August 3, 2015 Comment Letter
EXHIBIT 1

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Defending the West www.westernlaw.org

Western Environmental Law Center

August 3, 2015

Via email and hand delivery

Chris Yde
Program Supervisor
Montana DEQ
Industrial Minerals Bureau
PO Box 200901
Helena, Montana 59620-901
CYde@mt.gov

RE: OBJECTIONS TO DEQ's ACCEPTABILITY DETERMINATION FOR ROSEBUD AREA B EXPANSION

Mr. Yde

Please accept the following comments on behalf of the Montana Environmental Information Center and the Sierra Club (Citizens) regarding DEQ's acceptability determination and checklist environmental assessment for the Rosebud Coal Mine Area B Amendment AM4. The Citizens incorporate by reference our comments on recent proposed federak lease modification for the Rosebud Mine.[1]

I. DEQ MUST REFUSE THE PERMIT AMENDMENT

1. Current Violations of Environmental Laws

a. Absaloka Mine

Montana Code Annotated § 82-4-227(11) provides:

> Whenever information available to the department indicates that a strip- or underground-coal-mining operation that is owned or controlled by the applicant or by any person who owns or controls the applicant is currently in violation of Public Law 95-87, as amended, any state law required by Public Law 95-87, as amended, or any law, rule, or regulation of the United States or of any department

[1] Letter from MEIC & Sierra Club to Nate Arave, BLM (Oct. 10, 2014) (attached as Exhibit a).

> or agency in the United States pertaining to air or water environmental protection, the department may not issue a strip- or underground-coal-mining permit or amendment, other than an incidental boundary revision, until the applicant submits proof that the violation has been corrected or is in the process of being corrected to the satisfaction of the administering agency.

Western Energy Company (WECo) is a wholly owned subsidiary of Westmoreland Coal Company. Westmoreland also owns and operates the Absaloka Mine in Hardin, Montana. The Absaloka Mine is in current violation of the Clean Water Act (CWA) and has been in violation of the CWA for every quarter (save one) for the past three years.[2] Indeed, the unbroken three-year stream of violations seems to demonstrate a "a pattern of willful violations," which further precludes DEQ from issuing a permit to WECo for further strip-mining at the Rosebud Mine. § 82-4-227(12), MCA.

b. Rosebud Mine

Evidence available to DEQ also indicates that WECo is currently in violation of the Surface Mining Control and Reclamation Act (SMCRA) and the Montana Strip and Underground Mine Reclamation Act (MSUMRA). ARM 17.24.631(1) provides: "The permittee shall plan and conduct mining and reclamation operations to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance outside the permit area." *Accord* 30 C.F.R. § 816.41. Material damage is defined by statute to include "[v]iolation of a water quality standard." § 82-4-203(31), MCA.

Here, abundant evidence before DEQ indicates that WECo is causing violations of water quality standards. According to DEQ's 2014 Final Water Quality Integrated Report, the principal stream impacted by the strip-mining operation, East Fork Armells Creek, is currently not meeting water quality standards.[3] No portion of East Fork Armells Creek is within the permit boundary. DEQ has determined that the upper portion of the creek is not meeting water quality standards due to "alteration in stream-side or littoral vegetative covers," caused by "surface mining." DEQ has also determined that the lower portion of East Fork Armells Creek is not meeting water quality standards for Nitrate/Nitrite, nitrogen, specific conductance (SC), and total dissolved solids (TDS) and that the cause of these violations of water quality standards includes "coal mining." WECo is clearly responsible for all violations of water quality standards in the upper reach of East Fork Armells Creek. Indeed, WECo acknowledges that an upper section of the creek in Section 15 was intermittent in 1986 and that recent surveys indicate that it is now

[2] EPA, Enforcement and Compliance History Online, Westmoreland Resources, Inc.—Absaloka Mine, *available at* http://echo.epa.gov/ (attached as Exhibit 1).
[3] DEQ, Final Water Quality Integrated Report, app. A at A-158 (2014), *available at* http://deq.mt.gov/wqinfo/cwaic/reports.mcpx.

dry.[4] "Given the decreased water levels in alluvial wells between Areas B and C, it is possible that the change in flow is a result of mine related dewatering."[5] Removing the water from a creek also removes all designated uses associated with that creek, in violation of water quality standards: "Where augmentation of stream flow and stream underflow is reduced because of the lowering of the water table and the lack of discharge into streams from underground sources, aquatic life will be affected as well."[6] Because this portion of the creek is outside the mine permit boundary, the dewatering of the creek by WECo constitutes material damage outside the permit area.

WECo is also, at the least, a contributor to the violations of water quality standards in the lower reach of East Fork Armells Creek. Indeed, WECo itself concludes that saline water from coal spoils will, alone, be responsible for a 13% increase in TDS levels in the alluvium.[7] WECo also identifies ammonium-nitrate explosives from blasting as a contributor to elevated nitrate plus nitrite nitrogen levels in the East Fork Armells Creek alluvium.[8] Further, it is clear that DEQ also believes that WECo is causing material damage to the hydrologic balance outside the permit area, which the agency is discussing with WECo, while hiding the issue from the public.[9]

Because there is abundant information available to DEQ indicating that WECo is violating MSUMRA (as well as the Clean Water Act), DEQ must refuse WECo's application to expand mining operations in Area B.

2. The Mine Is Not Designed to Prevent Material Damage to the Hydrologic Balance Outside the Permit Area

MSURA requires an applicant for a mine expansion to "affirmatively demonstrate" that

> assessment of the probable cumulative impact of all anticipated mining in the area on the hydrologic balance has been made by the department and the proposed operation of the mining operation has been designed to prevent material damage to the hydrologic balance outside the permit area

§ 82-4-227(3)(a). The PHC fails to make this required determination.

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[4] Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B and C: Western Energy Rosebud Mine at 28 (Jan. 2014) [hereinafter PHC]
[5] PHC at 28-29.
[6] National Research Council, Coal Mining and Ground Water Resources in the United States 146 (1981) (attached as Exhibit 1a).
[7] Addendum to the Comprehensive Evaluation of Probably Hydrologic Consequences Areas A, B, C: Western Energy Mine, Attachment 1 at 29 [hereinafter PHC Addendum].
[8] Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B and C: Western Energy Rosebud Mine at 58 (Jan. 2014) [hereinafter PHC].
[9] Memo from Dicki Peterson to Daniel Munoz (June 13, 2014) (attached as Exhibit 2).

a. The PHC Does Not Affirmatively Demonstrate that the Cumulative Impacts of Strip Mining Will Not Cause Material Damage to Ground Water Outside the Permit Area.

With respect to groundwater, the PHC recognizes that TDS levels in the spoils will be "two to three times that of the baseline coal groundwater."[10] WECo acknowledges that this will "likely result in deterioration of groundwater quality within some areas of the mine backfill to a degree that will require at least temporary reclassification of the groundwater to a lower usage class."[11] DEQ's draft checklist environmental assessment (checklist EA) also recognizes that "groundwater class may change, typically from Class II to Class III."[12] The PHC attempts to minimize this change by asserting that the degradation of groundwater is "not expected to negatively affect existing uses."[13] That, however, is not the standard for assessing material damage to the hydrologic balance. Montana law requires a showing sufficient for DEQ to determine whether any water quality standard will be violated, regardless of impacts to existing uses. § 82-4-203(31). The narrative standard for groundwater is written in terms of designated "beneficial uses." ARM 17.30.1006(2)-(3). These standards prohibit pollution that will be "harmful, detrimental, or injurious" to designated beneficial uses. The degradation of high quality Class II groundwater to low quality Class III ground water limits or eliminates all beneficial uses of Class II water. *Compare* ARM 17.30.1006(2)(a), *with* ARM 17.30.1006(3)(a). As such, this degradation is "harmful, detrimental, or injurious" to these uses.

The PHC attempts to minimize this degradation of high quality water by reference to Clark (1995) for the proposition that "dissolved-solids concentrations may decrease as water moves from the backfill into the un-mined, down-gradient coal." PHC at 13. This, however, is a blatant misuse of Clark (1995). That study specifically considered whether high concentrations of TDS in spoils water at the Big Sky Mine in Colstrip, Montana, would decrease as it moves into unmined coal. The conclusion: "As water flowed from the spoils aquifer to the downgradient coal aquifer, the dissolved-solids concentration essentially was unchanged" and "[A]long a path from the spoils aquifer to the downgradient coal aquifer, dissolved-solids concentrations were unchanged and concentrations of most dissolved ions were relatively small and probably not solely related to geochemical processes."[14] Ultimately, what Clark (1995) shows is that the high TDS spoils water from the mine area *will* likely migrate beyond the mine

[10] PHC at 13-14.
[11] PHC at 14. Very unhelpfully, WECo describes salinity of ground and surface water in units of TDS. *E.g.*, PHC at 32. Groundwater classifications, however, are made, however, with respect to specific conductance (SC). ARM 17.30.1006. DEQ's checklist environmental assessment does not include any numeric values for background, current, or projected water quality.
[12] DEQ, Draft Checklist EA at 4 (July 8, 2015).
[13] PHC at 59.
[14] David W. Clark, Geochemical Processes in Ground Water Resulting from Surface Mining of Coal at the Big Sky and West Decker Mine Areas, Southeastern Montana at 16, 41 (1995) (attached as Exhibit 3).

permit boundary and that the high TDS levels will cause degradation of water quality outside the permit area.

Further, neither the PHC nor DEQ's draft checklist EA addresses the best science about sulfate impacts to livestock. The PHC states that the sulfate standard for livestock is between 2500 and 3000 mg/L.[15] However, the most recent science shows that sulfate concentrations as low as 1,000 mg/L are harmful to cattle: "Assuming normal feedstuff S concentrations, keeping water SO_4 concentrations less than 1,800 mg/L should minimize the possibility of acute death in cattle. Concentrations less than 1,000 mg/L should not result in any easily measured loss in performance."[16] Sulfate levels in the adjacent Big Sky mine area appear to be routinely greater than 1,000 mg/L.[17] Plus the PHC recognizes that in some circumstances, the increased TDS in spoils water is "mainly due to an increase in sulfate concentrations."[18] DEQ's draft checklist EA does not address sulfate at all. The PHC's failure to use the best science with respect to sulfate impacts to livestock is insufficient to affirmatively demonstrate that the proposed mine expansion will not cause material damage to the hydrologic balance outside the permit area.

b. The PHC Fails to Affirmatively Demonstrate that the Cumulative Impacts of Mining Will Not Cause Material Damage to Surface Water Outside the Permit Area.

Far from showing that the mine will not cause material damage to water quality, the PHC demonstrates that the strip-mine will cause and contribute to ongoing material damage to surface water. As noted, according to DEQ the lower portion of East Fork Armells Creek is impaired for TDS, SC, nitrate/nitrite, and nitrogen. As noted, the lower segment of East Fork Armells Creek is currently impaired due to excessive TDS, specific conductance (SC), nitrate/nitrite, and nitrogen.[19] The PHC confirms that due to continued operation of the mine, TDS and nitrate/nitrite concentrations will increase in the alluvium of East Fork Armells Creek. PHC Addendum ("Once those water levels fully recover, it is estimated that the increase in TDS in the alluvium will be about 13 percent when compared to baseline conditions."); ("Nitrate plus nitrite nitrogen exceedances were found mostly in alluvium along the EFA and spoils wells. The maximum value of 351 mg/L was detected in a sample from alluvial well WA-113. The most recent samples from this well contain nitrate plus nitrite nitrogen concentrations below the DEQ-7 (October 2012 edition) standard. The highest nitrate plus nitrite nitrogen concentration measured in spoils wells is 50 mg/L. High nitrate plus nitrite nitrogen in spoils could possibly be

[15] PHC, Attachment C.
[16] M.F. Raisbeck, et al., *Water Quality for Wyoming Livestock & Wildlife: A Review of the Literature Pertaining to Health Effects of Inorganic Contaminants* at 48 (2008) (attached as Exhibit 4); *see also* Erbs, *infra* at fig. 2 (lifestock sulfate criteria of 500 mg/L).
[17] Clark, *supra* at tbl. 11.
[18] PHC at 26.
[19] Integrated Report at A-158.

due to dissolved residuals from ammomium-nitrate explosives used in blasting coal and overburden.").

Further, WECo's attempts to shirk its responsibility for increased TDS concentrations in alluvial waters are not believable. First, WECo inflates baseline TDS levels in East Fork Armells Creek to 2,299 mg/L.[20] However, the only samples that unquestionably predate mining at Colstrip, which were taken by the U.S. Geological Survey in 1923, had TDS concentrations of 845 and 688.[21] Further, the last time that DEQ appears to have considered the cause of increased TDS concentrations on water quality in East Fork Armells Creek, the agency stated that the baseline average was 2,200 mg/L.[22]

In addition to inflating baseline concentrations, WECo's suggestion that the measured increase in TDS upstream of Colstrip is due to "natural" factors is not credible.[23] First, the increase in alluvial TDS levels is not a recent development but has been documented since the 1990s.[24] DEQ attributed this increase in TDS to mining activity:

> However, the 40% increase in TDS in the alluvial aquifer observed upstream of Colstrip does in fact appear to be directly associated with mining activity. To investigate whether the increase in alluvial aquifer TDS has resulted from discharge of highly mineralized spoil water, the Department evaluated spoil water recovery and quality data from upslope mining along EFAC. Several graphs showing the recovery curves and associated water quality recorded from spoil wells completed adjacent to EFAC in Area A and Area B at the Rosebud Mine are presented in the Appendix. Review of these graphs indicates that water quality in spoil wells along EFAC, while increasing, is commonly less than the 1995 average measured in the alluvium (3,300 mg/L [Western Energy Co., 1997]). A more likely mining-related mechanism responsible for the observed TDS increases in the EFAC alluvial aquifer is the capture and containment of surface waters in upslope ponds within the mine area. These ponds capture relatively low TDS precipitation and snowmelt runoff, hence reducing the dilution effect these waters would have on the alluvial aquifer system if they were to flow into EFAC. This mechanism appears to be the likely culprit responsible for increasing alluvial aquifer TDS levels upstream of Colstrip.[25]

[20] PHC Addendum at 16.
[21] John Wheaton et al., Montana Bureau of Mines and Geology, Spring and Stream Water Quality Powder River Basin, Montana at 39 (Aug. 2013).
[22] Letter from Dan Erbs, DEQ, to Harv Gloe, OSM at 2 (Oct. 1, 1998) (attached as Exhibit 5).
[23] PHC Addendum, Attachment 1 at 16.
[24] Erbs, *supra* at 2-3.
[25] *Id.* at 3.

The only citation that WECo offers for its theory that the increased TDS levels in the alluvium are "natural" is to an "email communication," with no additional explanation.[26]

c. Additional Shortcomings of the PHC

In addition to the foregoing, the PHC suffers numerous additional shortcomings that prevent it from presenting an affirmative showing that the proposed mine expansion is designed to prevent material damage to the hydrologic balance. First, the PHC, like DEQ's draft checklist EA, suffers from such generalized vagueness as to be devoid of any informational value to any save industry and agency insiders. For example, the PHC states that TDS concentrations will increase in spoils groundwater "during initial saturation and then decrease to an equilibrium level after one or more pore volumes of water pass through the backfill."[27] This may case a "temporary reclassification of the groundwater to a lower usage class."[28] There is no indication, however, about the length of time required for multiple "pore volumes" of water to pass through the backfill. And there is no effort to provide any reference frame for the "temporary reclassification of groundwater." Available research, however, indicates that the passage of a pore volume may take centuries or millennia and that the "temporary reclassification" may last equally long.[29] Regarding groundwater quantity, the PHC merely states that "full recovery" "will exceed 50 years in most portions that are mined" and that "[a]lthough it could take considerable time, there is no reason to expect that the regional groundwater flow gradient will not *eventually* recover because recharge and discharge areas for the principal aquifer will not be affected by mining."[30] This lack of provision, if adopted by DEQ, would likely prove unlawful. It provides no helpful information to the public or decisionmakers who might wish to weigh in on the wisdom of this proposed mine expansion. Further, this is because the PHC's ultimate analysis seems to say that there will not be a reduction in water quantity after mining because full recovery is expected *at some point before the end of time*. It is noted that regarding the Bull Mountain Mine expansion, DEQ has argued that the 50 year horizon is the relevant period for assessing impacts. If that is the case, then the inexorable conclusion here is that the mine will cause material damage to water quantity, as the PHC admits that "substantial residual drawdown is projected to remain fifty years following mining."[31]

In addition to the unlawful vagueness and inconsistency with respect to the time horizons for impacts, the PHC is insufficient because it fails to address the impacts that climate change

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[26] PH Addendum, Attachment 1 at 23.
[27] PHC at 13.
[28] *Id.* at 14.
[29] William Woessner, et al., The Impacts of Coal Mining on the Hydrologeologic System of the Northern Great Plains: Case Study of Potential Impacts on the Northern Cheyenne Reservation, 43 J. of Hydrology 445, 461 (1979) (attached as Exhibit 6).
[30] PHC at 12. The draft checklist EA adopts this wholly unhelpful analysis. *See* Draft Checklist EA at 3.
[31] PHC at 55.

will have on the hydrologic balance. The entire PHC bases its analysis on a wholly unsupportable assumption of a static climate.[32] However, given the reality of climate change, the one thing that is certain is that the climate will not be static. As the United States Global Change Research Program recently wrote, "The past century is no longer a reasonable guide to the future for water management."[33] More heavy precipitation events are expected, drought is expected to intensify, water demand is anticipated to change, and existing patterns of groundwater recharge are expected to change, among other things.[34] The complete failure of the PHC to acknowledge climate change and the ongoing and worsening impacts to water resources renders it inadequate. Of course, this is ironic, since ongoing coal mining and coal combustion is one of the principal drivers of the worsening impacts of climate change.

II. DEQ's MEPA ANALYSIS IS INSUFFICIENT

The Montana Environmental Policy Act (MEPA) requires DEQ to assess "the environmental impact of the proposed action." § 75-5-201(1)(b)(iv)(A). The draft checklist EA here fails to do so. First, the draft checklist EA fails entirely to address the foreseeable impacts that will result when the mine is burned at the Colstrip Generating Station. Though the EA recognizes that "[c]oal from this mine is used to fuel two of the four coal-fired power plants located in Colstrip."[35] Second, the draft checklist EA fails entirely to assess *any* cumulative impacts, stating incorrectly that the action will have no cumulative effects.[36] This is inconsistent with the statements from the PHC about the cumulative impacts of all mining on surface and ground water. Further, the draft checklist EA fails entirely to assess any impacts of climate change.

II. APPROVAL OF THE PROPOSED MINE EXPANSION VIOLATES THE RIGHT TO A CLEAN AND HEALTHFUL ENVIRONMENT

Approval of this application must be withheld because strip-mining thermal coal for combustion both implicates and violates provisions of the Montana Constitution. Under this constitution, "[a]ll persons are born free and have certain inalienable rights. They include the right to a clean and healthful environment . . . ." Mont. Const. Art. II, § 3. The constitution further provides that "the State and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations." *Id.* Art. IX, § 1. Further, "[t]he legislature shall provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and degradation of natural resources." *Id.* Art. IX, § 3. The Montana Supreme Court has held that "the right to a

[32] *Id.* at 16.
[33] USGCRP, Global Climate Change Impacts in the United State 41 (2009) (attached as Exhibit 7)
[34] USGCRP, National Climate Assessment 70 (2014) (attached as Exhibit 7a).
[35] Draft Checklist EA at 7.
[36] *Id.* at 10.

clean and healthful environment is a fundamental right." *Mont. Envtl. Info. Ctr. v. DEQ* (*MEIC*), 296 Mont. 207, 225 (1999). Further, "the right to a clean and healthful environment guaranteed by Article II, Section 3, and those rights provided for in Article IX, Section 1 were intended by the constitution's framers to be interrelated and interdependent and that state or private action which implicates either must be scrutinized consistently. Therefore, we will apply strict scrutiny to state or private action which implicates either constitutional provision." *Id.* These provisions are "anticipatory and preventative." *Id.* at 230.

In *MEIC*, the court held that these rights were "implicated" based on the plaintiffs' showing that private action, approved by a state agency would "add[] a known carcinogen such as arsenic to the environment in concentrations greater than concentrations present in the receiving water." *Id.* at 231. Having found that the constitutional rights to a clean and healthful environment and to be free from unreasonable environmental degradation were implicated, the Court then held: "to the extent [a statute] arbitrarily excludes certain 'activities' from nondegradation review without regard to the nature or volume of the substances being discharged, it violates those environmental rights guaranteed by Article II, Section 3 and Article IX, Section 1 of the Montana Constitution." *Id.* This construction of the right to a clean and healthful environment as a "safety net" for resolving environmental problems that legislative and executive bodies fail to address is consistent with international law interpreting similar provisions. *See* Environmental Law Institute, Constititional Environmental Law: Giving Force to Fundamental Principles in Africa 2 (2d ed., 2007).

