal surface runoff to undisturbed drainages below the mine, particularly during smaller storm or snowmelt runoff events. While much of the ponded runoff infiltrates or is later discharged to undisturbed drainages below (at much lower rates), some of the treated waters caught by perimeter ponds and traps is applied to haul roads for dust control where most is lost to evaporation.

Once regrading is completed in disturbed basins (just prior to resoiling and revegetation), new Western Alkaline MPDES effluent guidelines will require that 'Best Technology Currently Available' (BTCA) sediment control measures and practices, with reduced or minimal pond storage volume, be put in place. Western Alkaline sediment control practices are intended to replace operational sediment control ponds (e.g. with large, 10-year, 24-hour storm runoff volumes) and to allow natural streamflow discharges and sediment loads from reclaimed areas. The new Western Alkaline sediment control requirements will apply to regraded and reclaimed drainages throughout Spring Creek and Decker mine reclamation, and will complement reclamation goals to approximate premine hydrologic characteristics, and facilitate bond release requirements.

During the first few years after reclaimed areas have been resoiled and seeded, discharge and sediment loads from storm and snowmelt runoff events are usually much higher than similar events in undisturbed drainages. As vegetative cover is established in reclaimed areas, interception, infiltration and plant water consumption increase, resulting in less runoff and lower sediment loads. Where postmining topography landscapes are less diverse than premining (e.g. with flatter slopes and fewer tributaries) there would be greater potential for infiltration and increased evaporation, resulting in less runoff reaching tributaries, lowland areas and stock ponds, particularly during the more frequent smaller storm and snowmelt runoff events. Where shrub and forest cover are an important component of premine drainage basin cover, it will take decades or longer to approximate premining hydrologic conditions (e.g. of forest interception, evapotranspiration, infiltration and runoff) with similar forest cover.

In general, for disturbed ephemeral drainage systems, the long-term hydrologic consequences of proposed mining depend on the adequacy of reclamation in approximating premine topography, drainage basin geomorphology and vegetation. Thus, there is a significant and ongoing emphasis on planning and reassessment of the proposed postmining topography and reclamation plans so that they could be updated and adjusted where appropriate to effectively approximate premine topographic characteristics.

Operational and long-term impacts to intermittent and perennial surface water resources would depend on the extent of mining-related changes to relevant geologic and geomorphic characteristics, groundwater resources, and direct or indirect surface water contributions. Because overburden structure is lost and coal removed during mining, the most likely impacts would occur in springs, wet reaches or ponds that depend primarily on these sources.

Most drainages in the immediate SCM mine area are ephemeral (e.g. see Spring Creek, South Fork Spring Creek and Pearson Creek hydrographs; Figures 1, 2 and 3). Some intermittent flow periods have been recorded in portions of South Fork Spring Creek (e.g. see RS-3 and RS-7

hydrographs, Figure 2). These intermittent flows were more likely derived from shallow alluvial aquifer discharges during wetter periods, rather than from the coal aquifer (Anderson-Dietz).

Other indirect impacts to intermittent or perennial surface water resources may occur where groundwater contributions to premining springs, stream reaches, or stock ponds are affected by mining impacts to contributing or source aquifers. Some of these may occur with reductions in groundwater discharges, or changes in groundwater chemistry in intermittent or perennial stream reaches downgradient of area wide mining impacts (e.g. Squirrel Creek).

Related impacts and changes to stream flow and water chemistry due to groundwater pumping and discharges from coal bed methane operations in the mine areas further affect, and complicate interpretation of mining related impacts (see below).

Offsite Disturbances (Non-Mining Activities)

Other sources of surface water disturbance in the Tongue River drainage adjacent to and upstream of the Decker/Spring Creek mine area include a variety of municipal and industrial activities, mostly in Wyoming. The more notable disturbances include those associated with the developing coalbed methane (CBM, or coalbed natural gas) industry, and the city of Sheridan, Wyoming, approximately 20 miles to the southwest, with a population of ~16,000 (2000 census). The Tongue River Reservoir itself also influences Tongue River flow and water chemistry dynamics (e.g. see Figure 4).

Ongoing and proposed coalbed methane activities within the Spring Creek/Decker mine area include operations in Squirrel Creek, Pond Creek, Coal Creek, and Deer Creek. Potential surface water impacts related to coalbed methane activities include dewatering of local aquifers, springs and stream base flows, and the ponding and discharge of higher dissolved solids groundwater into ephemeral and other drainages. Potential impacts of coal bed methane activities in the Decker Spring Creek area are discussed further in the groundwater portion of the written findings. Additional information is included in CBM Environmental Assessments (EA), including those for the Coal Creek, Pond Creek and Deer Creek Fields (MBOGC, 2005), the EA for related Tongue River MPDES permits (MDEQ 2005), and in the Statewide Oil and gas EIS (US BLM, et al. 2003).