Here, there is no question that combustion of coal is a principal driver of climate change, which if unabated will radically impact the livability of our state and world.[37] As mentioned above, the impacts of climate change are already harming human and natural systems in Montana and across the nation.[38] At present, there is no state regulation of the carbon pollution from coal combustion or mining. As such, the mining and inevitable combustion of coal is and will continue to cause unabated GHG emissions entering the already saturated atmosphere. These impacts implicate the all citizens' right to a clean and healthful environment and their right to be free from unreasonable degradation of the "environmental life support system" (as well as DEQ's and the WECo's correlative duties to "maintain and improve" the Montana environment and protect it from unreasonable depletion). Thus DEQ's approval of the WECo's application is

[37] *See, e.g.*, World Bank, Turn Down the Heat: Why a 4ºC World Must Be Avoided xv (2012) ("The impacts of the extreme heat waves projected for a 4ºC world have not been evaluated, but they could be expected to vastly exceed the consequences experienced to date and potentially exceed the adaptive capacity of many societies and natural systems.") (attached as Exhibit 8); EPA, Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks ES-5 (2013); Drew Shindell et al., *Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security*, 335 Science 183 (2012) (noting that coal mines are major sources of methane pollution, a potent GHG).

[38] *E.g.*, National Climate Assessment, *supra*.

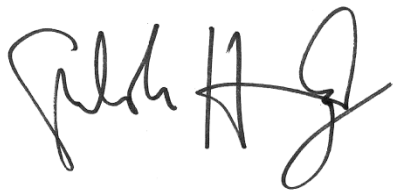
only permissible if it can survive strict scrutiny. It cannot because the pollutants causing the harm (GHGs), like the arsenic pollution in *MEIC*, are entirely unregulated under MSUMRA.[39] Until and unless strict scrutiny analysis is performed by DEQ, the permit may not be approved.

This conclusion is consistent with recent the recent unanimous decision from the Hague District Court in the Netherlands that determined that the Dutch Government is violating the rights of its citizens by failing to take action to abate climate change. There, the court stated, in relevant part:

> The State must do more to avert the imminent danger caused by climate change, also in view of its duty of care to protect and improve the living environment. The State is responsible for effectively controlling the Dutch emission levels. Moreover, the costs of the measures ordered by the court are not unacceptably high. Therefore, the State should not hide behind the argument that the solution to the global climate problem does not depend solely on Dutch efforts. Any reduction of emissions contributes to the prevention of dangerous climate change and as a developed country the Netherlands should take the lead in this.
>
> With this order, the court has not entered the domain of politics. The court must provide legal protection, also in cases against the government, while respecting the government's scope for policymaking. For these reasons, the court should exercise restraint and has limited therefore the reduction order to 25%, the lower limit of the 25%-40% norm.[40]

This analysis applies with greater force in Montana, given the express right to a clean and healthful environment enshrined in our state's constitution. Approval of additional strip-mining at the Rosebud Mine not only fails to assure our right to a healthful environment, it actually undermines it.

Sincerely,



Shiloh Hernandez
Western Environmental Law Center

[39] To the degree that Mont. Code Ann. § 82-4-221(1) permits approval of a application for permit renewal without regard to the impacts of carbon pollution, it violates the abovementioned provisions of the Montana Constitution, as applied to this case.

[40] *Urgenda Foundation v. Netherlands*, slip op. at 1 (Hague Dist. Ct., Netherlands June 24, 2015) (attached as Exhibit 9).

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on behalf of Montana Environmental Information Center and the Sierra Club

30(b)(6) Deposition
EXHIBIT 2

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:)
APPEAL AMENDMENT AM4)
WESTERN ENERGY)
COMPANY, ROSEBUD STRIP)
MINE AREA B)
PERMIT NO. C1984003B)

DEPOSITION OF ANNE HEDGES

On the 11th day of May, 2016, beginning at 9:00 a.m., the deposition of ANNE HEDGES, appearing at the instance of Intervenors, was heard at the Montana Department of Environmental Quality, 1520 East Sixth Avenue, Helena, Montana, before Lisa R. Lesofski, Registered Professional Reporter, Notary Public.

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MR. MARTIN: Okay.
Q. (By Mr. Martin) While we were off the record, Ms. Hedges, you noted that this does not include every feature of the Rosebud Mine, notably you said it doesn't identify the Big Sky Mine, it doesn't have the cumulative impact area and it doesn't include, I will also say for the record, every single feature that one might identify with a map; is that right?
A. Correct.
Q. Let's go ahead and mark the document.
(Deposition Exhibit 5 marked for identification.)
Q. (By Mr. Martin) Again, referring to Exhibit 5, the map that we've been talking about. What it does identify is the different areas, doesn't it?
A. It identifies the different areas of this, of Western Energy's Rosebud Mine.
Q. And we have Area B; is that correct? Do you see that on the map?
A. I do.
Q. And you see Area F on the map?
A. Yes.
Q. And Area C is in between. Do you see

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those features identified on the map?
A. Yes.
Q. And do you have any reason to believe that this map is inaccurate with respect to the identification of those areas?
A. I have no way to tell one way or the other without spending more time with it.
Q. So at least as you sit here today, you can't identify a deficiency in terms of where those areas are located; is that right?
A. Right.
MR. SULLIVAN: And I would object on the basis of asked and answered.
Q. (By Mr. Martin) And, again, just for purposes of the record, if you don't mind, based on this map and looking at its legend, can you say for the record how far away Area F is from Area B?
A. A mile or two. I can't tell. I mean, I see a legend but, you know, that's...
Q. Is it fair to say it's over four miles away?
A. It's -- yes. No, it's -- I don't know. I can't tell you for sure. Possibly.
Q. Based on this map, isn't it apparent that it's more than four miles away from Area B?

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A. More than four miles? No. I don't think that's apparent.
Q. Would you say about four miles?
A. It could be, uh-huh.
Q. Okay. And Area C is between Area B and Area F; is that correct?
A. That's correct.
Q. In response to my question about the interface between Area F and Area B, you recounted the regulation that governs material damage under the Montana Surface Mining Act, didn't you?
A. Correct.
Q. And how would that apply vis-a-vis Areas B and F?
A. Because Area B is -- Area B and Area F are within the cumulative hydrologic impact, or cumulative impact area that has been determined for the mine and they both affect some of the same watersheds, which are outside the permit boundary.
Q. And you're talking now about surface waters; is that right?
A. Surface and groundwaters.
Q. And you're looking at the CHIA again. Can you say for the record what document you're looking at, that is to say what table or map that you're

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looking at from the CHIA?
A. It's page 13-7 and it is Figure 5-1.
Q. Is there a map in the CHIA that you would take issue with?
A. No. I'd have no reason to take issue with them.
Q. Was this concern about the interaction between Area F and Area B addressed in MEIC's comments?
A. Yes, it was.
Q. Can you show me where it was?
A. It was a reference to our scoping comments.
Q. Can you describe that for the record?
A. I'd have to see the scoping comments to get them perfectly accurate. But it was a reference to the fact that they needed to consider other areas of the mine that were -- "where anticipated mining could occur, which includes at a minimum the entire projected lives through bond release of all operations with pending applications and all operations required to meet diligent development requirements for leased federal coal for which there is actual mine development information available."
Q. Ms. Hedges, what did you just read from?

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A. I just read from Montana Rules 17.24.301(32.)
Q. And I appreciate the text of the regulation. Can you show me anywhere in your comments where that issue was raised on August 3rd, 2015?
A. It was a -- I believe it's in Footnote 1, a letter from MEIC and Sierra Club to Nate Arave, BLM, on October 10th, 2014.
Q. Do you have that document with you right now?
A. I do not.
Q. And as you sit here today, how do you know that that issue was raised in the letter from MEIC/Sierra Club of October 10, 2014?
A. Well, because I reviewed it at the time.
Q. When did you review it?
A. A long time ago. And then I read about it again in preparation for this deposition.
Q. And, Ms. Hedges, that's the only basis for your testimony that this issue was raised in MEIC's comments?
A. I'd have to look back in our comments and check.
Q. Well, by all means. Go ahead and review

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those comments.
A. Okay.
Q. Should we go ahead and take a break here so you've got a chance to review this more carefully?
MR. SULLIVAN: Sure.
(Break taken.)
Q. (By Mr. Martin) Ms. Hedges, we broke for a few minutes and I think you had an opportunity to review Exhibit 2.
A. Uh-huh.
Q. And are there other places in Exhibit 2 where this issue was raised, specifically the issue regarding the interaction between Area F and Area B?
A. Exhibit 2 raised this issue in the footnote that we attached as an Exhibit A to our comments. But ultimately the company and DEQ, primarily the company, have the burden and the administrative record is supposed to demonstrate that there is compliance with the standards in the law, and that was the expectation that you would comply with the standards in the law.
The definition of anticipated uses is a regulation by which you were supposed to comply. So we certainly expected compliance and we have raised

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this in our responses to your comments in one of these documents that you have provided me. Our response to interrogatories, it was an issue we raised.
Q. But focusing directly on Exhibit 2, if I understood your testimony, the only way this issue was raised was by the footnote, i.e, Footnote 1; is that correct?
A. The only way it was raised it was raised. It was raised whether you think that one time was sufficient or we needed to repeat ourselves multiple times. The bottom line is we raised this in our comments.
Q. And --
A. And it is a requirement in law.
Q. Ms. Hedges, the only place where this was raised in Exhibit 2 is the footnote; is that correct?
MR. SULLIVAN: I'm going to object on the basis of the form of the question. It is argumentative and it has also been asked and answered and, finally, the document speaks for itself.
MR. MARTIN: Read back the question.
(Previous question read.)

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A. And attached as Exhibit A in our comments.
Q. (By Mr. Martin) Okay. That's a fair point. So the footnote and the attachment that included the document referenced in the footnote; is that right?
A. From my knowledge and my review of this letter at this time, that appears to be the case.
Q. So prior to the issuance of the CHIA, to the best of your knowledge was that issue raised to DEQ other than what you've just described?
A. That is the avenue by which we raise issues to DEQ is to provide comments, which we did, and it was included in our comments.
Q. All right. For the record, I'm going to move to strike that answer as not responsive.
MR. MARTIN: Would you read back the question?
(Previous question read.)
MR. SULLIVAN: And I'll object to that question as asked and answered.
Q. (By Mr. Martin) You may answer the question.
A. It was raised in our comments, as you stated.
Q. And no other place, to the best of your

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knowledge?
A. To the best of my knowledge.
Q. To the best of your knowledge, yes?
A. Yes.
Q. Thank you.
For purposes of the record, I'd like to clarify. I misspoke when I described our last exhibit and I indicated that all of the areas were areas of permitted mining. Am I right that Area F is a proposed area of mining as opposed to one that's been permitted?
A. It is an area where mining is anticipated.
Q. But no permit has been issued?
A. The permit has been applied for and is pending. DEQ is reviewing that now.
Q. And it's not been issued?
A. No.
MR. MARTIN: Off the record.
(Discussion off the record.)
(Deposition Exhibit 6 marked for identification.)
Q. (By Mr. Martin) Ms. Hedges, we've laid out a map that's been marked for identification as Exhibit 6. You'll note in the bottom left-hand corner it has the designation Figure 8-5,

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Potentiometric Surface of the Rosebud Coal and Spoil. And I'll certify for the record that that is a document that was taken from the CHIA and I believe it's at page 13-21. And let's talk about where it came from.
You have the CHIA in front of you, do you not, Ms. Hedges?
A. I do.
Q. And is this document the same map that appears within the CHIA at page 13-21?
A. Yes, it appears to be.
Q. I'll ask you, if you don't mind, if you would look at this map and review it. You'll see that there are certain lines that are drawn on the map. Do you know what those are?
A. This is the potentiometric surface of Rosebud Coal and Spoil plotted for monitoring well water levels at the Rosebud and Big Sky Mines in 2012.
Q. And you know, don't you, what potentiometric contours are?
A. More or less. I am not a scientist. I am not an expert.
Q. But you're familiar with those sorts of contours, aren't you?

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A. I have some familiarity.
Q. And do they give you an indication as to the direction of groundwater flow?
A. I believe that that's the purpose.
Q. And you'll see designations of Areas A, B, C on this map. Do you see that?
A. Yes.
Q. And you also see, do you not, a designation for Big Sky Mine?
A. Yes.
Q. Do you have any reason to believe that these potentiometric contours are not drawn accurately?
MR. SULLIVAN: And before you answer, I'm going to object both on the basis of foundation in terms of the witness as not being advanced as an expert and, second, I'm not sure as to where this fits into the 26 issues that you've specified an organizational representative to appear this morning.
Q. (By Mr. Martin) Okay, you can answer the question.
A. Can you repeat it?
MR. MARTIN: Go ahead.
(Previous question read.)

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A. I am not an expert so I have no way to know one way or the other.
Q. (By Mr. Martin) So is it fair to say that on that issue MEIC/Sierra Club has no position?
A. No, it is not fair to say.
MR. SULLIVAN: And I would say that that also calls for a legal conclusion, object on that basis.
Q. (By Mr. Martin) So the accuracy of potentiometric contours is not something that you're able to testify about at this point in time; is that right?
A. I am not. I am not a hydrologist.
Q. And the organizations are not prepared at this point in time to contest the accuracy of those potentiometric contours; is that correct?
MR. SULLIVAN: And I would object as being beyond the basis of the 30(b)(6) deposition.
Q. (By Mr. Martin) You can answer the question.
A. Can you repeat it?
MR. MARTIN: Go ahead.
(Previous question read.)
A. To the best of my knowledge, no.
Q. (By Mr. Martin) Would you agree with me

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that potentiometric contours tend to provide evidence of the direction of groundwater flow?
MR. SULLIVAN: And, John, do you mind if I have a standing objection on the same grounds if you're going to pursue this potentiometric map? I've stated objections as being on foundation --
MR. MARTIN: That's fine.
MR. SULLIVAN: -- and also as beyond the scope of the 30(b)(6) --
MR. MARTIN: That's fine.
MR. SULLIVAN: -- deposition notice.
A. Can you repeat the question?
(Previous question read.)
A. I believe that's what they indicate.
Q. (By Mr. Martin) And I'll invite your attention to Area B. Do you see that designation?
A. I do.
Q. And can you discern from the potentiometric contours the direction of groundwater flow?
A. No. I am just not an expert in this arena and if I tried to guess, I would probably be in error and I don't want to be in error. I would probably want to seek expert advice.

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Q. Okay. And let's talk about that for a minute. Are you aware of any scientific evidence that groundwater would flow from Area B to the west toward Area F?
A. I believe there are certain areas in which the drainages do flow into the same drainage.
Q. And, again, I'll invite your attention to Exhibit 6. Can you point to one of those drainages?
A. The Area B, if you look at all of Area B and you go beyond this -- I would like to stop and say that was the purpose of our complaint is we do not believe that you have adequately shown what Area F is going to do in relation to the impacts from Area B. They are both potentially going to impact the same watersheds and it is your burden to show what that impact will be. And we do not believe that that has been done in the record.
Q. And you would agree with me that this document is from the record; is that right?
A. That is correct.
Q. And with potentiometric contours, it does give you an indication of the direction of groundwater, doesn't it?
A. That's -- Yes, I believe so.
Q. Is there any evidence, any credible

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scientific evidence that would suggest to you that groundwater from Area B would flow in the direction of Area F?
A. I believe that is your job to demonstrate.
Q. And I appreciate the legal burden. But do you know of any evidence that demonstrates to the contrary?
A. I'd have to look at the record. It's possible that it is in the CHIA.
Q. But you don't know?
MR. SULLIVAN: Objection, asked and answered.
MR. MARTIN: She didn't answer the question.
Q. (By Mr. Martin) You don't know, do you?
A. The CHIA map indicates that there is a hydrologic connection at some point, whether it's ground or surface water, between these areas and that was not analyzed in the CHIA.
Q. Ms. Hedges, can you identify any map, any place in the CHIA that even suggests that connection?
MR. SULLIVAN: Objection, asked and answered.
A. Any map? I don't know of any, but I

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haven't looked closely at the maps because I am not a hydrologist.
Q. (By Mr. Martin) Ms. Hedges, if I understood your testimony a moment ago, you referenced what you described a, "a CHIA map," that demonstrated a hydrologic connection between Area F and Area B. Where is that map?
A. That map -- well, the map -- Let me find the map. Where is that map? These are my stickies. The map is map 5.1, but it does not include Area F. But Area F is within, as stated by DEQ in its response to our interrogatories, their response is -- if you'd like me to find them, I can -- there is parts of Area F that are within the Area B hydrologic impact areas.
Q. Let me see if I understand your testimony. I think your answer to my question is that Area B and a part of Area F is within the cumulative impact area; is that right?
A. I believe that's stated correctly.
Q. Okay. And so the basis for your testimony that there is a hydrologic connection between Area F and Area B is simply that a part of Area F is within the cumulative impact area; is that correct?
MR. SULLIVAN: And I think that it

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misstates the deponent's testimony.
MR. MARTIN: And that's why I'm asking the question.
Q. (By Mr. Martin) Answer the question.
A. DEQ in its response to our -- in Respondent's Response to Petitioners' First Set of Requests for Admissions and Requests for Production, there are a number of places in which DEQ identifies that portions of Area F are within the Area B area.
Q. And do you have any evidence anywhere in the CHIA or elsewhere that there is a hydrologic connection between Area B and Area F?
A. That is the purpose of a CHIA is to make that determination and that is not in the record.
MR. MARTIN: Read back the question.
(Previous question read.)
MR. SULLIVAN: And I object on the basis of asked and answered and argumentative.
A. There is a failure to meet your burden showing that there is no connection between the two of them.
Q. (By Mr. Martin) But am I right in saying that at this point in time you're not aware of any scientific information that there is a hydrologic connection between Area F and Area B?

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A. We have not seen any presented.
Q. I don't want to be argumentative. And I think what your testimony is is that there is not, to the best of your knowledge, any scientific evidence that demonstrates a hydrologic connection between Area B and Area F; is that right?
A. On the record? No, I don't believe there is any.
Q. Is there any elsewhere off the record?
A. Goodness sakes, I don't know.
Q. Okay. Have you worked at all with potentiometric contours?
A. No. I'm not a water, groundwater expert by any means.
Q. So is it fair to say you don't know the direction of the groundwater from the AM4 area within Area B; is that right?
A. It's listed in the CHIA, and I'd be happy to find it for you in the CHIA and read it back to you. That information, some of it is provided in the CHIA.
Q. And Exhibit 6 is taken from the CHIA as well; is that right?
A. Which one was Exhibit 6?
Q. It's this one.

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A. Oh, yes. Yes, it was.
Q. And you don't know at this point in time whether or not Exhibit 6 gives you an indication as to the direction of groundwater flow from Area B and specifically from AM4, do you?
A. Could you repeat that question?
Q. Why don't I rephrase it. I'm sorry.
Do you know the direction of groundwater flow from the area that's designated as Area B and/or AM4?
A. I know that the CHIA, the written CHIA describes a lot of the groundwater flow as going towards East Fork Armells Creek, and there is a lot of places in the CHIA that describe groundwater flow in this area. Because I am not a hydrologist, I rely more on words than I do on potentiometric maps. I go to experts for that type of information.
Q. And have you been to an expert or seen words that would indicate to you that groundwater was flowing from Area B to Area F?
MR. SULLIVAN: And I'm going to object to the form of the question on several bases. First, it's a compound question; second, it's confusing; and, third, we have not disclosed that we will be using any testifying experts in

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this proceeding and to the extent the petition organizations have consulted with experts with their attorneys, that's attorney work product and otherwise privileged.
Q. (By Mr. Martin) Well, let's clarify the question. Are you aware of any expert opinion that would suggest to you that groundwater flows from Area B to Area F?
A. I am not aware.
Q. And is there an indication someplace in the text that groundwater would flow from Area B to Area F?
A. I believe you are mistaken in how you are representing what you think is our position. Our position is that it is the area that is impacted, so it would be not that groundwater might flow underneath Area F from Area B, it is that the development of both areas has the potential to impact the hydrology in the area.
Q. Do they interact with one another?
A. They may.
Q. And what would make you say that?
A. Because they both lie within the cumulative impact area.
Q. And that's the only basis for that

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MR. SULLIVAN: Counsel, where --
Q. (By Mr. Martin) -- and if the answer is you don't know, I understand that.
A. The answer --
MR. SULLIVAN: For foundation, on this where is Area F? I don't see an Area F on this map.
Q. (By Mr. Martin) Do you know where Area F would be on this map?
A. Approximately but not definitely, which is one of the reasons that we would want it included in the analysis.
Q. And it would be on the western side of this map; would it not?
A. Yes.
Q. And the groundwater, can you tell what the direction of the groundwater is?
A. Only from certain areas. I don't know where Area F is. It has not been identified.
Q. And to the extent that this document and this analysis provides for the direction of groundwater, wouldn't that be an evaluation as to whether or not Area F impacted BLM?
MR. SULLIVAN: And I'm going to again object on the basis of foundation and also

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calling for a legal conclusion.
A. No.
Q. (By Mr. Martin) And why not?
A. Because you haven't identified where Area F is so I don't even -- I can't tell if the potentiometric map actually includes all or just a portion of Area F.
Q. And if you know that Area F is on the western side of this map and you know the direction of the groundwater, isn't that an evaluation of the impact between Area F and Area B?
A. No.
Q. And what would you demand beyond that?
A. I would like to see Area F indicated on the map and I'd like to see an analysis of Area F and where groundwater would flow and what its impact may be on the hydrology in the area both West Fork Armells Creek and East Fork Armells Creek and their tributaries.
Q. And that's the level of response that you would require?
A. Off the top of my head, that's what I can think of, yes.
Q. And you didn't require that level of response in your comments, did you?

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MR. SULLIVAN: And I'm going to object on the basis of calling for a legal conclusion.
A. That burden is not on us. That burden is on you. We think the law is clear on what your legal obligations were.
Q. (By Mr. Martin) And you didn't ask for that level of response in your comments, did you?
A. We wanted you to include Area F in the analysis. In our mind the analysis includes what is required by law.
Q. And you didn't, however, in your comments, even mention Area F, did you?
MR. SULLIVAN: Well, that whole area has been asked and answered, so I'm going to object on form on that basis.
A. We did raise it in our comments.
Q. (By Mr. Martin) And you're talking now about the footnote in the attachment; is that right?
A. That's correct.
Q. And that's the only place?
A. That is the place.
Q. And you didn't ask for a detailed analysis of Area 4 in your comments, did you?
MR. SULLIVAN: I'm sorry, John. Area what?

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Q. (By Mr. Martin) I'm sorry. I misspoke. Area F in your comments.
A. We believe that we -- well, yes, we did. It was raised as an issue in our comments, which indicates it's something that should have been considered because it is required under law.
Q. And let me just be clear on this question. And I don't want to be ambiguous in any respect. And for purposes of the record, you never asked for a detailed analysis of Area F in your comments?
A. Why would we ask for an analysis of Area F if it weren't going to be detailed?
MR. MARTIN: Read back the question.
(Previous question read.)
A. We raised it in our comments and that indicates we thought it should be included in the analysis. We included it as an attachment to our comments, which indicates it was something that we thought was important.
Q. (By Mr. Martin) You never asked -- is it correct to say that you never asked for a detailed analysis of Area F in your comments?
MR. SULLIVAN: And I'm going to object as asked and answered.
A. We raised it in our comments.

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Armells Creek to form Armells Creek lower down.
Q. Okay. Well, first let's talk about Lee Coulee. Are you familiar with any indication that groundwater would flow from AM4 into Lee Coulee?
A. We are concerned with the cumulative impacts from Area B. Amendment 4 is just one small amendment to the Area B permit.
Q. And are you familiar with whether or not groundwater would flow from AM4 to Lee Coulee; do you?
A. I don't know the answer to that. It's Area B that is the subject of our concern. This is an amendment to that permit. It is not a permit that stands on its own.
Q. So the answer is you don't know as you sit here today about the flow of groundwater from AM4 toward Lee Coulee, do you?
A. I do not know.
Q. Okay. Let's go back to the two surface waters that you mentioned in addition to Lee Coulee. One was West Fork Armells Creek. I gather from your testimony that you believe that Area F would have an impact on West Fork Armells Creek; is that right?
A. That's my prediction. I also believe there is a potential for it to impact East Fork

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Armells Creek, but that's -- we will see when they come out with their draft environmental impact statement what they think.
Q. Okay. Well, let's stop there. As you sit here today, are you aware of any evidence that groundwater from Area F would flow to East Fork Armells Creek?
A. It has not been provided in the record.
Q. And even outside the record, are you aware of any evidence that would suggest that groundwater or surface water from Area F would flow to East Fork Armells Creek?
A. Not being a hydrologist, I don't know the answer to that. I don't know if it would or not. That's the purpose of developing a record.
Q. So the answer is you just don't know?
A. I just don't know.
Q. Okay. And let's also go back to Area B. Are you aware of any scientific evidence that would suggest that groundwater or for that matter surface water from Area B would make its way to West Fork Armells Creek?
A. I'm not aware of any evidence.
Q. And you mentioned that East Fork Armells Creek and West Fork Armells Creek eventually meet to

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the north of the Rosebud Mine; is that right?
A. Yes.
Q. And do you know how far north?
A. No. I'd venture a guess of probably ten miles or so, but I could be right or wrong by quite a few miles.
Q. And you talked about or I asked for your testimony concerning the surface water CIA; is that right?
A. Yes.
Q. And do you see where the CIA is limited with respect to East Fork Armells Creek and West Fork Armells Creek?
A. I do.
Q. And that's well below the ten-mile distance --
A. That's well below. Can you repeat that?
Q. I'm sorry. Let me rephrase that. That boundary is well south of the point where East Fork Armells Creek meets West Fork Armells Creek; is that correct?
A. Yes, but the water is the same and the legal requirements for that water are the same when it comes to impairment.
Q. Am I right that you didn't dispute the

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boundary of the cumulative impact area; is that right?
A. I did not.
Q. And the place where East Fork meets West Fork of Armells Creek is well outside the cumulative impact area; is that correct?
A. Yes. According to this map, yes.
Q. And that is in the record; is that correct?
A. Yes, that is in the record.
Q. Ms. Hedges, just to refresh your recollection, I'll refer again to Exhibit 5 which, of course, is the map of the Rosebud Mine that designates the different areas of existing or proposed permits. Do you see where Area C is located?
A. Yes.
Q. And can you describe where it's located for the record?
A. Just across East Fork Armells from Area B.
Q. And is it fair to say that it's between Area B and Area F?
A. Yes.
Q. And I think you indicated that you have a copy of the CHIA in front of you; is that right?

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definition of anticipated uses, it does not include Area F and on page 7, number 4 --
Q. You know, I'm going to interrupt you and I have to ask that you answer the question. Are you unable to even describe or draw on this exhibit a hypothetical groundwater connection between Area F and Area B?
MR. SULLIVAN: I object to the interruption of the answer. The answer was being responsive and it was describing as best this witness with her qualifications could her response to your question. And I would like to have at least the courtesy of her being able to make her response and you can follow up with whatever questions you care to, but the deponent should be allowed to fully answer a question that's proffered.
MR. MARTIN: And in fairness, it was not responsive to the question. It was a statement of the general position that your client has made.
Now, look, I don't like to interrupt witnesses and I'm not going to make that a practice, but this is unusual. I asked a question. I'm not getting an answer.

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MR. SULLIVAN: I object to the objection to the answer. You know, you and I, John, can sort this out, but I think the best way to do it is to allow the witness to finish. It then allows you to follow up with your questions --
MR. MARTIN: All right.
MR. SULLIVAN: -- and then we can move forward with an appropriate record that we can do with what we feel is appropriate.
Q. (By Mr. Martin) And, Ms. Hedges, if you want to finish your answer, by all means, go ahead.
A. Thank you. I would like to.
If you look on DEQ's response to our interrogatories, our requests for response, if you look on page 4, Request for Admission Number 3, Number 4, and Number 6, Interrogatory Number 6, all of those say that, "DEQ admits that the proposed Area F permit areas are within the cumulative hydrologic impact area, but DEQ's CHIA for Amendment 4 did not address any of the potential hydrologic impacts expected from the proposed Area F. A portion of the currently proposed Area F operation is within the cumulative hydrologic impact area identified in DEQ's CHIA."
All I can go off of, because I am not a

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hydrologist, is what is in the record and DEQ's record admits that it did not analyze this. So I could give you an opinion and it would be meaningless because I am not a hydrologist, I haven't looked at the raw data, and it hasn't been provided in the record.
Q. And, Ms. Hedges, then is it fair to say based on what you just described that as you sit here today, you don't know of a way that groundwater would interact between Areas B and F?
A. It is not included in the record, so no.
MR. MARTIN: Read back the question.
A. So, no, it has not been included in the record.
Q. (By Mr. Martin) So the answer is you don't know of any potential hydrologic impact between Areas F and B?
A. I don't know whether there is a potential or not a potential because it hasn't been included in the record.
Q. Okay. Let's move on.
In various documents Sierra Club/MEIC has indicated a concern for the impact of AM4 on Rosebud Creek and its tributaries; is that right?
A. Yes.

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Q. What is that concern?
A. The concern is that you failed to consider the impacts from Area B, which you are amending the permit on Rosebud Creek. It is that it's not Amendment 4 per se, it is the cumulative impacts from Area B that are impacting Lee Coulee and other tributaries that go into the Rosebud.
Q. And is it fair to say, without going through what we've been through with respect to Area F, you don't, as you sit here today, know the direction of groundwater flow from AM4?
A. I'm sure it's in, you know, there is some evidence of that in the record and I could find it for you if you're interested.
Q. And in terms of the maps that we've showed you with the potentiometric contours, that doesn't tell you even the direction of the groundwater; is that right?
A. It gives some information regarding the direction of the groundwater, but the hydrology in that area is complex, as is the geology. And so the potentiometric map is helpful but it is not a complete analysis.
Q. But you don't know as you sit here today whether or not, for example, groundwater could make

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more extensive at Lee Coulee in particular, mining impacts are most likely in these drainages but have been predicted to be insignificant below their junctions with the much larger Rosebud Creek drainage, there is evidence in here that is stated, and I would be happy to find it for you if you give me a moment, that there are two monitors on Rosebud creek, one above Lee Coulee and one below Lee Coulee and the impacts show that the water levels are better above where Lee Coulee enters than below where Lee Coulee enters out of Rosebud.

Q. Let's talk about those two stations. And, again, directing your attention to Exhibit 9 and just turning to page 9-15, the top of that document. It reads as follows, "Two stations on Rosebud Creek upstream." I'll skip over the parenthetical. "And downstream of Lee Coulee were used to determine if hydrologic impacts to Lee Coulee could be detected in Rosebud Creek. TDS is shown in Figure 9-5 as a general indicator of changes in water quality."

Are those the two stations that you're talking about?

A. I believe so, yes.

Q. And I'd ask you just to read to yourself the remainder of the text in that paragraph.

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A. Okay.

Q. There is an indication that flow measurements were taken between 1989 and 1993 and these are obviously evaluated in the CHIA. You see that, don't you?

A. Yes.

Q. And there was a TDS load that was calculated for the two monitoring stations. You see that as well, don't you?

A. Uh-huh.

Q. And it indicates that a salt load reveals that Rosebud Creek gains salt between those two monitoring points. Do you see that?

A. Yes.

Q. And then the ending sentence to that paragraph reads as follows, "The concentration of TDS measured at the downstream station has not increased over time and, similarly, no trend can be seen in the difference in concentration between the upstream and downstream stations." Do you have a basis to disagree with the conclusion in that sentence?

A. Let me continue reading this because I have marked other places.

Q. Okay.

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A. It is difficult to look at that statement in isolation because the remainder, the conclusion that is drawn in this section is that, "The proposed action is designed to prevent material damage to Rosebud Creek because as of 2013, there has been no change in water quality in Rosebud Creek that can be directly attributable to mining in Lee Coulee."

I disagree that that is the proper standard directly attributable and, therefore, I am unclear whether the conclusions reached in that statement that you read are subject to the same error.

Q. And in essence, if I understand your testimony, your objection is based upon what you've talked about as the burden of proof; is that right?

A. That is correct.

Q. But in terms of the factual issues divorced from that legal issue, do you have a factual basis to disagree with the sentence that reads, "The concentration of TDS measured at the downstream station has not increased over time and, similarly, no trend can be seen in the difference in concentration between the upstream and downstream stations"?

A. If you'd look at that in conjunction with

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the rest of that paragraph, which is the upstream is different that the downstream, so Lee Coulee is obviously adding something, then I don't disagree that that's the conclusion that DEQ reached.

Q. So explain to me and I apologize, maybe I misunderstood your testimony. Is there a factual basis or a scientific basis for you to disagree with that statement?

A. Today, no, because I am not a hydrologist and once we see a legally compliant analysis that is based upon your obligation to show that, to affirmatively demonstrate that this isn't going to be the case, I can't say one way or the other, and I would eventually want to hire a hydrologist to make this determination. But right now we are arguing legal issues about whether the analysis that was conducted was legally proper.

Q. And, you know, I'm really not interested in wading into that legal issue and, if I were, your counsel would object. But just in terms of the factual issues and the scientific issues, as we sit here today you don't have a factual or scientific issue with that statement; is that right?

A. As a nonhydrologist, I do not.

Q. And then going on to the paragraph that

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Do you agree with that statement?
A. Generally I think I do.
Q. Within the permit area the act requires the operator to minimize disturbance to the hydrologic balance.
A. Excuse me. Is somebody on the phone?
(Discussion off the record.)
MR. SULLIVAN: So are we on the second sentence to the DEQ response, John?
MR. MARTIN: Yes. Go ahead.
Q. (By Mr. Martin) Within the permit area the act requires the operator to minimize disturbance to the hydrologic balance; is that right?
A. I'd have to go back and review the statute and the rule. Assuming that that's close but I can't guarantee it's identical.
Q. And then the next sentences says, "A reduction of water quality in the mining area is expected and is not grounds for denial of a mine permit application as long as reasonable conservation practices are being applied."
Do you agree with that statement?
A. Yes, however, water flows downhill and so the question is will that eventually move offsite in

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a way that harms the hydrologic balance outside the permit area.
Q. And you don't have an opinion on that as you sit here today?
A. I don't have an opinion on what? I have an opinion on many things.
Q. On whether or not the groundwater from this area would move outside the permit area and provoke some sort of material damage off the permit?
A. Could you give me a minute? I can't answer that question off the top of my head. The record -- this is in response to your question number 19, I believe. This is what you're asking about and there are a number of places where we do have an opinion about that. Is the question you're asking different than number 19 or is it similar to number 19?
MR. MARTIN: Read back the question.
(Previous question read.)
Q. (By Mr. Martin) And let me rephrase that. As you sit here today, you don't have a view as to whether or not groundwater would move from the permit area to areas outside the permit area and provoke some sort of material damage to the groundwater; is that correct?

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A. That is incorrect. I believe that there is a number of pieces of evidence in the record that are contrary to that conclusion. In the CHIA at 9-58 through 9-59, MEIC's response to comments or comments, sorry, in August of 2015 in which we refer to a study by Clark on page 4, the answers to interrogatories on page 11, 5B, and DEQ response at page 27. And I would be happy to find all those for you.
Q. Well, let's focus for a moment on the CHIA. But before we do that, let me ask. If I understood your testimony this morning, you didn't have a view as to what direction the groundwater would flow; is that right?
A. I believe that some of the data indicates what direction it would flow, but as I am not a hydrologist or a geohydrologist and I don't understand the complex nature of the hydrology and the geology in the area, I am not the best person to determine which direction groundwater will flow out there in any one location.
Q. And so as you sit here today, you don't know whether groundwater would flow from AM4 or Area B to areas outside the permit area and cause material damage; is that correct?

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A. I believe there is evidence in the record to that effect but I don't believe that you have met your burden of proving that it will not.
Q. And, Ms. Hedges, I'm asking what your view is. I'm asking what MEIC/Sierra Club's view is on that issue. And I recognize what your legal position is.
MR. SULLIVAN: And I'm going to object on the basis that it's been asked and answered and she has stated the organization's position on the issue.
Q. (By Mr. Martin) And if I understood your testimony earlier today, you don't know what direction the groundwater would flow beneath AM4; is that right?
A. Me personally? No. I believe that there is some information in the record. But me, all I can do is point to information in the record.
Q. Okay. Let's go ahead and go to that record then. And first let's talk about --
(Deposition Exhibit 12 marked for identification.)
Q. (By Mr. Martin) Ms. Hedges, we're handing you a document that's been marked for identification as Exhibit 12. And, for the record, I will explain

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Q. And the last sentence, "No material damage is indicated because any mine-related water quality changes are not likely to be distinguishable from natural variations." Do you agree with that sentence?
A. No.
Q. And what would make you think that water quality changes are distinguishable from natural variation?
A. I believe that this is a conclusion without sufficient backup material. This is stated as a conclusion but I don't believe that it is supported by the evidence in the record that is in the -- this section of the material damage analysis for East Fork Armells Creek.
Q. And you've looked at Figure 9-23 that's cited there?
A. Yeah, I have. Do you want me to look at it now?
Q. You don't have to. I just want to make sure that I understood the basis for your conclusion.
And then, of course, there is a discussion in the preceding two paragraphs as well; is that right?

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A. There is.
Q. But that's not sufficient for your purposes?
A. No.
Q. What would you have DEQ do in this setting that would be sufficient by way of an analysis for your purposes?
A. Comply with the requirement in statute and regulation.
Q. Well, what would that be? What would they do that would be sufficient to, as you put it, comply with the regulations and the statute?
A. They would have to -- well, they would have to -- you would have to affirmatively demonstrate and they would have to verify that you had demonstrated that you were not going to have material damage off the mine site. You have to look at all of the anticipated impacts in the area and you have to look at the existing water quality. You need to look at the fact that it is a perennial or intermittent stream and not ephemeral, and you should be changing water classifications through the proper process if you find that you are going to be changing the water chemistry in a way that harms aquatic life.

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Q. So what study would be sufficient to achieve that level? Set aside for the moment changes in water classification and those sorts of things. What would you consider to be a sufficient analysis for the conclusion that is recited in the CHIA?
A. Well, ultimately that's not my job.
Q. On that we can agree.
A. Yes.
Q. Whose job is it? That's a serious question.
A. It is the -- the regulation says that you have to affirmatively demonstrate as the applicant and DEQ has to verify based upon evidence in the record that you are not going to cause material damage to the cumulative hydrology in the impacted area. That's paraphrasing, but I would say it is your job initially, it is DEQ's job secondarily, and you have to work within the confines of the requirements in statute and you have to show that evidence in the record.
Q. And who is it that makes the judgment as to whether or not we, that is Western Energy, has sufficient, has submitted sufficient evidence or information?