Conclusions / Material Damage

The proposed Spring Creek Mine Application 00183 mine plan revision would result in a 1.91 $mi.^2$ (26 %) increase in proposed LOM mining and surface disturbance in the Spring Creek/Decker mine area. Proposed LOM surface disturbance for the Spring Creek, West Decker and East Decker mines would total approximately 24.6 $mi.^2$, an increase of ~2.0 $mi.^2$ (9%). However, the total surface disturbance would only affect approximately 1.4% of the 1770 $mi.^2$ Tongue River drainage basin area above and including the Tongue River Reservoir. Mining related impacts to surface water are expected to be measureable in the short term within and below mined area drainages, and would diminish with reclamation recovery and distance downstream. Cumulative mining related impacts to surface water resources within and adjacent to the Spring Creek/Decker mine area are not expected to change significantly, or to be

measureable, within the main reservoir body or the Tongue River below, largely due to the much larger drainage area and streamflows of the Tongue River, e.g. see Figure 4).

Reclamation proposed for the amendment would generally approximate pre-mine topography and drainage basin morphology, but proposed PMT would have changes in drainage basin size, channel location, topography and slope diversity. The proposed mine plan would include additional mining in the South Fork and Pearson Creek valley bottoms and in steeper, more diverse upland and ridge topography. Some steeper areas would be reclaimed to less steep terrain, with fewer headwater tributaries and reduced topographic diversity. The operator has committed to ongoing reevaluation of post-mine topography (e.g. spoil placement, rough and final grading) to better approximate pre-mine topography and related hydrologic characteristics and functions.

Surface runoff (and water chemistry) would be similar to premine conditions in areas where PMT (soil and vegetation) most closely approximate premine characteristics (e.g. basin size, tributary patterns, slope diversity). Surface runoff could be reduced in areas where drainage density and topographic diversity are reduced (subject to more potential overland flow and infiltration), with potentially fewer runoff events from smaller storms.

Sediment in runoff from initial reclamation would generally be increased over natural background levels, but should recover to levels similar to premine with vegetative recovery. Water chemistry in the predominantly ephemeral drainages of the SCM mine area should be similar overall to premine characteristics. Any spoil aquifer discharges that develop (e.g. springs or intermittent /perennial channel reaches) are expected to have increased dissolved ions as discussed for groundwater systems in the following section.

Material damage with respect to the hydrologic balance is the degradation or reduction of the quality or quantity of water outside of the mine permit area in a manner or to an extent that land uses or beneficial uses of water are adversely affected, water quality standards are violated, or water rights are impacted. All proposed mining operations must be designed and conducted in a way to prevent material damage to the hydrologic balance outside the permit area (and to protect the quantity and quality of water uses and the rights of water users. Overall, the proposed Spring Creek Mine Application 00183 mine plan amendment would contribute additional, more extensive mining disturbance to cumulative surface water impacts of the Spring Creek/Decker Creek mine area. However, Spring Creek Mine's proposed reclamation plan would help minimize mining related impacts to surface water resources within and adjacent to the mine, and it does not appear that premine surface water uses outside the Spring Creek Mine LOM plan area would be prevented. The Department therefore finds that no material damage to surface water systems would result from the reduced mining proposed in the Spring Creek Mine Application 00183 mine plan revision.

REFERENCES

Decker Coal Company. 2011. 2010 Annual Mining Report.

Attachment 1: Application 00182 – Surface Water CHIA

Montana Department of Environmental Quality. 1999. East Decker Major Revision Application 00152, Written Findings.

Montana Department of Environmental Quality. 2005. Environmental Assessment – Fidelity, Tongue River Project (for the Flow Based and Treatment MPDES permits).

Montana Department of Environmental Quality. 2006. West Decker Major Revision Application 175 Written Findings.

Spring Creek Coal Company. 2011. 2010 Annual Mining Report.

U.S. Bureau of Land Management, Montana Board of Oil and Gas Conservation, Montana Department of Environmental Quality. 2003. Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans.

Wyoming Department of Environmental Quality. 1996. Sheridan, Wyoming. Big Horn Coal Mine Permit Number 213-T4. Probable Hydrologic Consequences.

ILLUSTRATIONS and TABLES

Figures

Tables

Maps