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A. Well, that is the permitting process that has been developed and --
Q. That's for DEQ to decide, isn't it?
A. It is for DEQ to decide but they are not the final arbiter. If we disagree and believe that they have failed to do their job, as we have on many occasions, and on some occasions we have been correct, found by either the Board of Environmental Review or a court.
Q. And what I'm trying to discern is what is it on this particular issue, on just this issue, the TDS issue where the PHC said there may be an increase of perhaps as much as 13 percent in the TDS in the alluvium. What is it that either Western Energy or DEQ could possibly do that would satisfy you that the conclusion they've reached is accurate?
A. It would be an analysis and I would -- once the analysis is properly conducted, I would probably want to hire a hydrologist, a geohydrologist to analyze the data that you have provided.
Q. And, of course, you know that there are hydrologists that work on staff at DEQ.
A. Uh-huh.
Q. And you understand and appreciate that not

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DEQ really thought.
Q. But you have -- You will agree with me, won't you, that DEQ in this document concluded that that reach of EFAC was ephemeral; is that right?
A. DEQ concluded in this document that that is the case. It did not look at the historic nature necessarily of that section of stream and whether it has always been ephemeral.
Q. And what you've just described is the basis for you to say that there may be areas of this portion of East Fork Armells Creek that are not ephemeral; is that right?
A. There may be portions of East Fork Armells Creek that are not ephemeral based upon statements like this in the document that you handed me, the assessment, where the mine has not obliterated the channel, the stream habitat is not impaired. So it is obvious that this is just looking at the current situation and is not looking at how the mine has impacted that water body over time.
Q. And is there any record, any historic record that would indicate that the mine "obliterated" East Fork Armells Creek?
A. That's a statement in here. I don't know. I think that we may have to look back at these

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historic records that are in the record that we have cited before regarding the nature of that water body.
Q. Okay. Do you know what the proposed operation is that is the subject of this hearing before BER?
A. Excuse me?
Q. Isn't it true that the proposed operation that we're talking about is AM4?
A. We are talking about Area B and an amendment to expand Area B.
Q. And that would be AM4; would it not?
A. Yes. AM4 is an amendment to the existing --
Q. One of the things I'm trying to understand is whether or not you're suggesting that because this is an amendment it somehow opens up the Area B permit. Are you suggesting that?
A. I am suggesting that Area B is an integral component of Amendment 4. There would be no amendment if you did not have Area B.
Q. I'll grant you that. But it's not your position that we are opening up the permit for Area B as a whole, is it?
A. You are looking -- It is my position that

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the law requires you to do a cumulative hydrologic analysis and that the impacts from mining on Area B are a part of that analysis.
Q. And getting back to the question. While I appreciate that one must consider other parts of Area B than just AM4 for a cumulative impacts analysis, you're not suggesting, are you, that with AM4 we're reopening the entire permit for Area B?
A. We are looking at the impacts from what has occurred in Area B on the hydrologic balance of the area. You cannot -- What you are arguing for, it appears to me, is segmentation.
Q. And for the record let's be clear. Our position is not segmentation. We recognize what the word cumulative means. What I'm trying to discern is whether or not you folks are attempting to take the position that by virtue of this amendment we've reopened the entirety of Area B?
MR. SULLIVAN: And I'm going to object on the basis that it's been asked and answered, it's argumentative, and I'll leave it at that.
Q. (By Mr. Martin) And, sincerely, I don't believe it's been answered. It's certainly been asked. And I don't think this is a difficult question and I'm not trying to trick you. I'm

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trying to understand what your position is.
MR. SULLIVAN: Well, the position of the organizations is as stated in our notice of appeal. We've laid out the grounds for the appeal and we've stated the basis for them, and so I think you really are asking for a legal conclusion. And to the extent that this witness is able to answer it, the witness has attempted to answer it. It may not be the answer that you wanted but it's been sincerely attempted.
Q. (By Mr. Martin) And let me ask this simplistic question. Are you with this action attempting to reopen the permit for Area B as opposed to the amendment that's been described as AM4?
MR. SULLIVAN: And I'm going to object on the same basis.
MR. MARTIN: Fair enough.
MR. SULLIVAN: Calls for a legal conclusion, asked and answered.
A. The cumulative impact analysis must include Area B and the impacts that have occurred in Area B.
Q. (By Mr. Martin) And that's as far as you

would go; is that right?
A. No. It is the impacts to the hydrologic balance in the cumulative impact area.
MR. MARTIN: Let's go off the record.
(Discussion off the record.)
Q. (By Mr. Martin) I don't have any further questions. Let me confer with Becky to make sure.
(Off the record briefly.)
Q. (By Mr. Martin) Let's go back on the record and just a follow-up question that we talked about. Would you agree that material damage determination for AM4 applies only to impacts to the hydrologic balance resulting from the proposed mining operation for AM4 and the impacts of previous existing and anticipated mining that interact with the impacts of the proposed mining operation for AM4?
A. That was a mouthful.
MR. SULLIVAN: I'm going to object to the extent it calls for a legal conclusion and it is a compound question, but answer it to the extent you can.
A. To the extent that that question complies with the rules and the definition of material damage and the definition of anticipated mining, I would

agree with that statement.
Q. (By Mr. Martin) I think we're done.
(The deposition was concluded at 6:00 p.m.)
(Signature required.)
* * * * * * *

CERTIFICATE OF WITNESS

PAGE	LINE	CORRECTION

I, ANNE HEDGES, have read the foregoing transcript of my testimony and believe the same to be true except for the corrections noted above.
DATED this _____ day of _____, 2016.

_____
Deponent

C E R T I F I C A T E

COUNTY OF LEWIS AND CLARK)
STATE OF MONTANA)

I, LISA R. LESOFSKI, Registered Professional Reporter and notary public for the State of Montana, do hereby certify:
That the witness in the foregoing deposition was first duly sworn by me in the foregoing cause, that the deposition was then taken before me at the time and place herein named, that the deposition was reported by me and that the foregoing -219- pages contain a true record of the testimony of the witness to the best of my ability.
IN WITNESS WHEREOF, I have set my hand and seal on this 20th day of May, 2016.

_____
Lisa R. Lesofski

Environmental Assessment Checklist
EXHIBIT 3

MONTANA DEPARTMENT OF ENVIORNMENTAL QUALITY COAL AND URANIUM PROGRAM CHECKLIST ENVIRONMENTAL ASSESSMENT FOR SURFACE AND UNDERGROUND MINING PERMIT

DATE: December 3, 2015

SITE: Rosebud Coal Mine Area B

PERMITTEE: Western Energy Company

CITY/TOWN: Colstrip

PERMIT ID: C1984003B

COUNTY: Rosebud

PROJECT: Amendment AM4

LOCATION: Area B is located in the following:
T1N, R40E; Sections 8, 9, 11, 12, 13, 14, 15, 16 and 17
T1N, R41E; Sections 2, 3, 4, 5, 7, 8, 9, 10, 11, 17 and 18

MINERAL PROPERTY OWNERSHIP (Area B):
Federal ☒ State ☒ Private ☒ County ☐ Tribal ☐

SURFACE PROPERTY OWNERSHIP (Area B):
Federal ☐ State ☒ Private ☒ County ☐ Tribal ☐

BACKGROUND: Rosebud Mine Area B was originally permitted on January 18, 1978. A total of three amendments to the original permit area have been previously approved. Additionally, the permit area has been adjusted with a couple of incidental boundary changes (surface disturbance only – no additional mining.

TYPE AND PURPOSE OF ACTION: Western Energy Company (Western) applied to the Montana Department of Environmental Quality (DEQ) for an amendment to the Rosebud Mine Area B surface mining permit (the permit). This amendment request proposes the following changes to the permit: a 49 acre or 0.8% increase in area permitted (6,182 to 6,231), a 146 acre or a less than 3% increase in the proposed amount of surface disturbance limit (5,531 to 5,677), 8.6% increase in the minable coal reserve (approximately 12.1 million tons), 306 more acres of coal removal or 8.3% increase in the amount of coal aquifer disturbed (3,686 to 3,992), re-calculation of the performance bond to account for current practices and conditions (increase from $48,403,696 to $73,650,000), and changes to the post mine topography (PMT). The additional proposed disturbance and mining would be a continuation of existing operations to the south and east. Performance bond associated with the additional proposed disturbance and mining would be an insignificant portion of the before mentioned bond increase. As coal is removed, the operator would proceed with reclamation according to the requirements of the Reclamation Plan, as described in Section 17.24.313 of the currently approved permit. Topsoil would be removed prior to mining and either direct-hauled to areas graded to the approved PMT or stockpiled. Soil stockpiles would be marked with an identification sign and stockpiles would be protected from erosion. Currently approved permit maps depicting vegetation plans would need to be reviewed and updated as a general course of permit renewal, mid-permit review or an additional minor revision to the permit. Regardless of future permit revisions, the vegetation plan would be monitored over time and adjusted as necessary to achieve successful establishment of plant communities which would support the approved post-mine land use.

N= No Present or No Impact will occur.
Y= Impacts may occur (explain under Potential Impacts).

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
1. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE: Are soils present which are fragile, erosive, susceptible to compaction, or unstable? Are there unusual or unstable geologic features? Are there special reclamation considerations?	[N] There were no soils identified as fragile, erosive, susceptible to compaction, or unsuitable in the premine soil survey. A majority of the area was previously disturbed through agricultural practices, and the remaining areas are contiguous gently sloping rangeland. No special features or reclamation considerations are present. Soils for reclamation will be handled following currently established mining practices as designated in permit C1984003B of which this action is amending. Two 12 inch soil lifts will be salvaged and used directly on reclamation or stockpiled separately for later use when there are no areas ready for resoiling. Stockpiled soils will be protected from degradation and loss with standard best management practices and seeding with non-noxious species. Prior to redistribution the spoil surface is evaluated for suitability per the DEQ soil and spoil quality guideline. This process aims to ensure there is an adequate rooting zone for targeted species, and aims to leave a useful topography with substrates for establishing diverse and effective vegetation.
2. WATER QUALITY, QUANTITY AND DISTRIBUTION: Are important surface or groundwater resources present? Is there potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality?	[Y] <u>Groundwater</u> Mining of the proposed AM4 amendment would continue removal of overburden and Rosebud coal to the south of existing mining, resulting in an increase of 306 acres (8.3%) of disturbance to the Rosebud coal aquifer in the east part of Area B. Mining has caused and will continue to cause changes to both the quantity and the quality of the groundwater in the mine area. <u>Possible impacts to groundwater quantity.</u> Head decline in the Rosebud coal aquifer, the aquifer most profoundly impacted by mining, would increase in depth and extent with mining proposed in AM4. Modeled head decline in the eastern most cuts of Area B at the end of mining proposed under AM4 in 2026 is predicted to be 110 feet, an increase of approximately 30 to 40 feet over the decline anticipated from modeling for the same location at the end of currently

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	approved mining by 2020. An increase of 5 feet of head decline in McKay coal is predicted as the result of expanded mining under proposed AM4. After 50 years of postmining recovery, modeling results indicate that Rosebud coal head decline is anticipated to remain approximately 15 feet greater from mining under proposed AM4 than it would from currently approved mining. The difference in aerial extent of anticipated decline indicated by comparison of modeling results of currently approved operations and proposed operations under AM4 is not significant. The steepest decline in head that is anticipated to result from expanded mining under AM4 would take place within the permit boundary, with head decline dropping to 5 feet approximately two miles south of the permit boundary. It is not expected that head decline attributable to expansion of mining in Area B will adversely affect any wells located outside the area of any permit for the Rosebud Mine. Although it could take considerable time, the premine groundwater flow gradient inside and outside the permit area is expected to recover because recharge and discharge areas for the Rosebud coal aquifer will not be affected by mining. The hydraulic characteristics of the spoils are similar to that of the Rosebud coal and will facilitate storage and transmission of groundwater between the undisturbed up-gradient and down-gradient coal aquifers. Existing and anticipated groundwater uses outside the permit area include wildlife and livestock drinking water and domestic supply. The proposed expansion of mining operations under AM4 is not expected to reduce the quantity of water in affected areas to a level that would impair an existing source of water during and after mining. The extensive groundwater monitoring system will identify decreases in groundwater head inside and outside the permit area. Private wells unexpectedly affected by diminished supply due to mining drawdown must be replaced by the operator. <u>Potential Impacts to Groundwater quality.</u> During mining, disturbed overburden (spoil) from each successive cut is cast into the previous cut and then slowly saturates. The source of this recharge is groundwater migrating mainly laterally from unmined Rosebud coal to the unsaturated spoil backfill, although surface water may also contribute locally. Concentrations of total dissolved solids (TDS) in the spoil backfill are, on average, greater than that of the Rosebud coal that they replace. Increases in the concentrations of sulfate, calcium, and magnesium dissolved from overburden minerals contribute to the increase in TDS. It is anticipated that concentrations of

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	TDS in spoil water will increase by approximately 2% of the median and 4% of the average TDS concentration in overburden groundwater, and an approximate increase of 41% of the median and 48% of the average TDS concentration of Rosebud coal groundwater. Based on bench tests and paste extract modeling, spoil water quality is expected to improve as upgradient water moves through the spoil and returns to concentrations closer to those of the Rosebud coal. Proposed AM4 mining would increase the amount of spoil and thus the volume of groundwater affected by mining. This would also increase the amount of time for spoil water quality to improve in Area B. Based on the flow direction of groundwater, spoil water in the southeast part of Area B is expected to move east and southeast toward the coal crop in Rosebud Mine Area E and Big Sky Mine Area A. Saturated thickness of the Rosebud coal seam typically thins toward and becomes dry at the coal crop, lessening the lateral extent and area of impact of spoil water with higher concentrations of TDS. Mixing of spoil with the background Rosebud coal water will take place as groundwater from the spoil moves to the south. There are no wells identified in the private well inventory that are completed in the Rosebud coal in the area between the Rosebud Mine and Big Sky Mine. No uses are expected to be impacted and numeric water quality standards are not expected to be exceeded based on spoil water quality. Due to the natural spatial and temporal variability of water quality in Area B spoils, the unmined coal between Area B and the Big Sky Mine, and Big Sky Area A spoils there is no generally accepted methodology to predict impacts with any certainty. Due to a large deposit of clinker throughout much of the area between the two mines, enhanced aquifer recharge will serve to dilute spoil water quality impacts in this area, therefore it does not appear that a parameter will increase to a level that would violate a numeric water quality standard for groundwater or render the water unsuitable for domestic use or livestock and wildlife watering or domestic use, or harmful, detrimental, or injurious to the beneficial uses listed for Class II and Class III groundwater. As such, adverse impacts to the hydrologic balance outside the proposed AM4 permit area are not expected, and the hydrologic regime will remain suitable in terms of water quality for all listed beneficial uses for groundwater. Because expanded mining proposed under AM4 is restricted to the southeastern boundary of Area B, it is not anticipated that the proposed expanded mining operations will result in intensification of any potential impacts in other areas in the expanded permit area, the other permit

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	areas, and in the area of drawdown for the Rosebud Mine. Deeper units including the interburden, the McKay coal seam, and the sub-McKay underburden are protected from vertical leakage by mudstones and silty sandstones with low conductivity, and it is not anticipated that proposed expanded mining operation under AM4 will result in intensification of any potential impacts to water quality in those units. <u>Potential impacts to water quality-parameters governed by numeric standards.</u> Exceedances of numeric standards that have been observed at the Rosebud mine area for cadmium, fluoride, lead, nickel, selenium, and zinc. Some of these exceedances, especially in the 1970s and early 1980s may be attributable to imprecise sampling methods or problems with laboratory analysis and are considered to be anomalous. Arsenic occurs naturally at concentrations which can exceed human health standards in aquifers in the Fort Union Formation. There is no indication that mining has caused or created a situation that has contributed the occurrence of arsenic inside or outside the mine areas. None of the exceedances reported for arsenic are may be attributed to mining operations. Exceedances in nitrate/nitrite are generally attributable to causes other than mining. One nitrate/nitrite exceedance that may be attributable to mining operations is located within the Area B permit boundary and is not expected to cause contamination, but require expanded monitoring by placing monitoring wells between the location of the exceedance and the permit boundary. [Y] <u>Surface Water</u> The drainage system of the greater Colstrip area consists of mainly ephemeral streams which feed into Armells Creek or Rosebud Creek. These two main creeks in turn are minor tributaries to the Yellowstone River. Both Armells Creek and Rosebud Creek have ephemeral, intermittent, and occasional perennial stretches. All of the drainages within the Rosebud Mine permit areas are classified as C-3 with a majority considered C-3 ephemeral. The proposed increase in mining would result in an expansion of the life of mine disturbance area. The proposed mine cuts would be located near the drainage divide with Rosebud Creek and cut into small tributaries of

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	East Fork Armells Creek. These tributaries have already been partially mined through, and many of the lower reaches of the tributary drainages have already been reclaimed. The existing haul roads that would be used to access the additional proposed mining areas were built along the premine drainage channels, and these roads are proposed to be reclaimed as the postmine tributary channels. The proposed amendment area and mine cut area does not currently contain any springs or stock water ponds. <u>Potential impacts to surface water quantity.</u> The proposed expansion of mining operations under AM4 would not significantly increase anticipated hydrologic impacts to surface water resources within and adjacent to Area B and other permitted areas, including the East Fork Armells Creek drainage. Since the acreage to be added under AM4 is upstream of current mining activities and would not disturb new drainage basins, the proposed expansion would not result in any further decrease in the quantity of natural runoff to drainages downstream of the mine during operations. The results of surface water runoff models were used to assess potential impacts to surface water quantity for downstream users after final reclamation. The results of modelling indicate that proposed changes to postmine drainage basin size, land use, and vegetation would not result in a significant change in the quantity of runoff or peak discharge anticipated under currently approved postmine reclamation. <u>Potential impacts to surface water quality-total suspended solids (TSS).</u> Modeling of storm driven runoff indicates that water quality from flows in well-vegetated postmine channels proposed under AM4 is expected to be similar to premine runoff water quality or contain less sediment. During mining and while vegetation is re-establishing, sediment ponds and other best management practices would treat or retain runoff preventing excess sediment from entering native drainages. Surface water quality from the affected tributaries to East Fork Armells Creek should be similar to previous expectations for postmine water quality with no changes expected for stock or wildlife use attributable to TSS. While the proposed postmining topography for the amendment would approximate the premine landscape, there would be some changes in drainage basin size, channel location, and upland topography. The proposed mine plan would include more mining into steeper, more diverse upland and ridge topography. These areas would be reclaimed to less steep terrain with fewer headwater tributaries and reduced

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	topographic diversity. AM4 changes the postmine topography throughout the Area B east permit. The overall distribution of the terrain's aspect would be similar between the proposed PMT and the approved PMT; 39% of the Area B permit area would have north or northeast aspects in both the approved and proposed PMT. The premine permit area landscape had approximately 46% of the area with north or northeast aspects. North aspects aid in the retention and slower release of snow in the winter and spring. <u>Potential impacts to surface water quality.</u> The proposed AM4 amendment and associated disturbance area in Rosebud Area B do not contain any springs or stock water ponds. The amendment area would mine through upstream ephemeral reaches. No wetlands have been identified in the amendment area. East Fork Armells Creek (EFAC) is an ephemeral to intermittent stream that flows through the Rosebud Mine between Area B and Area C to the west, and Area A and Area B to the east. Rosebud Mine Area A, Area B, Area C, and the west part of Area D drain to EFAC. Most of the stream reach upstream of Area A is ephemeral. Short stretches of intermittent flow have been identified downstream. Some areas of intermittent flow support aquatic life. Discharges from Rosebud coal and McKay coal contribute locally to flow and alluvial recharge in EFAC. Stocker Creek is an ephemeral stream that drains the north parts of Rosebud Mine Area C and the northwest part of Area A, joining EFAC north of Colstrip. The proposed mining under AM4 will not affect water quality in Stocker Creek. The west and northwestern most parts of Rosebud Mine Area C drains to West Fork Armells Creek (WFAC). The proposed mining under AM4 will not affect water quality in the WFAC drainage, Cow Creek, South Fork Cow Creek and Pony Creek are ephemeral tributaries to Rosebud Creek and drain Rosebud Mine Area D and Area E. The proposed action will not affect water quality in the Cow Creek drainage basin. Spring Creek flows northeast from Rosebud Mine Area D. The proposed mining with AM4 is located away from Area D and will not affect the water quality in Spring Creek drainage. Lee Coulee is an ephemeral to intermittent stream that flows through Big Sky Mine Area B into Rosebud Creek. The proposed expansion of mining

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	in Rosebud Area B in AM4 will not affect the water quality in the Lee Coulee drainage. Spoil water from expanded mining in Area B under AM4 will not contribute to surface flow in Lee Coulee. <u>Potential impacts to surface water quality-narrative standards.</u> Expanded mining operations under AM4 is located along the southeast boundary of Area B and is removed from intermittent and perennial streams. It is not anticipated that expanded mining under AM4 will impact existing or designated uses for surface water governed by narrative standards. In 2014, a second macroinvertebrate survey was conducted in a reach of EFAC that exhibits standing water. The sampling methodology differed from the methodologies used in the previous studies so that taxa richness may not be directly comparable. However, the survey demonstrated that a diverse community of macroinvertebrates was using the stream reach. Therefore, the intermittent reach of EFAC currently meets the narrative standard of providing a beneficial use for aquatic life. In baseline samples, the sulfate thresholds for aquatic life in EFAC were exceeded published threshold for aquatic life. Macroinvertebrate communities in Eastern Montana are likely adapted to high sulfate water. Concentrations of chloride in the intermittent reach of EFAC have been measured above 100 mg/L which is greatly above normal background levels for creeks in this area. The current uses of the water in the vicinity of the intermittent reaches EFAC are for livestock, wildlife, and aquatic life. Further downstream on EFAC, the water is also used for irrigation. Because the stream still maintains its C-3 uses (primarily aquatic life, non-salmonid fishes, and agriculture) per ARM 17.30.629, the beneficial use of the stream for the most sensitive use is expected to be maintained. The proposed mine plan is designed not to contribute additional chloride to the stream because lignin sulfonate will be used on roads instead of magnesium chloride. Baseflow in the intermittent reaches of EFAC is predicted to experience a postmine increase in TDS of 13%, elevating the average concentration of TDS to almost 2,600 mg/L. The increase in TDS comes from spoil replacing the Rosebud coal as a source feeding the alluvial groundwater which supplies baseflow to the stream. This increase will not occur until the spoil has resaturated and groundwater flows from the spoils to the alluvium of EFAC. The proposed action will increase the volume of spoils generated by the mine, and groundwater from the recharged spoils may

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	ultimately become baseflow in the creek. The postmine water quality should continue to support livestock use, although the water quality in the stream may be diminished from premine quality. Western Energy Company will continue to periodically conduct macroinvertebrate surveys to monitor the vitality of both aquatic life and habitat available in EFAC. Surface water quality and quantity sampling will continue at SW-55 on EFAC. Because the creek should be able to support its designated beneficial uses, even when spoil water contributes to baseflow, the proposed mine plan is designed to prevent material damage. Postmine baseflow in EFAC by SW-55 will be influenced by spoil water quality, and the baseflow will have increased TDS, mainly in the form of increased sulfates. While changes to EFAC have been seen adjacent to the Rosebud Mine (areas A, B, and C), the magnitude and extent of surface mining impacts to EFAC downstream of mining (Colstrip and beyond) are difficult to quantify because of the contributions of additional industrial and municipal surface and groundwater water impacts in the Colstrip area. Because alluvial water connected to EFAC flows from EFAC to the Area B spoil backfill, proposed mining operations under amendment AM4 would not significantly increase anticipated hydrologic impacts to surface water resources within and adjacent to the mine area or downstream in EFAC. The operator would continue to monitor surface water resources surrounding proposed mining to determine quantity and quality characteristics during and after mining. If needed, the operator would be required to provide alternate water supplies to replace water supplies diminished in quantity or quality by mining activities.
3. AIR QUALITY: Will pollutants or particulate be produced? Is the project influenced by air quality regulations or zones (Class I airshed)?	[N] Proposed changes would not affect conditions anticipated in the original assessment and as observed during operation of the mine. Dust would be generated during the mining and reclamation operations; however, Western Energy must operate within the confines of the approved Air Quality Permit. The proposed amendment area is not directly influenced by the more stringent air quality requirements of a Class 1 air shed. The mined coal is destined to be combusted at a nearby power generation facility. Emissions from the coal combustion are regulated by that power generation facility's air quality permits which contain enforceable conditions for maintaining compliance with the Federal and State Clean Air Acts. There is no increase to the maximum potential emission levels from the power generation facility related to the combustion of this coal and it would be delivered using the same existing equipment and methods. Greenhouse gas emissions from that facility are regulated in accordance with current federal and state laws.

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
4. VEGETATION COVER, QUANTITY AND QUALITY: Will vegetative communities be significantly impacted? Are any rare plants or cover types present?	[Y] An additional 146 acres would be disturbed. Vegetation communities would be removed and vegetation resources would be impacted in the short term. Reclamation commitments in the permit are designed to mitigate the vegetative community loss and provide for the approved postmine land uses of grazing and wildlife habitat. One reclamation commitment is for a PMT that approximates the premine condition. Changes proposed to the PMT would help mitigate impacts to vegetation because the changes would better approximate premine conditions. No threatened plants or vascular species of concern are known to inhabit the area.
5. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS: Is there substantial use of the area by important wildlife, birds or fish?	[N] The proposed new disturbance would be adjacent to currently approved operations and would result in approximately 146 acres of additional disturbance into higher cover reserves. No impacts above those addressed in previous environmental assessments would be expected. There would be a short-term loss of habitat from initiation of soil salvage through mining and reclamation. Once the disturbed area is graded, soiled and seeded, vegetation would become established. While the initial vegetation would provide wildlife habitat, it would not be of the similar quality of the premine habitat. As the reclaimed vegetation becomes better established, vegetation diversity and structure would better approximate what was present premine. Shrubs and trees take longer to establish and grow to a size where they would provide the structural diversity found in premine shrub and tree habitats. The loss of structural diversity would affect nesting, roosting, and foraging habitat for a variety of avian species. Mitigations have been incorporated into the Fish and Wildlife Plan to minimize soil salvage during the nesting season. This would minimize impacts to nesting birds (e.g. loss/destroyed nests, loss of eggs, nestlings, adults, etc.). If raptor nests will be destroyed by mining, the proper permit will be obtained from the USFWS. Nests will be destroyed or moved outside of the normal nesting period. The proposed reclamation plan would provide suitable postmine habitats for the wildlife species currently utilizing Area B and the

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
	surround areas.
6. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES: Are any federally listed threatened or endangered species or identified habitat present? Any wetlands? Species of special concern?	[N] No known listed, threatened or endangered species or important habitat would be impacted by the proposed activities. Five species (Interior least tern, red knot, black-footed ferret and pallid sturgeon) are federally listed threatened, endangered, or candidate species in Rosebud County. The greater sage grouse, a species of state concern, has been observed during two years during the annual wildlife monitoring at the Rosebud Mine. Both observations were at Sharp-tailed Grouse Lek 20 and consisted of one male each year. The proposed mine expansion would have insignificant impact on sage-grouse as the area contains grasslands and mixed grass/shrublands. No extensive areas of sagebrush habitat is found within the proposed mine expansion. No impacts to the five listed species are expected as the area does not contain the appropriate habitats (e.g. river habitat for pallid sturgeon) or the habitats are considered marginal for a particular species (e.g. marginal grassland habitat for the Sprague's pipit). Bald eagles may use the area for hunting and during migration; however, no concentration/roosting habitats or breeding territories have been identified within the Rosebud Mine area. Golden eagles are found throughout the year in the area of the Rosebud Mine; however, no nesting territories are located in or adjacent to the proposed expansion.
7. HISTORICAL AND ARCHAEOLOGICAL SITES: Are any historical, archaeological or paleontological resources present?	[N] The proposed amendment would result in no adverse effect upon the known cultural, archeological and paleontological resources, and the operator's approved cultural resource memorandum of agreement (MOA) for Area B protects incidental discoveries. No changes in the Area B MOA are necessary and Western Energy accordingly remains in Section 106 compliance for Area B.
8. AESTHETICS: Is the project on a prominent topographic feature? Will it be visible from populated or scenic areas? Will there be excessive noise or light?	[N] Additional mining disturbance would be in a remote area and not located near prominent topographic features. The project area would not be visible from any designated scenic areas. The nearest community, Colstrip, Montana, is located approximately 1.5 air miles from the project area. No noise above that associated with ongoing operations would occur.
9. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY: Will the project use resources that are limited in the area? Are there other activities	[N] The area to be included for mining is surrounded by active mining and reclamation operations. The project is not expected to create demands on limited resources. Coal from this mine area is used to fuel two of the four coal-fired power plants located in Colstrip. Lower quality coal from this mine area is also used to fuel a smaller coal-fired power plant north of Colstrip.

IMPACTS ON THE PHYSICAL ENVIRONMENT	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
nearby that will affect the project?	
10. IMPACTS ON OTHER ENVIRONMENTAL RESOURCES: Are there other activities nearby that will affect the project?	[N] Other impacts to environmental resources are not anticipated.

IMPACTS ON THE HUMAN POPULATION	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
11. HUMAN HEALTH AND SAFETY: Will this project add to health and safety risks in the area?	[N] Heavy equipment, trucks, loaders, and blasting would create hazards; however, the operator must comply with all MSHA and OSHA regulations. The operator currently utilizes proper precautions to enhance safety and would continue in the best interest of its employees. Public access would be controlled by the operator. The proposed operation would not add or reduce the affects to human health or safety.
12. INDUSTRIAL, COMMERCIAL AND AGRICULTURAL ACTIVITIES AND PRODUCTION: Will the project add to or alter these activities?	[N] The project would add an additional 12.1 million tons to the minable reserve base. At current rates of consumption, the additional mining would extend the life of the Area B permit by approximately three years. Historically, the area within the permit area and the expanded mine area was pastureland, grazing land, and wildlife habitat. The final reclamation plan is designed to return the area to its previous use, with equal to or greater vegetation production than pre-mining. There would, however, be a short-term loss of vegetative production during mining and reclamation of the proposed additional area. There is no alluvial valley floors associated with this revision.
13. QUANTITY AND DISTRIBUTION OF EMPLOYMENT: Will the project create, move or eliminate jobs? If so, estimated number.	[N] The proposal is not expected to create new jobs; however, if permitted the additional mining would continue jobs presently in place for a longer period of time.
14. LOCAL AND STATE TAX BASE AND TAX REVENUES: Will the project create or eliminate tax revenue?	[Y] The project would create added coal severance tax revenue due to additional coal recovery. The proposed project should not eliminate any tax revenues. It is expected that the mine would sustain production at current levels or at a somewhat increased level and not change the state or local tax base resulting from mine production.

IMPACTS ON THE HUMAN POPULATION	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
15. DEMAND FOR GOVERNMENT SERVICES: Will substantial traffic be added to existing roads? Will other services (fire protection, police, schools, etc.) be needed?	[N] No changes would occur as a result of the proposed action.
16. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS: Are there State, County, City, USFS, BLM, Tribal, etc. zoning or management plans in effect?	[N] No locally adopted environmental plans and goals would change as a result of the proposed action.
17. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES: Are wilderness or recreational areas nearby or accessed through this tract? Is there recreational potential within the tract?	[N] The proposed mine area is not located in or adjacent to any wilderness or recreational areas. Recreation potential within the site is limited due to current operations.
18. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING: Will the project add to the population and require additional housing?	[N] The project is not expected to significantly affect local populations. Neither population increase nor residential decrease would be incurred by approving the project
19. SOCIAL STRUCTURES AND MORES: Is some disruption of native or traditional lifestyles or communities possible?	[N] Disruption of lifestyles is not expected since there is minimal human activity within or near the proposed project area. State Highway #39 passes within visual observation of the proposed mining. No changes from currently approved operations would occur.
20. CULTURAL UNIQUENESS AND DIVERSITY: Will the action cause a shift in some unique quality of the area?	[N]
21. PRIVATE PROPERTY IMPACTS: Are we regulating the use of private property under a regulatory statute adopted pursuant to the police power of the state? (Property management, grants of financial assistance, and	[N]

IMPACTS ON THE HUMAN POPULATION	
RESOURCE	**POTENTIAL IMPACTS AND MITIGATION MEASURES**
the exercise of the power of eminent domain are not within this category.) If not, no further analysis is required.	
22. PRIVATE PROPERTY IMPACTS: Does the proposed regulatory action restrict the use of the regulated person's private property? If not, no further analysis is required.	[N]
23. PRIVATE PROPERTY IMPACTS: Does the agency have legal discretion to impose or not impose the proposed restriction or discretion as to how the restriction will be imposed? If not, no further analysis is required. If so, the agency must determine if there are alternatives that would reduce, minimize or eliminate the restriction on the use of private property, and analyze such alternatives.	[Y] DEQ has a level of discretion in its permitting decisions.
24. OTHER APPROPRIATE SOCIAL AND ECOMONIC CIRCUMSTANCES:	[N] No other social and economic circumstances would be expected.

25. Alternatives Considered:

a) No Action: Under the "No Action" alternative, DEQ would deny approval of additional mining. This alternative would decrease the amount of disturbance, decrease the amount of coal produced and thereby, shorten the potential life of the mine by limiting development to the currently approved mine area. Additional mining would not be conducted. The mineral owners and mine operator would not utilize the resource. The potential use of this coal reserve would not be realized.

b) Approval: If approved, an estimated 12,100,000 tons of recoverable coal would be added to the mine plan and extend the life of the Area B permit by approximately three years. An additional 146 acres of surface area and 306 acres of coal aquifer would be affected by mining.

c) Approval with Modification: DEQ found no need to modify the proposed revision from what was presented in the amendment application.

26. Public Involvement: Availability of this Environmental Assessment was published in:

The availability of the EA was included in the Acceptability Notice, anticipated to be published in the Billings Gazette on July 10 and 17.

27. Other Governmental Agencies with Jurisdiction: Other agencies with jurisdiction include Office of Surface Mining Reclamation and Enforcement, Bureau of Land Management, US Fish and Wildlife Service, Montana Fish, Wildlife and Parks, Montana Department of Natural Resources, and Rosebud County.

28. Magnitude and Significance of Potential Impacts: The magnitude of impacts would be small given the size of additional disturbance. Potential impacts would be insignificant given requirements for reclamation of all disturbances and the reclamation performance bond.

29. Cumulative Effects: None

Recommendation for Further Environmental Analysis:

☐ **EIS**

☐ **More Detailed EA**

X **No Further Analysis**

EA Checklist Prepared By: Angela McDannel-Groundwater Hydrologist, Emily Hinz-Surface Water Hydrologist, Chris Yde-Program Supervisor, Bob Smith-Permit Coordinator, Peter Mahrt-Engineer

Circular DEQ-7
EXHIBIT 4

Montana Department of
ENVIRONMENTAL QUALITY

CIRCULAR DEQ-7

MONTANA NUMERIC WATER QUALITY STANDARDS

October 2012

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INTRODUCTION

The Department of Environmental Quality (Department) Circular DEQ-7 (DEQ-7) contains numeric water quality standards for Montana's surface and ground waters. The standards were developed in compliance with Section 75-5-301, Montana Code Annotated (MCA) of the Montana Water Quality Act, Section 80-15-201, MCA (the Montana Agricultural Chemical Groundwater Protection Act), and Section 303(c) of the Federal Clean Water Act (CWA). Together, these provisions of state and federal law require the adoption of narrative and numeric standards that will protect the designated beneficial uses of state waters, such as growth and propagation of fishes and associated wildlife, waterfowl and furbearers, drinking water, culinary and food processing, recreation, and agriculture.

DEQ-7 contains a great deal of information about Montana's numeric standards in a compact form. In addition to providing the numeric water quality standards for each parameter DEQ-7 also contains the following:

- The primary synonyms of each parameter. This section also includes any identification numbers used by the U.S. Environmental Protection Agency (EPA), such as the Resource Conservation and Recovery Act (RCRA) waste number, if available, as the last entry in the synonyms section;
- the Chemical Abstracts Service Registry Number (CASRN) for each chemical, as well as the National Institute for Occupational Safety and Health (NIOSH) and the SAX reference numbers (taken from Dangerous Properties of Industrial Materials, by N. Irving Sax);
- the categorization of each parameter according to the type of pollutant;
- the bioconcentration factor, if known;
- trigger values used to determine "nonsignificant changes in water quality" under Montana's nondegradation policy (ARM 17.30.701-718); and
- required reporting values (RRV). See footnote 19 for a further explanation of RRV usage.

The numeric water quality standards in DEQ-7 have been established for parameters (i.e., "pollutants") in five categories: toxic, carcinogenic, radioactive, nutrients and harmful. An explanation of each of these categories is given below under "Explanation of Terms".

Parameters are listed in alphabetical order. In order to facilitate listing by alphabetical order, parameters that are normally written with the numbers first are listed with the numbers last. For example, 2,4-Dinitrophenol is listed as Dinitrophenol, 2,4-.

There are many explanatory notes following the table portion of DEQ-7. Footnotes referencing the explanatory notes are found in both the table headings and in individual line items. The notes following the table explain various aspects of the standards. For example, the standards for some metals, ammonia, and dissolved oxygen cover a range of values that are computed by using tables or formulas, using such parameters as pH, hardness, or temperature.

The Department will provide hard copies of this document upon request or the document may be retrieved from the Department website at, http://www.deq.mt.gov/wqinfo/Circulars/DEQ-7.PDF. Use of an electronic copy will enable the reader to search for synonyms or CASRN. Such searches will make this document easier to use.

STANDARDS DEVELOPMENT

Montana's numeric water quality standards were developed using guidance from the EPA which includes:

- National Recommended Water Quality Criteria (NRWQC)[1] for the protection of human health and aquatic life, developed under Section 304(a) of the CWA. These include criteria for priority pollutants (PP), non priority Pollutants (NPP), and organoleptic pollutants (OL); and
- Drinking Water Health Advisories (HA) and Maximum Contaminant Levels (MCLs) developed under the Safe Drinking Water Act.[2]

The 2011 versions of NRWQC and Drinking Water Standards and Health Advisories were used to develop the standards in this version of DEQ-7.

Aquatic life criteria take into consideration the magnitude (how much of a pollutant is allowable), duration of exposure to the pollutant (averaging period), and frequency (how often criteria can be exceeded). Acute criteria are based on a one hour exposure event and can only be exceeded once, on average, in a three year period. Chronic criteria are based on a 96 hour exposure and can only be exceeded, on average, once in a three year period. For more information, see EPA's ***Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses***.[3] The techniques used for determining Aquatic Life numeric standards are complex and take a great deal of time to develop. They require a detailed accumulation of scientific evidence from multiple studies, reviewed by experts in their field that may take years to complete. Aquatic Life Standards are added to DEQ-7 as they become available.

Nutrient standards for aquatic life are not included in DEQ-7, but will be addressed in future, separate documentation. Nutrients in the aquatic environment are essential substances (organic or inorganic) which are used by living organisms such as algae or bacteria for cellular metabolism or construction. Examples include nitrogen (typically as ammonia, nitrate, or nitrite) and phosphorus. If present in excessive amounts (which depends on the ecosystem involved), nutrients can produce excessive algal and plant growth, which can lead to undesirable deterioration of beneficial uses of State waters. The human health standards for nitrogenous compounds are still found in DEQ-7 and are listed as toxic compounds.

Human health criteria also have a magnitude, duration and frequency component. The standard assumption in calculating the magnitude of the pollutant for groundwater exposure is that a 70 kg person will consume two liters a day for 70 years. Water consumption is assumed to be the only route of exposure in that time frame. For surface water criteria, two routes of exposure are considered, water consumption and fish consumption. EPA and the Department use a fish consumption rate of 17.5 grams of fish per day.

Other publications used by the Department in the development of standards include: the *1986 Quality Criteria for Water*, EPA 440/5/86-001 (the "Gold Book") and numerous updates; *Toxics Criteria for those States not Complying with Clean Water Act* 303(c)(2)(B); *The National Toxics Rule* [NTR], which was published in the Code of Federal Regulations, 40 CFR 131.36 (1992); and *Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California*, 62 F.R. 42159 [1997].

EXPLANATION OF TERMS

Toxics: A toxin is any chemical which has an immediate, deleterious effect on the metabolism of a living organism. The surface water quality standards for human health toxins are the more restrictive of either the MCL or the NRWQC. The ground water standards for human health toxins are the drinking water MCL or, if an MCL is not available, the NRWQC criteria. If neither an MCL nor an NRWQC criteria is available, an HA will be developed by the Department with the aid of the regional EPA toxicologist.

[1] See http://www.epa.gov/waterscience/criteria/wqctable/
[2] See http://water.epa.gov/drink/standards/hascience.cfm#dw-standards
[3] Available at: http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/

Carcinogens: The Montana Water Quality Act requires that human health standards for carcinogens be the more restrictive of either of the following: (1) the risk-based level of one in one hundred thousand [$1x10^{-5}$] for all carcinogens except arsenic, which is based upon one in one thousand [$1x10^{-3}$]; or, (2) the MCL. For surface water, the risk-based levels in EPA's NRWQC criteria or the MCL was used, or if not available HA information was used. In cases where a risk based level was not available, the most recent oral reference dose (RfD) or cancer potency factor (q1*) in the Integrated Risk Information System (IRIS) was used to compute the standard. In cases where no risk-based levels were available for known carcinogens, the standards in DEQ-7 are based on toxic effects. Ground water standards are based on EPA Drinking Water MCLs or HAs, NRWQC criteria, or IRIS information.

Pesticides: The Montana Agricultural Chemical Ground Water Protection Act requires that federal water quality criteria be adopted as ground water standards for pesticides if they are available. Pesticides are not a separate category in DEQ-7, but are included in either the toxic or carcinogenic categories. The criteria derivation would follow the process described above for those categories. If no MCLs or other federal criteria are available, standards must be developed using available data on health effects RfD and standard assumptions. The standard assumptions are that two liters of water are consumed per day and that adults weighing 70 kilograms are exposed for 70 years (life-long exposure) to a single source of water. When information was available, a relative source contribution (RSC) factor was also applied. The RSC is the percentage of a parameter's intake through drinking water versus other dietary sources. A RSC of 0.2 was used in most cases to develop ground water standards for pesticides. In some cases, no data was available to develop a water quality standard for a pesticide in surface water. In these cases, the ground water standard (developed for a pesticide according to the risk-based analysis provided above) was also adopted as a surface water standard. Other federal data sources were used when the EPA's most recent drinking water regulations and health advisories did not include data for a pesticide.

Bioconcentration: Bioconcentration factors (BCF) are not a separate category in DEQ-7, but are included with each pollutant for which there is a known bioconcentration effect. Bioconcentration is a biological amplification process which results in a higher concentration of a pollutant in a living organism than in the environment to which the organism is exposed. Pollutants such as mercury can be hundreds of times more concentrated in fish tissues than in the water the fish lives in. The calculation of a BCF is complex and is dependent on the age of the organism and the chemistry of its environment. A detailed discussion of bioconcentration can be found in EPA 823-B-94-004 *Guidance for Assessing Chemical Contaminant Data for use in Fish Advisories.*

The human health standards for carcinogens and other parameters that exhibit bioconcentration were developed using the assumption that there are two routes of human exposure: through consumption of water and fish. EPA's water quality criteria are derived using an average fish consumption rate of 17.5 grams/day and water consumption of two liters per day. The Department follows the EPA guidance for fish consumption rates.

Radioactive: All elements that emit alpha, beta, or gamma radiation are regulated in ground water by the EPA. As all forms of radiation are carcinogenic, the calculation of a numeric standard is derived either from MCLs set by the EPA or calculated from the Oral Cancer Slope Factor (OCSF) provided by the EPA Region VIII toxicologist, the use of a risk based level of one in one hundred thousand ($1x10^{-5}$) and the consumption of two liters of water daily for 70 years for an adult weighing 70 kilograms. Unlike pesticides, a relative source correction (RSC) is not applied to the calculation of numeric standards for radioactive substances as discussed in EPA 402-R-11-001, *EPA Radiogenic Cancer Risk Models and Projections.*

Harmful: Pollutants typically classified as harmful include substances or measures which are controlled by both numeric and narrative standards. Examples of numeric standards would be pH, color or bacterial concentration. The numeric standards vary depending on the water body classification for beneficial use. The

use of tables from the footnotes section of DEQ-7 is pivotal to the proper selection of the appropriate standard. Narrative standards are not covered in DEQ-7, but include such parameters as alkalinity, sulfates, chloride, hardness, sediment, and total dissolved solids.

Required Reporting Value: Each pollutant's required reporting value (RRV) is the Department's selection of a laboratory reporting limit that is sufficiently sensitive to meet the most stringent numeric water quality standard. The Department's RRV calculation is modified from EPA Guidance 821-B-04-005, "Revised Assessment of Detection and Quantitation Approaches," and uses method detection limits (MDLs) provided by laboratories. An MDL, as defined in 40 CFR 136 Appendix B, is "the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte." EPA's guidance is based on MDL studies conducted at individual labs and recommends multiplying the MDL by 3.18 to calculate the RRV. Since the Department calculates RRVs based on an inter-laboratory study, the guidance has been modified to use the 75^{th} percentile of the MDLs from the labs multiplied by 3.18.

Because DEQ-7 contains numeric standards for pollutants regulated under 40 CFR 136, EPA's Safe Drinking Water Act (SDWA), and EPA's Office of Pesticides, MDLs used to calculate RRVs in DEQ-7 include those from methods in 40 CFR 136 Appendix A, EPA's SDWA methods, and select methods approved by EPA for the analysis of pesticides. It is the responsibility of the sampling entity to ensure that appropriate methods and reporting limits are requested from the laboratory to meet analytical and reporting limit needs. For pollutants with low standards and RRVs, the Department realizes that the RRVs may be below the laboratory's lowest calibration standards. In these cases, laboratories are encouraged to report values down to the RRV when possible, and to qualify data reported below their lowest calibration standard.

RULES CONTAINING MONTANA'S WATER QUALITY STANDARDS

The Administrative Rules of Montana (ARM), 17.30.620 through 17.30.670, contain numeric surface water quality standards that vary with each stream classification. Examples of numeric standards that change under each stream classification include Escherichia coli bacteria, color, turbidity, pH, and temperature.

Both Montana's surface water and ground water rules contain narrative standards (ARM 17.30.620 through 17.30.670 and ARM 17.30.1001 through 17.30.1045). The narrative standards cover a number of parameters, such as alkalinity, chloride, hardness, sediment, sulfate, and total dissolved solids for which sufficient information does not yet exist to develop specific numeric standards. These narrative standards are directly translated to protect beneficial uses from adverse effects, supplementing the existing numeric standards.

CIRCULAR DEQ-7, MONTANA NUMERIC WATER QUALITY STANDARDS(9)

Except where indicated, values are listed as micrograms per liter (µg/L). No number indicates that a standard has not been adopted or information is currently unavailable. A '( )' indicates that a detailed note of explanation is provided.

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Acenaphthene §§ § 3Acenaphthalene § Naphthyleneethylene § 1,8-Ethylenenaphthalene § 1,8-Ethylene Naphthalene § 1,2-Dihydroacenphthylene § Acenphthylene, 1,2-Dihydro-	83-32-9 AB 1255500 AAE750	Toxic			242	670 PP	670 PP		10
Acetochlor (30) §§ § Acenit § Azetochlor § C10925 § Erunit § Harness § MG 02 § MON 097 § Nevirex	34256-82-1	Toxic				140 HA	140 HA		0.4
Acifluorfen §§ Blazer § Tackle § Scepter § as sodium salt	62476-59-9	Carcinogen				10 HA	10 HA	N/A	0.5
Acrolein §§ Aqualine § Biocide § Crolean § Aqualin § Propenal § SHA 00701 § 2-propenal § Acraldehyde § Acrylaldehyde § Acrylic Aldehyde § Ethylene Aldehyde	107-02-8 AS 1050000 ADR000	Carcinogen	3 PP	3 PP	215	60 PP	60 PP	N/A	3
Acrylamide §§ 2-Propenamide § Propenamide§ Acrylic Amide § Ethylenecarboxamide § RCRA Waste Number U007	79-06-1 AS 3325000 ADS250	Carcinogen				0.08 HA	0.08 HA	N/A	0.008
Acrylonitrile §§ Fumigrain § Ventox § ENT 54 § TL 314 § Carbacryl § Cyanoethylene § Vinyl cyanide § Propenenitrile § 2-Propenenitrile § Acrylonitrile monomer § RCRA Waste Number U009	107-13-1 AT 5250000 ADX500	Carcinogen			30	0.51 PP	0.51 PP	N/A	3

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Alachlor (includes metabolites Alachlor ESA and Alachlor OA) (31) §§ Lasso § Lazo § Alator § Alanex § Alochlor § Pillarzo § Metachlor § Chimiclor § SHA 090501 § Methachlor § 2-Chloro-N-(2,6-Diethyl)Phenyl-N-Methoxymethylacetamide § 2-Chloro-2',6'-Diethyl-N-(Methoxymethyl) Acetanilide	15972-60-8 AE 1225000 CFX000	Toxic				2 MCL	2 MCL		0.3
Aldicarb (37) §§ Temik § Temic § Ambush § OMS 771 § Temik G 10 § Aldecarb § Carbamyl § SHA 098301 § Carbanolate § Sulfone Aldoxycarb § Union Carbide 21149 § § Propanal, 2-Methyl-2-(Methylthio)-, O-[(Methylamino)Carbonyl] Oxime RCRA Waste Number P070	116-06-3 UE 2275000 CBM500	Toxic				3 MCL	3 MCL	1	0.4
Aldicarb Sulfone (37) §§ Aldoxycarb § Standak § UC 21865 § Sulfocarb § SHA 110801 § Propionaldehyde, 2-Methyl-2-(Methylsulfonyl)-, O-(Methylcarbomoyl)Oxime § 2-Methyl-2-(Methylsulfonyl) Propanal O-[(Methylamino)Carbonyl] Oxime	1646-88-4 UE 2080000 AFK000	Toxic				2 MCL	2 MCL	2	0.5
Aldicarb Sulfoxide (37) §§	1646-87-3	Toxic				4 MCL	4 MCL	2	0.4

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Aldrin §§ § HHDN § Altox § Drinox § Aldrex § Aldrite § Seedrin § Octalene § SHA 045101 § Hexachlorohexahydro-endo-exo-Dimethanonaphthalene § 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8, 8a-Hexahydro-1,4,5,8-Dimethanonaphthalene § 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-endo,exo- § 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexa-Hydro-1,4:5,8-Endo,Exo-Dimethanonaphthalene § RCRA Waste Number P004	309-00-2 IO 2100000 AFK250	Carcinogen	1.5 PP		4,670	$4.9x10^{-4}$ PP	0.02 HA	N/A	0.1
Alpha Emitters (11) §§ § Gross Alpha § Adjusted Gross Alpha	Multiple	Carcinogen / Radioactive				15 picoC /liter MCL	15 picoC /liter MCL	N/A	
alpha-Chlordane §§ -Chlordane § cis-Chlordan § cis-Chlordane § c (cis)-Chlordane § Chlordane, cis-Isomer	5103-71-9 PB 9705000 CDR675	Carcinogen			14,100	0.008 HA	1 HA	N/A	0.006

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
alpha-Hexachlorocyclohexane §§ § a-BHC § alpha-BHC § HCH-alpha § alpha-HCH § alpha-Lindane § a Hexachlorocyclohexane § alpha-Benzenehexachloride § alpha-Hexachlorocyclohexane § Benzene Hexachloride-alpha-isomer § alpha-1,2,3,4,5,6-Hexachlorocyclohexane § Cyclohexane, alpha-1,2,3,4,5,6-Hexachloro- § 1-alpha,2-alpha,3-beta,4-alpha,5-beta,6-beta-Hexachlorocyclohexane § Cyclohexane, alpha-1,2,3,4,5,6-Hexachloro-, (1-alpha, 2-alpha, 3-beta, 4-alpha, 5-beta, 6-beta)-	319-84-6 GV 3500000 BBQ000	Carcinogen			130	0.026 PP	0.026 PP	N/A	0.03
Aluminum, dissolved, pH 6.5 to 9.0 only (9) §§ Al	7429-90-5 BD 0330000 AGX000	Toxic	750 NPP	87 NPP				30	9
Ametryn §§ Ametrex	834-12-8	Toxic				60 HA	60 HA		6
Aminomethylphosphonic Acid (AMPA) § Glyphosate metabolite §§		Toxic				2,000 HA	2,000 HA		200
Aminopyralid § 4-amino-3,6-dichloropyridine-2carboxilic acid, § 4 amino-3,6 dichlro-2-pyridinecarboxilic acid § Milestone	150114-71-9	Toxic				4,000 HA	4,000 HA		0.2
Ammonia [total ammonia nitrogen (NH3-N plus NH4-N)] as ug/L N §§ § Ammonia Anhydrous § Anhydrous Ammonia § Spirit of Hartshorn	7664-41-7 BO 0875000 AMY500	Toxic	(7)(8) NPP	(7)(8) NPP				10	70

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Ammonium Sulfamate §§	7773-06-0	Toxic				2,000 HA	2,000 HA		200
Anthracene (PAH) §§ Paranaphthalene § Green Oil § Anthracin § Tetra Olive N2G	120-12-7 CA 9350000 APG500	Toxic			30	8,300 PP	2,100 HA	0.04	10
Antimony §§ Sb § Antimony Black § Antimony Regulus § C.I. 77050 § Stibium	7440-36-0 CC 4025000 AQB750	Toxic			1	5.6 PP	6 MCL	0.4	0.5
Arsenic (36) §§ As § Arsenicals § Arsenic-75 § Arsenic Black § Colloidal Arsenic § Grey Arsenic § Metallic Arsenic	7440-38-2 CG 0525000 ARA750	Carcinogen	340 PP	150 PP	44	10 MCL	10 MCL	N/A	1
Asbestos, fibers longer than 10 microns in length §§ § Amianthus § Amosite (Obs.) § Amphibole § Asbestos Fiber § Fibrous Grunerite § NCI CO8991 § Serpentine, includes Chrysotile, Actinolite, Aurosite, Anthophyllite, Crocidolite, and Tremolite	Multiple	Carcinogen				$7x10^6$ fibers /liter MCL	$7x10^6$ fibers /liter MCL	N/A	

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Atrazine (includes metabolites deethyl atrazine, deisopropyl atrazine, and deethyl deisopropyl atrazine) (32) §§ § Aatrex § Aktikon § Atrasine § Atred § Candex § Crisatrina § Crisazine§ Cyazin § Fenamin § Fenamine § Zeaphos § Fenatrol § Gesaprim § Hungazin § Inakor § Primatol § Malermais § Radazin § Radizine § Shell Atrazine herbicide § Strazine § Zeazine § SHA 080803 § 1-Chloro-3-Ethylamino-5-Isopropylamino-2,4,6-Triazine § s-Triazine, 2-Chloro-4-Ethylamino-6-Isopropylamino- § 2-Chloro-4-Ethylamino-6-Isopropylamino-s-Triazine	1912-24-9 XY 5600000 PMC325	Toxic				3 MCL	3 MCL	0.1	0.3
Azinophos and degredate azinphos methyl oxon metiltriazotion § Azimil § Bay 9027 § Bay 17147 § Carfene § Cotnion-methyl § Gusathion § Gusathion-M§ Guthion § Methyl-Guthion	961-22-8	Toxic				10 HA	10 HA		0.1
Azoxystrobin §§ § azoksystrobin § Azoxistrobin § Azoxistrobina § Azoxystrobin (BSI, ISO) § azoxystrobine § Azoxystrolin	131860-33-8	Toxic				1,000 HA	1,000 HA		0.03
Barium §§ Ba	7440-39-3 CA 8370000 BAH250	Toxic				1,000 NPP	1,000 NPP	2	3
Bentazon Methyl §§ § Basagran	25057-89-0	Toxic				200 HA	200 HA		3

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Benzene §§ § Phene § Benzol § Benzolene § Pyrobenzol § Carbon Oil § SHA 109301 § Coal Naphtha § Motor Benzol § Phenyl hydride § Cyclohexatriene C § Caswell Number 077 § EPA Pesticide Chemical Code 008801 § NCI C55276 § RCRA Waste Number U019	71-43-2 CY 1400000 BBL250	Carcinogen			5.2	5 MCL	5 MCL	N/A	0.6
Benzidine §§ § p,p'-Bianiline § 4,4'-Bianiline § 4,4'-Biphenyldiamine § p,p'-Diaminobiphenyl § 4,4'-Diaminodiphenyl § 4,4'-Biphenylenediamine § 4,4'-Diphenylenediamine § Biphenyl, 4,4'-Diamino- § 4,4'-Diamino-1,1'-Biphenyl § (1,1'-Biphenyl)-4,4'-Diamine § NCI C03361 § RCRA Waste Number U021	92-87-5 DC 9625000 BBX000	Carcinogen			87.5	$8.6x10^{-4}$ PP	$8.6x10^{-4}$ PP	N/A	5
Benzo(g,h,i)perylene (PAH) §§ § 1,12-Benzoperylene § 1,12-Benzperylene § Benzo(ghi)Perylene	191-24-2 DI 6200500 BCR000	Toxic			30			0.076	10
Benzo[a]Pyrene (PAH) §§ § BaP § 3,4-BP § Benz(a)Pyrene § Benzo-a-Pyrene § 3,4-Benzpyrene § 6,7-Benzopyrene § 3,4-Benzopyrene § 3,4-Benz(a)Pyrene § Benzo(d,e,f)Chrysene	50-32-8 DJ 3675000 BCS750	Carcinogen			30	0.038 PP	0.05 HA	N/A	0.06

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Benzo[b]Fluoranthene (PAH) §§ § B(b)F § Benzo(b)Fluoranthene § Benzo(e)Fluoranthene § 2,3-Benzfluoranthene § 3,4-Benzfluoranthene § 3,4-Benzofluoranthene § 2,3-Benzofluoranthene § 2,3-Benzofluoranthrene § Benz(e)Acephenanthrylene § 3,4-Benz(e)Acephenanthrylene	205-99-2 CU 1400000 BAW250	Carcinogen			30	0.038 PP	0.5 (29) HA	N/A	5
Benzo[k]fluoranthene (PAH) §§ § Benzo(k)Fluoranthene § 8,9-Benzofluoranthene § Dibenzo(b,jk)Fluorene § 2,3,1'8'-Binaphthylene § 11,12-Benzofluoranthene § 11,12-Benzo(k)Fluoranthene	207-08-9 DF 6350000 BCJ750	Carcinogen			30	0.038 PP	5 (29) HA	N/A	0.1
Benzo[a]anthracene (PAH) §§ § Tetraphene § Benzanthracene § Benzoanthracene § Naphthanthracene § 1,2-Benzanthrene § Benz(a)Anthracene § Benzo(a)Anthracene § 1,2-Benzanthracene § Benzo(b)Phenanthrene § 1,2-Benzoanthracene § Benzanthracene, 1,2- § 1,2-Benz(a)Anthracene § 2,3-Benzophenanthrene § RCRA Waste Number U018	56-55-3 CV 9275000 BBC250	Carcinogen			30	0.038 PP	0.5 (29) HA	N/A	0.1
Beryllium §§ Be § Beryllium-9 § Glucinum § RCRA Waste Number P015	7440-41-7 DS 1750000 BFO750	Carcinogen			19	4 MCL	4 MCL	N/A	0.8

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Beta Emitters (11) §§ § Gross Beta	Multiple	Carcinogen / Radioactive				0.4 mrem /yr MCL	0.4 mrem /yr MCL	N/A	
Beta-Chloronaphthalene §§ 2-Chloronaphthalene § ß-Chloronaphthalene § Naphthalene, 2-Chloro- § 2 Chlornaftalen § A13-01537 § CCRIS 5995 § HSDB 4014 § Halowax § EINECS 202-079-9 § RCRA waste number U047	91-58-7 QJ 2275000 CJA000	Toxic			202	1,000 PP	1,000 PP	0.94	10
beta-Hexachlorocyclohexane §§ § ß-BHC § beta-BHC § HCH-beta § beta-HCH § ß-Lindane § beta-Lindane § Hexachlorocyclohexane, beta- § trans-alpha-Benzenehexachloride § Cyclohexane, 1,2,3,4,5,6-Hexachloro-, beta- § 1-alpha,2-beta,3-alpha,4-beta,5-alpha,6-beta-Hexachlorocyclohexane § Cyclohexane, 1,2,3,4,5,6-Hexachloro-, (1-alpha, 2-beta, 3-alpha, 4-beta, 5-alpha, 6-beta)- § Benzenehexachloride, trans-alpha- § beta-1,2,3,4,5,6-Hexachlorocyclohexane	319-85-7 GV 4375000 BBR000	Carcinogen			130	0.091 PP	0.091 PP	N/A	0.02

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Bis(2-Chloroisopropyl) Ether §§ § DCIP § NCI C50044 § Dichlorodiisopropyl Ether § 2,2'-Oxybis(1-Chloropropane) § Bis (2-Chloroisopropyl) ether § Propane, 2,2'-Oxybis(2-Chloro- § Propane, 2,2'-Oxybis[1-Chloro- § 2',2'-Dichlorodiisopropyl Ether § Dichlorodiisopropyl Ether (DOT) § Bis(2-Chloro-1-Methylethyl) Ether § RCRA Waste Number U027 Reregistration decision CAS-RN	108-60-1 KN 1750000 BII250 39638-32-9	Toxic			2.47	1,400 PP	1,400 PP	0.8	10
Bis(2-Chloroethoxy)Methane §§ § Bis(ß-Chloroethyl)Formal	111-91-1 PA 3675000 BID750	Toxic			0.64			0.5	10
Bis(Chloroethyl)Ether §§ § BCEE § DCEE § Clorex § Chlorex § Chloroethyl Ether § Dichloroethyl Ether § Dichloroethyl Oxide § Bis(Chloroethyl) Ether § Di(2-Chloroethyl) Ether § Bis (Chloroethyl) Ether § Bis(2-Chloroethyl) Ether § Bis(ß-Chloroethyl) Ether § ß,ß'-Dichloroethyl Ether § 2,2'-Dichloroethyl Ether § Bis (2-Chloroethyl) Ether § 1,1'-Oxybis(2-Chloro)Ethane § Ethane, 1,1'-Oxybis[2-Chloro- § beta,beta'-Dichloroethyl Ether § 1-Chloro-2-(beta-Chloroethoxy)Ethane § RCRA Waste Number U025	111-44-4 KN 0875000 BIC750	Carcinogen			6.9	0.3 PP	0.3 PP	N/A	5

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Bis(Chloromethyl)ether §§ § BCME § bis-CME § Chloromethyl Ether § Oxybis(Chloromethane) § Bis (Chloromethyl) Ether § sym-Dichlorodimethyl Ether § 1,1'-Dichlorodimethyl Ether § Dimethyl-1,1'-Dichloroether § Chloro(Chloromethoxy) Methane § RCRA Waste Number P016	542-88-1 KN 1575000 BIK000	Carcinogen			63	0.001 NPP	0.001 NPP	N/A	$1x10^{-4}$
Bromacil §§ Hyvar §	314-40-9	Carcinogen				90 HA	90 HA	N/A	0.03
Bromate	7789-38-0	Carcinogen				10 MCL	10 MCL	N/A	1
Bromodichloromethane (HM) §§ Dichlorobromomethane § BDCM § NCI C55243 § Methane, bromodichloro- § Dichloromonobromomethane § Monobromodichloromethane	75-27-4 PA 5310000 BND500	Carcinogen			3.75	5.5 PP	10 HA	N/A	0.6
Bromoform (HM) §§ Tribromomethane § NCI C55130 § Methane, Tribromo- § Methenyl Tribromide § RCRA Waste Number U225	75-25-2 PB 5600000 BNL000	Carcinogen			3.75	43 PP	80 HA	N/A	5
Bromoxynil §§	1689-84-9	Carcinogen				3.4 HA	3.4 HA	N/A	0.3

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Butyl Benzyl Phthalate §§ § BBP § Sicol 160 § Unimoll BB § Palatinol BB § Santicizer 160 § Butylbenzylphthalate § Butylbenzyl Phthalate § Benzyl Butyl Phthalate § n-Benzyl Butyl Phthalate § Benzyl n-Butyl Phthalate § Phthalic Acid, Benzyl Butyl Ester § Butyl Phenylmethyl 1,2-Benzenedicarboxylate § 1,2-Benzenedicarboxylic Acid, Butyl Phenylmethyl Ester § NCI C54375	85-68-7 TH 9990000 BEC500	Carcinogen			414	1,500 PP	1,500 PP	N/A	10
Butylate §§ Sutan §	2008-41-5	Toxic				400 MCL	400 MCL		0.02
Cadmium §§ Cd § C.I. 77180 § Colloidal Cadmium	7440-43-9 EU 9800000 CAD000	Toxic	0.52 @25 mg/L hardness (12) PP	0.097 @25 mg/L hardness (12) PP	64	5 MCL	5 MCL	0.1	0.03
Carbaryl §§ Sevin §	63-25-2	Toxic				700 HA	700 HA	2	1
Carbofuran §§ § Yaltox § Euradan § Furadan § Curaterr § Furacarb § SHA 090601 § Niagra 10242 § 2,2-Dimethyl-7-Coumaranyl N-Methylcarbamate § 2,2-Dimethyl-2,3-Dihydro-7-Benzofuranyl N-Methylcarbamate § Carbamic Acid, Methyl-, 2,3-Dihydro-2,2-Dimethyl-7-Benzofuranyl Ester	1563-66-2 FB 9450000 FPE000	Toxic				40 MCL	40 MCL	1	1

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Carbon Tetrachloride §§ Freon 10 § R 10 § Univerm § Tetrasol § Fasciolin § Flukoids § Necatorina § Necatorine § Halon 104 § Tetraform § Carbon Tet § Benzinoform § Carbon Chloride § Perchloromethane § Tetrachloromethane § Methane Tetrachloroide § RCRA Waste Number U211	56-23-5 FG 4900000 CBY000	Carcinogen			18.75	2.3 PP	3 HA	N/A	0.6
Carboxin §§ Vitavax §	5234-68-4	Toxic				700 HA	700 HA	1	70
Chloramben §§ Vegiben §	133-90-4	Toxic				100 HA	100 HA		0.5
Chlordane §§ Termex § Belt § Niran § Dowchlor § Chlortox § Chlordan § Clordano § Chlor Kil § Toxichlor § Octa-Klor § Ortho-Klor § SHA 058201 § Gold Crest C-100 § Chlordane, Technical § Octachloro-4, 7-Methanohydroindane § Octachlorodihydrodicyclopentadiene § Octachloro-4,7-Methanotetrahydroindane-4,7-Methylene Indane § 4,7-Methanoindan, 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tetrahydro- § 4,7-Methano-1H-Indene § RCRA Waste Number U036	57-74-9 PB 9800000 CDR750	Carcinogen	1.2 PP	0.0043 PP	14,100	0.008 PP	1 HA	N/A	0.1
Chlorimuron Ethyl §§ Classic §	90982-32-4	Toxic				700 HA	700 HA	0.1	0.1
Chlorine, total residual §§ Cl § Bertholite § Chlorine, molecular § Molecular Chlorine	7782-50-5 FO 2100000 CDV750	Toxic	19 NPP	11 NPP		4,000 MCL	4,000 MCL		100

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Chlorite	7758-19-2	Toxic				1,000 MCL	1,000 MCL		100
Chlorobenzene §§ Monochlorobenzene § MCB § Chlorobenzol § Chlorbenzene § Phenyl Chloride § Benzene Chloride § Benzene, Chloro- § Monochlorbenzene § NCI C54886 § RCRA Waste Number U037	108-90-7 CZ 0175000 BBM750	Toxic			10.3	100 MCL	100 MCL	0.5	0.8
Chlorodibromomethane §§ Monochlorodibromomethane § CDBM § NCI C55254 § Methane, Dibromochloro- § Dibromochloromethane (THM)	124-48-1 PA 6360000 CFK500	Carcinogen			3.75	4 PP	4 PP	N/A	0.6
Chloroethane §§ Ethyl Chloride § Aethylis § Aethylis Chloridum § Anodynon § Chelen § Chlorethyl § Chloridum § Chloryl § Chloryl Anesthetic § Ether Chloratus § Ether Hydrochloric § Ether Muriatic § Hydrochloric Ether § Kelene § Monochlorethane § Muriatic Ether § Narcotile § NCI C06224	75-00-3 KH 7525000 EHH000	Toxic						0.52	
Chloroform (THM) §§ Trichloromethane § TCM § Freon 20 § Trichloroform § R-20 Refrigerant § Methenyl Chloride § Formyl Trichloride § Methyl Trichloride § Methane Trichloride § Methane, Trichloro- § Methenyl Trichloride § NCI CO2686§ RCRA Waste Number U044	67-66-3 FS 9100000 CHJ500	Carcinogen			3.75	57 PP	70 HA	N/A	0.9

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Chlorophenol, 2- §§ Phenol, 2-Chloro § o-Chlorophenol § 2-Chlorophenol § Phenol, o-Chloro- § RCRA Waste Number U048	95-57-8 SK 2625000 CJK250	Toxic			134	81 PP	81 PP	0.3	10
Chlorophenyl Phenyl Ether, 4- §§ § 4- Chlorophenyl Phenyl Ether	7005-72-3	Toxic with BCF >300			1,200				10
Chlorsulfuron §§ Glean §§ Telar	64902-72-3	Toxic				1,750 HA	1,750 HA		0.02
Chlorothalonil §§ Bravo §	1897-45-6	Carcinogen				100 HA	100 HA	N/A	0.05
Chlorpyrifos §§ Dursban § Ethion § Brodan § Eradex § Lorsban § Pyrinex § NA 2783 § Piridane § DowCo 179 § SHA 059101 § Ethion, dry § Chlorothalonil § Chlorpyrifos-Ethyl § O,O-Diethyl O-3,5,6-Trichloro-2-Pyridyl Phosphorothioate § Phosphorothioic Acid, O,O-Diethyl O-(3,5,6-Trichloro-2-Pyridyl) Ester	2921-88-2 TF 6300000 DYE000	Toxic	0.083 NPP	0.041 NPP		20 HA	20 HA	0.25	0.1
Chromium, all forms §§ Cr § Chrome	7440-47-3 GB 4200000 CMI750	Toxic				100 MCL	100 MCL	1	10
Chromium, hexavalent §§ Chromium (VI) §	18540-29-9	Toxic	16 PP	11 PP	16				2
Chromium, trivalent §§ Chromium (III) §	16065-83-1	Toxic	579 @ 25mg/L hardness (12) PP	27.7 @ 25 mg/L hardness (12) PP	16			1	3

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Chrysene (PAH) §§ § Benz(a)Phenanthrene § Benzo(a)Phenanthrene § 1,2-Benzphenanthrene § 1,2-Benzophenanthrene § 1,2,5,6-Dibenzonaphthalene § RCRA Waste Number U050	218-01-9 GC0700000 CML810	Carcinogen			30	0.038 PP	50 (29) HA	N/A	0.1
cis-1,2-Dichloroethylene §§ § 1,2-Dichloroethylene § cis-Dichloroethylene § cis-1,2-Dichloroethene § 1,2,cis-Dichloroethylene § ethylene, 1,2-Dichloro-, (z)-	156-59-2 KV 9420000 DFI200	Toxic				70 MCL	70 MCL	0.002	0.9
cis-1,3-Dichloropropene §§ Telone II § 1,3-Dichloropropene § 1,3-Dichloropropylene § (Z)-1,3-Dichloropropene § cis-1,3-Dichloropropylene § 1-Propene, 1,3-Dichloro-, (Z)-	10061-01-5 UC 8325000 DGH200	Carcinogen			1.91	3.4 HA	4 HA	N/A	0.6
Clopyralid §§ Stinger §	1702-17-6	Toxic				1,000 HA	1,000 HA	1	0.3
Color §§	N/A	Harmful				(18)	(18)	N/A	5 UNITS
Copper §§ Cu § Allbri Natural Copper § ANAC 110 § Arwood Copper § Bronze Powder § CDA 101 § CDA 102 § CDA 110 § CDA 122 § C.I. 77400 § C.I. Pigment Metal 2 § Copper Bronze § 1721 Gold § Gold Bronze § Kafar Copper § M1 (Copper) § M2 (Copper) § OFHC Cu § Raney Copper	7440-50-8 GL 5325000 CNI000	Toxic	3.79@ 25mg/L hardness (12) PP	2.85@ 25 mg/L hardness (12) PP	36	1,300 PP	1,300 PP	0.5	2
Cyanazine §§ Bladex	21725-46-2	Toxic				1 HA	1 HA		0.02

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Cyanide, total §§ § Cyanide § Isocyanide § Cyanides, includes soluble salts and complexes § RCRA Waste Number P030	57-12-5 GS 7175000 COI500	Toxic	22 PP	5.2 PP	1	140 PP	200 MCL		3
Dacthal §§ DCPA §	1861-32-1	Toxic				70 HA	70 HA	0.025	1
Dalapon §§ Revenge § Dalpon § Unipon § Dowpon § Radapon § Basinex § Ded-Weed § Dalacide § Gramevin § Crisapon § Dalpon Sodium § 2,2-Dichloropropionic Acid § SHA 28902, for sodium salt § SHA 28901, for dalapon only Propionic Acid, 2,2-Dichloro- § Sodium 2,2-Dichloropropionate § a-Dichloropropionic Acid § a,a-Dichloropropionic Acid § alpha-alpha-Dichloropropionic Acid	75-99-0 UF 0690000 DGI400	Toxic				200 MCL	200 MCL	1.3	3
Dalapon, sodium salt §§ Dalpon § Unipon § Dowpon § Radapon § Revenge § Basinex § Ded-Weed § Dalacide § Gramevin § Crisapon § Dalpon Sodium § Sodium Dalapon § 2,2-Dichloropropionic Acid § SHA 28902, for sodium salt § SHA 28901, for dalapon only § Propionic Acid, 2,2-Dichloro- § Sodium 2,2-Dichloropropionate § alpha-alpha-Dichloropropionic Acid	127-20-8 UF 1225000 DGI600	Toxic				200 MCL	200 MCL	1.3	3

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Demeton §§ Systox § Bay 10756 § Bayer 8169 § Demox § Diethoxy Thiophosphoric Acid Ester of 2-Ethylmercaptoethanol § O,O-Diethyl 2-Ethylmercaptoethyl Thiophosphate § O,O-Diethyl O(and S)-2-(Ethyl-Thio)Ethyl Phosphorothioate Mixture § E 1059 § ENT 17,295 § Mercaptophos § Systemox § Systox § ULV § Demeton-O + Demeton-S	8065-48-3 TF 3150000 DAO600	Toxic		0.1 NPP		1.4 HA	1.4 HA	0.25	0.01
Di(2-Ethylhexyl)Phthalate (PAE) §§ Bis(2-Ethylhexyl)Phthalate § BEHP § DEHP § Octoil § Fleximel § Flexol DOP § Kodaflex DOP§ Ethylhexyl Phthalate § Diethylhexyl Phthalate § 2-Ethylhexyl Phthalate § Di(Ethylhexyl)phthalate § Di(2-Ethylhexyl)phthalate § Bis (2-Ethylhexyl) Phthalate § Bis(2-Ethylhexyl)-1,2-Benzene-Dicarboxylate § 1,2-Benzenedicarboxylic Acid, Bis(2-Ethylhexyl)Ester	117-81-7 TI 0350000 BJS000	Carcinogen			130	6 MCL	6 MCL	N/A	2

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Di(2-Ethylhexyl)Adipate §§ Hexanedioic Acid § DEHA § BEHA § Bisoflex DOA § Effemoll DOA § Ergoplast AdDO § Flexol A 26 § PX-238 § Reomol DOA § Vestinol OA § Wickenol 158 § Kodaflex DOA § Monoplex DOA § NCI C54386 § Octyl Adipate § Dioctyl Adipate § Di-2-Ethylhexyl Adipate § Di (2-Ethylhexyl) Adipate § Bis(2-Ethylhexyl) Adipate § Adipic Acid, Bis(2-Ethylhexyl) Ester § Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	103-23-1 AU 9700000 AEO000	Carcinogen				300 HA	300 HA	N/A	6
Diazinon §§	333-41-5	Toxic	0.17 NPP	0.17 NPP		0.6 HA	0.6 HA	0.25	0.03
Dibenz[a,h]Anthracene (PAH) §§ § DBA § DB(a,h)A § Dibenz(a,h)Anthracene § Dibenzo(a,h)anthracene § 1,2:5,6-Benzanthracene § Dibenzo (a,h) Anthracene § 1,2,5,6-Dibenzanthracene § 1,2:5,6-Dibenz(a)Anthracene § RCRA Waste Number U063	53-70-3 HN 2625000 DCT400	Carcinogen			30	0.038 PP	0.05 (29) HA	N/A	0.1
Dibromoethane, 1,2- §§ Ethylene Dibromide § DBE § EDB § Nephis § Kopfume § Celmide § E-D-Bee § Soilfume§ Bromofume § Dowfume 40 § SHA 042002 § Pestmaster § Soilbrom-40§ Dibromoethane § Ethylene Bromide § Glycol Dibromide § 1,2-Dibromoethane § 1,2-Ethylene Dibromide § RCRA Waste Number U067	106-93-4 KH 9275000 EIY500	Carcinogen				0.004 HA	0.004 HA	N/A	0.01

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dibutyl Phthalate §§ § DPB § Celluflex DPB § Elaol § Hexaplas M/B § Palatinol C§ Polycizer DBP § PX 104 § Staflex DBP § Witcizer § SHA 028001 § Butylphthalate § N-Butylphthalate § Di-n-Butylphthalate § Di-n-Butylphthalate § Dibutyl-o-Phthalate § Di-n-Butyl Phthalate § RCRA Waste Number U069 § Phthalic Acid Dibutyl Ester § Dibutyl 1,2-Benzene Dicarboxylate § 1,2-Benzenedicarboxylic Acid Dibutyl Ester § 1,2-Benzenedicarboxylic Acid, Dibutyl Ester § Benzene-o-Dicarboxylic Acid Di-n-Butyl Ester	84-74-2 TI 0875000 DEH200	Toxic			89	2,000 PP	2,000 PP	0.25	10
Dicamba §§ Banvel §	1918-00-9	Toxic				200 HA	200 HA	0.28	0.7
Dichlorobenzene, 1,2- §§ DCB § ODB § ODCB § Dizene § Cloroben § Chloroben § Chloroden § Termitkil § Dilatin DB § Dowtherm E § Dilantin DB § o-Dichlorobenzene § Orthodichlorobenzene § ortho-Dichlorobenzene § Special Termite Fluid § Benzene, 1,2-Dichloro- § RCRA Waste Number U070	95-50-1 CZ 4500000 DEP600	Toxic			55.6	420 PP	600 MCL	0.02	10
Dichlorobenzene, 1,3- §§ Benzene, 1,3-Dichloro § M-Dichlorobenzene § m-Dichlorobenzene § meta-Dichlorobenzene § 1,3-Dichlorobenzene-	541-73-1 CZ 4499000 DEP699	Toxic			55.6	320 PP	600 HA	0.006	5

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dichlorobenzene, 1,4- §§ Benzene, 1,4-Dichloro- § 1,4- Dichlorobenzene § PDB § PDCB § NCI C54955 § Evola § Paradi § Paradow§ Persia-Perazol § Paracide § Parazene § Paramoth § Santochlor § Paranuggets § di-Chloricide § Para Chrystals § p- Dichlorobenzene § Caswell Number 632 § Paradichlorobenzene § para-Dichlorobenzene- § p- Chlorophenyl Chloride § EPA Pesticide Chemical Code 061501 § RCRA Waste Number U070 § RCRA Waste Number U071 § RCRA Waste Number U072	106-46-7 CZ 4550000 DEP800	Toxic			55.6	75 MCL	75 MCL		5
Dichlorobenzidine, 3,3'- §§ DCB § C.I. 23060 § Curithane C126 § Dichlorobenzidine § o,o'-Dichlorobenzidine § Dichlorobenzidine Base § Benzidine, 3,3'-Dichloro- § 3,3'-Dichloro-4,4'- Diaminodiphenyl § 3,3'- Dichloro-(1,1'-Biphenyl)- 4,4'-Diamine § 1,1'- Biphenyl-4,4'-Diamine, 3,3'-Dichloro- § RCRA Waste Number U073	91-94-1 DD 0524000 DEQ400	Carcinogen			312	0.21 PP	0.21 PP	N/A	5

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dichlorodifluoromethane (HM) §§ Freon 12 § F 12 § R 12 § FC 12 § Halon § CFC-12 § Arcton 6 § Electro-CF 12 § Eskimon 12 § Frigen 12 § Gentron 12 § Isceon 122 § Kaiser Chemicals 12 § Ledon 12 § Ucon 12 § Propellant 12 § Refrigerant 12 § Fluorcarbon-12 § Difluorodichloromethane § Methane, dichlorodifluoro- § RCRA Waste Number U075	75-71-8 PA 8200000 DFA600	Toxic			3.75	1,000 HA	1,000 HA	0.05	0.8
Dichloroethane, 1,2- §§ Ethylene Chloride § EDC § Brocide § 1,2-DCE § NCI C00511 § Dutch Oil § Dutch Liquid § Dichloremulsion § Di-Chlor-Mulsion § 1,2-Bichlorethane § 1,2-Dichlorethane § Ethane Dichloride § 1,2-Bichloroethane § Ethylene Dichloride § 1,2-Dichloroethane § Ethane, 1,2-Dichloro- § 1,2-Ethylene Dichloride § alpha,beta-Dichloroethane § RCRA Waste Number U077	107-06-2 KI 0525000 DFF900	Carcinogen			1.2	3.8 PP	4 HA	N/A	0.5
Dichloroethylene, 1,1- §§ Vinylidene Chloride § VDC § 1,1-DCE § Sconatex § NCI C54262 § 1,1-Dichloroethene § Vinylidene Chloride § 1,1-Dichloroethylene § Vinylidene Dichloride § Ethene, 1,1-Dichloro- § Vinylidene Chloride II § Dichloroethylene, 1,1- § Ethylene, 1,1-Dichloro- § RCRA Waste Number U078	75-35-4 KV 9275000 DFI000	Carcinogen			5.6	7 MCL	7 MCL	N/A	0.7

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dichlorophenol, 2,4- §§ Phenol, 2,4-Dichloro § DCP § 2,4-DCP § NCI C55345 § 2,4-Dichlorophenol § RCRA Waste Number U081	120-83-2 SK 8575000 DFX800	Toxic			40.7	77 PP	77 PP	10	10
Dichlorophenoxyacetic Acid, 2,4- §§ Dichlorophenoxyacetic Acid § 2,4-D § Salvo § Phenox § Farmco § Amidox § Miracle § Agrotect § Weedtrol § Herbidal § Ded-Weed § Lawn-Keep § Fernimine § Crop Rider § Dichlorophenoxyacetic Acid, 2,4- § Acetic Acid, (2,4-Dichlorophenoxy)- § 2,4-Dichlorophenoxyacetic Acid, salts and esters	94-75-7 AG 6825000 DFY600	Toxic				70 MCL	70 MCL	0.02	1
Dichloropropane, 1,2- §§ Propylene Chloride § 1,2-Dichloropropane § NCI C55141 § Propylene Dichloride § Caswell Number 324 § Propane, 1,2-Dichloro- § a,ß-Propylene Dichloride § alpha,beta-Dichloropropane § EPA Pesticide Chemical Code 029002 § RCRA Waste Number U083	78-87-5 TX 9625000 DGF600	Toxic			4.11	5.0 PP	5 MCL		0.7

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dichloropropene, 1,3- §§ Telone II § Telone § NCI C03985 § Vidden D § Dichloropropene § a-Chloroallyl Chloride § g-Chloroallyl Chloride § 1,3-Dichloropropene § 1,3-Dichloropropylene § 1,3-Dichloro-2-Propene § Propene, 1,3-Dichloro- § Telone II Soil Fumigant § 3-Chloropropenyl Chloride § alpha,gamma-Dichloropropylene	542-75-6 UC 8310000 CEF750	Carcinogen			1.91	3.4 PP	4 HA	N/A	0.3
Dichlorprop §§ § Canapur DP § Basagran DP § Cornox RX § Hedonil DP § Kildip § Mayclene § Polyclene § Weedone DP § Polytox	120-36-5	Toxic				300 HA	300 HA		1
Dieldrin §§ § Alvit § Quintox § Octalox § Illoxol § Dieldrex § NCI C00124 § Dieldrite § Hexachloroepoxyoctahydro-endo,exo-Dimethanonaphthalene § 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-Octahydro-2,7:3,6-Dimethanonaphth(2,3-b)Oxirene § 2,7:3,6-Dimethanonaphth(2,3-b)Oxirene, 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-Octahydro- § SHA 045001 § 1,4:5,8-Dimethanonaphthalene § RCRA Waste Number P037	60-57-1 IO 1750000 DHB400	Carcinogen	0.24 PP	0.056 PP	4,670	$5.2x10^{-4}$ PP	0.02 HA	N/A	0.02

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Diethyl Phthalate §§ § Anozol § Neantine § Solvanol § NCI C60048 § Placidole E § Ethyl Phthalate § Diethylphthalate § Diethyl-o-Phthalate § 1,2-Benzenedicarboxylic Acid, Diethyl Ester § RCRA Waste Number U088	84-66-2 TI 1050000 DJX000	Toxic			73	$1.7x10^4$ PP	$1.7x10^4$ PP	0.25	10
Difenoconazole §§ § 1-[2-[2-chloro-4-(4-chlorophenoxy)phenyl1]-4-methyl-1,3-dioxolan-2ymethyl]-1H-1,2,4-triazole § CGA169374 § Dividend § Dragon § Plover § Score § Score EC250	119446-68-3	Carcinogen				70 HA	70 HA	N/A	0.06
Dimethenamid and degredate demethenamid OA § 2-Chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide § San 682H § Frontier herbicide § EPA pesticide Code 129051	87674-68-8	Carcinogen				400 HA	400 HA	N/A	0.03
Dimethoate §§	60-51-5	Toxic				7 HA	7 HA		6
Dimethrin §§	70-38-2	Toxic				2,000 HA	2,000 HA		200

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dimethyl Phthalate §§ § DMP § NTM § ENT 262 § Mipax § Avolin § Fermine § Solvanom § Solvarone § Palatinol M § Methyl Phthalate § Dimethylphthalate § Phthalic Acid, Dimethyl Ester § Dimethyl Benzene-o-Dicarboxylate § Dimethyl 1,2-Benzenedicarboxylate § 1,2-Benzenedicarboxylic Acid, Dimethyl Ester	131-11-3 TI 1575000 DTR200	Toxic			36	$2.7x10^5$ PP	$2.7x10^5$ PP	0.04	10
Dimethylphenol, 2,4- §§ Phenol, 2,4-Dimethyl- § m-Xylenol § 2,4-Xylenol § 4,6-Dimethylphenol § Caswell Number 907A § 2,4-Dimethyl Phenol § 1-Hydroxy-2,4-Dimethylbenzene § 4-Hydroxy-1,3-Dimethylbenzene § EPA Pesticide Chemical Code 086804 § RCRA Waste Number U101	105-67-9 ZE 5600000 XKJ500	Toxic			93.8	380 PP	380 PP	10	10
Dinitro-o-Cresol, 4,6- §§ Dinitrocresol § Detal § Sinox § DNOC § Arborol § Capsine § Dinitrol § Trifocide § Antinonin § Winterwash § Dinitro-o-Cresol § 2,4-Dinitro-o-Cresol § 4,6-Dinitro-o-Cresol § o-Cresol, 4,6-dinitro- § 2-Methyl-4,6-Dinitrophenol § 4,6-Dinitro-2-Methylphenol § 2,4-Dinitro-6-Methylphenol § 3,5-Dinitro-2-Hydroxytoluene § Phenol, 2-Methyl-4,6-Dinitro- § Caswell Number 390 § RCRA Waste Number P047	534-52-1 GO 9625000 DUT400	Toxic			5.5	13 PP	13 PP		10

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dinitrophenol, 2,4- §§ Phenol, 2,4-Dinitro § Nitro § Kleenup § Aldifen § 2,4-Dinitrophenol § 2,4- DNP § Chemox PE § Maroxol-50 § Solfo Black B § alpha-Dinitrophenol § Dinitrophenol, 2,4- § Tertrosulphur Black PB § 1- Hydroxy-2,4- Dinitrobenzene § RCRA Waste Number P048	51-28-5 SL 2800000 DUZ000	Toxic			1.5	69 PP	69 PP	13	60
Dinitrotoluene, 2,4- §§ Toluene, 2,4-Dinitro § 2,4-DNT § NCI C01865 § 2,4-Dinitrotoluol - § Benzene, 1-Methyl-2,4- Dinitro- § RCRA Waste Number U105	121-14-2 XT 1575000 DVH000	Carcinogen			3.8	1.1 PP	1.1 PP	N/A	0.2
Dinitrotoluene, 2,6- §§ Toluene-dinitro § 2,4-DNT § Methyl-1,3- Dinitrobenzene § RCRA Waste Number U106	606-20-2 XT 1925000 DVH400	Carcinogen				0.5 HA	0.5 HA	N/A	0.2
Dinoseb §§ § DNBP § DBNF § Aretit § Basanite § Caldon § Sparic § Kiloseb § Spurge § Premerge § Dinitro § Hel- Fire § SHA 037505 § Dow General § Sinox General § Dow General Weed Killer § Vertac General Weed Killer § 2-sec-Butyl-4,6- Dinitrophenol § Dinitro- Ortho-Sec-Butyl Phenol § 2-(1-Methylpropyl)-4,6- Dinitrophenol § 4,6- Dinitro-2-(1-Methyl-n- Propyl)Phenol§ Phenol, 2- (1-Methylpropyl)-4,6- Dinitro- § RCRA Waste Number P020	88-85-7 SJ 9800000 BRE500	Toxic				7 MCL	7 MCL	0.19	1

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Dioxin Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans Calculation of an equivalent concentration of 2,3,7,8-TCDD is to be based on congeners of CDDs/CDFs and the toxicity equivalency factors (TEF) in van den Berg, M: et al. (2006) The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 93(2):223-241.	1746-01-6	Carcinogen			5,000	$5x10^{-9}$ (10) PP	$2x10^{-6}$ (10) HA	N/A	footnote (10)
Diphenamid §§	957-51-7	Carcinogen				200 HA	200 HA	N/A	20
Diphenylhydrazine, 1,2- §§ Hydrazine, 1,2-Diphenyl- § Hydrazobenzene § NCI C01854 § N,N'-Bianiline § Benzene, Hydrazodi- § (sym)-Diphenylhydrazine § 1,2-Diphenylhydrazine § RCRA Waste Number U109	122-66-7 MW 2625000 HHG000	Carcinogen			24.9	0.36 PP	0.36 PP	N/A	0.04
Diquat §§ § Actor § Feglox § Deiquat § Reglone § Aquacide § Dextrone § Paraquat § Preeglove § SHA 032201 § Weedtrine-D § Diquat Dibromide § Ethylene Dipyridylium Dibromide § 1,1-Ethylene 2,2-Dipyridylium Dibromide § 5,6-Dihydro-Dipyrido(1,2a,1c)Pyraziniu m Dibromide § 9,10-Dihydro-8a,10a-Diazoniaphenanthrene(1,1'-Ethylene-2,'-Bipyridylium)Dibromide	2764-72-9 DWX800 JM 5690000	Toxic				20 MCL	20 MCL	0.44	2

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Disulfoton §§ § Disyston	298-04-4	Toxic				0.3 HA	0.3 HA	0.07	0.09
Diuron §§ § Karmex	330-54-1	Toxic				10 HA	10 HA	1	0.5
Endosulfan (39) §§ § NCI C00566 § Malixv § Ensure § Beosit § Endocel § Thiodan § Cyclodan § Crisulfan § Benzoepin § Thiosulfan § SHA 079401 § Chlorthiepin § Endosulfan (mixed isomers) § Hexachlorohexahydromethano 2,4,3-Benzodioxathiepin-3-Oxide § 1,4,5,6,7,7-Hexachloro-5-Norbornene-2,3-Dimethanol Cyclic Sulfite § 5-Norbornene-2, 3-Dimethanol, 1,4,5,6,7,7-Hexachloro Cyclic Sulfite § RCRA Waste Number P050	115-29-7 RB 9275000 BCJ250	Toxic	0.11 PP	0.056 PP	270	62 PP	62 PP	0.014	see Cis and trans isomers
Endosulfan, I (39) (the cis isomer of Endosulfan) §§ § Thiodan I § Endosulfan-I § Alpha-Endosulfan § alpha-Endosulfan	959-98-8	Toxic	0.11 PP	0.056 PP	270	62 PP	62 PP		0.02
Endosulfan, II (39)(the trans isomer of endosulfan) §§ § Thiodan II § Endosulfan-II § Beta-Endosulfan § beta-Endosulfan	33213-65-9	Toxic	0.11 PP	0.056 PP	270	62 PP	62 PP	0.004	0.02
Endosulfan Sulfate §§ § 6,9-Methano-2,3,4-Benzodioxathiepin, 6,7	1031-07-8	Toxic			270	62 PP	62 PP	0.05	0.05

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Endothall §§ § Hydout § Hydrothal-47 § Aquathol § SHA 038901 § Accelerate § Tri-Endothal § Endothal Hydout § 3,6-Endooxohexahydrophthalic Acid § Phthalic Acid, Hexahydro-3,6-endo-Oxy- § 7-Oxabicyclo(2,2,1)Heptane-2,3-Dicarboxylic Acid § 1,2-Cyclohexanedicarboxylic Acid, 3,6-endo-Epoxy- § RCRA Waste Number P088	145-73-3 RN 7875000 EAR000	Toxic				100 MCL	100 MCL	1	2
Endrin §§ § NCI C00157 § Endrex § Mendrin § Nendrin § Hexadrin § SHA 041601 § Compound 269 § 1,2,3,4,10,10-Hexachloro-6,7-Epoxy-1,4,4(a)5,6,7,8,8a-Octahydro-endo § 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-Octahydro-2, 7:3,6-Dimethanonaphth[2,3-b]oxirene § 1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-Hexachloro-6,7-Epoxy-1,4,4a,5,6,7,8,8a-Octahydro-Endo,Endo- § RCRA Waste Number P051	72-20-8 IO 1575000 EAT500	Toxic with BCF >300	0.086 PP	0.036 PP	3,970	0.059 PP	2 MCL		0.006
Endrin Aldehyde §§	7421-93-4	Toxic with BCF >300			3,970	0.29 PP	0.29 PP		0.03

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Epichlorohydrin §§ § ECH § Epoxy Propane § - Epichlorohydrin § Chloromethyloxirane § RCRA Waste Number U041 § y-Chloropropyleneoxide § 2-Chloropropylene Oxide § Glycerol Epichlorhydrin § 2,3-Epoxypropyl Chloride § 1-Chlor-2,3-Epoxypropane§ 3-Chlor-1,2-Epoxypropane	106-89-8 TX 4900000 CGN750	Carcinogen				30 HA	30 HA	N/A	3
Escherichia coli (Bacteria)	N/A	Harmful				(13)	Less than 1 (6)	N/A	1 per 100ml
Ethion §§ Phosphorodithioic acid, S,S'-methylene O,O,O',O'-tetraethyl ester § Diethion § Embathion § Ethanox § Ethiol 100 § Ethodan § Ethopaz § ethyl methylene phosphorodithioate § FMC-1240 § Fosfatox E § Fosfono P § HSDB 399 § Hylemox § KWIT § NIA 1240 § Niagara 1240 § Nialate § Phosphotox E § RP 8167 § Rhodocide § Rodocid § Vegfru fomisate	563-12-2	Toxic				4 HA	4 HA		0.3
Ethofumesate §§ 2-Ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate § BRN 5759730 § CR 14658 § Caswell #427BB § HSDB 7451 § Nortron § Progress § Tramat	26225-79-6	Toxic				9,000 HA	9,000 HA		0.08
Ethylbenzene §§ § EB § NCI C56393 § Ethylbenzol § Phenylethane § Ethyl Benzene § Benzene, Ethyl	100-41-4 DA 0700000 EGP500	Toxic			37.5	530 PP	700 MCL	0.002	1

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Fenamiphos §§ § Nemacur	22224-92-6	Toxic				2 HA	2 HA		0.2
Fenbuconazole §§ 1H-1,2,4-Triazole-1-propanenitrile,alp-ha-(2-(4-chlorophenyl)ethyl)-alpha-phenyl- § 4-(4-chlorophenyl)-2-(1H-1,2,4-triazol-1-ylmethyl)butyronitrile	114369-43-6	Carcinogen				100 HA	100 HA	N/A	0.02
Fipronil §§ §HSDB 7051 §MB 46030 §RM1601 §Regent §UNII-QGH063955F	120068-37-3	Carcinogen				1 HA	1 HA	N/A	0.004
Flucarbazone §§ Flucarbazone § 1H-1,2,4-Triazole-1carboxamide, 4,5-dihydro-3-methoxy-4-methyl-5-oxo-N((2-(trifluoromethoxy) phenyl)sulfonyl-	145026-88-6	Toxic				3,000 HA	3,000 HA		300
Flucarbazone sulfonamide §§ §	37526-59-3	Toxic				3,000 HA	3,000 HA		300
Fluometuron §§ § Flo-Met	2164-17-2	Carcinogen				90 HA	90 HA	N/A	0.5
Fluoranthene §§ § Idryl § Benzo(jk)Fluorene § Benzo(j,k)Fluorene § 1,2-Benzacenaphthene § 1,2-(1,8-Naphthylene)Benzene § Benzene, 1,2-(1,8-Naphthalenediyl)- § RCRA Waste Number U120	206-44-0 LL 4025000 FDF000	Toxic BCF >300			1,150	130 PP	130 PP		10
Fluorene (PAH) §§ § 9H-Fluorene § Diphenylenemethane § o-Biphenylenemethane § 2,2'-Methylenebiphenyl	86-73-7	Toxic			30	1,100 PP	1,100 PP	0.25	5

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Fluoride §§ Flourine § Fluoride § Fluoride(1-) § Perfluoride § Fluoride Ion § Fluorine, Ion § Soluable§ Fluoride § Hydrofluoric Acid, on(1-) § RCRA Waste Number P056	16984-48-8 ~~NIOSH:~~ LM 6290000 FEX875	Toxic				4,000 MCL	4,000 MCL	5	200
Fluroxypyr	69377-81-7	Toxic				7,000 HA	7,000 HA		0.1
Fonofos §§ § Dyfonate	944-22-9	Toxic				10 HA	10 HA		1
Gamma Emitters (11) §§	Multiple	Carcinogen / Radioactive				0.4 mrem /yr MCL	0.4 mrem /yr MCL	N/A	
gamma-Chlordane §§ § Chlordane, beta-Isomer	5566-34-7	Carcinogen			14,100	0.008 HA	1 HA	N/A	0.006
gamma-hexachlorocyclohexane §§ Lindane § BHC § -BHC § Gamene § Lintox § Lentox § Hexcide § Aparsin § Agrocide § Afcide § BHC-gamma § gamma-BHC § HCH-gamma § gamma-HCH § Hexachlorocyclohexane § gamma-Hexachlorobenzene § gamma-Benzenehexachloride § gamma-Benzene Hexachloride § Hexachlorocyclohexane-gamma § Hexachlorocyclohexane (gamma)	58-89-9 GV 4900000 BBQ500	Toxic	0.95 PP		130	0.2 MCL	0.2 MCL		0.02
Gases, dissolved, total-pressure (20) §§	Multiple	Toxic	110% of saturation						

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Glyphosate §§ § Jury § Honcho § Rattler § Weedoff § Roundup § Glifonox § n-(Phosphonomethyl)-Glycine § Glycine, n-(Phosphonomrthyl)- § Glyphosate plus inert ingrediants § MON 0573	1071-83-6 MC 1075000 PHA500	Toxic				700 MCL	700 MCL	6	6
Glyphosate Isopropylamine Salt §§ § SHA 103601	38641-94-0	Toxic				700 HA	700 HA	6	70
Guthion §§ § DBD § NCI C00066 § Carfene § Gothnion § Azinphos § Crysthyon § Gusathion § Bay 17147 § Methylazinphos § Methyl Guthion § Methyl-Guthion § Azinphos-Methyl § Azinphos Methyl § Caswell Number 374 § o,o-Dimethylphosphorodithioate S-Ester § Benzotriazinedithiophosphoric Acid Dimethoxy Ester § Phosphorodithioic Acid, O,O-Dimethyl Ester, S-Ester with 3-(Mercaptomethyl)-1,2,3-Benzotriazin-4(3H)-One § EPA Pesticide Chemical Code 058001	86-50-0 TE 1925000 ASH500	Toxic		0.01 NPP					0.1
Haloacetic acids (38) § Dichloroacetic acid (79-43-6) § Trichloroacetic acid (76-03-9) § Chloroacetic acid (79-11-8) § Bromoacetic acid(79-08-3) §Dibromoacetic acid (631-64-1)	various	Carcinogen				60 MCL	60 MCL	N/A	1

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Heptachlor §§ § NCI C00180 § Drinox § Heptamul § Agroceris § Heptagran § SHA 04481 § Rhodiachlor § Velsicol-104 § 3,4,5,6,7,8,8a-heptachlorodicyclopentadiene § Dicyclopentadiene, 3,4,5,6,7,8,8a-Heptachloro- § 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-Tetrahydro-4,7-Methanol-1H-Indene § 4,7-Methano-1H-Indene, 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-Tetrahydro- § 1(3a),4,5,6,7,8,8-Heptachloro-3a(1),4,7,7a-Tetrahydro-4,7-Methanoindene § RCRA Waste Number P059	76-44-8 PC 0700000 HAR000	Carcinogen	0.26 PP	0.0038 PP	11,200	$7.9x10^{-4}$ PP	0.08 HA	N/A	0.02
Heptachlor Epoxide §§ § HCE § Velsicol 53-CS-17 § Epoxyheptachlor § 1,4,5,6,7,8,8-Heptachloro-2,3-Epoxy-2,3,3a,4,7,7a-Hexahydro-4,7-Methanoindene § 2,5-Methano-2H-Indeno[1,2b]Oxirene, 2,3,4,5,6,7,7-Heptachloro-1a,1b,5,5a,6,6a-Hexahydro- (alpha, beta, and gamma isomers)	1024-57-3 PB 9450000 EBW500	Carcinogen	0.26 PP	0.0038 PP	11,200	$3.9x10^{-4}$ PP	0.04 HA	N/A	0.01
Hexachlorobenzene §§ § HCB § Amatin § Smut-Go § Sanocide § Anticarie § Bunt-Cure § Bunt-No-More § Perchlorobenzene § Phenyl Perchloryl § No Bunt Liquid § Julin's Carbon Chloride § Co-op Hexa § Hexa C.B. § Benzene, Hexachloro-	118-74-1 DA 2975000 HCC500	Carcinogen			8,690	0.0028 PP	0.2 HA	N/A	0.03

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Hexachlorobutadiene §§ § 1,3-Hexachlorobutadiene § 1,3-Butadiene, Hexachloro- § 1,1,2,3,4,4-Hexachloro-1,3-Butadiene § 1,3-Butadiene, 1,1,2,3,4,4-Hexachloro- § HCBD § Dolan-Pur § Perchlorobutadiene § RCRA Waste Number U128	87-68-3 EJ 0700000 PCF000	Carcinogen			2.78	4.4 PP	5 HA	N/A	0.5
Hexachlorocyclohexane §§	608-73-1	Carcinogen				0.123 NPP	0.123 NPP	N/A	0.01
Hexachlorocyclopentadiene §§ § HEX § HCP § PCL § C-56 § HCCPD § NCI C55607 § Hexachloropentadiene § Perchlorocyclopentadiene § 1,3-Cyclopentadiene, 1,2,3,4,5,5-Hexachloro- § RCRA Waste Number U130	77-47-4 GY 1225000 HCE500	Toxic			4.34	40 PP	50 MCL	1	5
Hexachloroethane §§ § Avlotane § Distokal § Distopan § Distopin § Egitol § Falkitol § Fasciolin § NCI C04604 § Phenohep § Mottenhexe § Perchloroethane § Hexachloroethylene § Ethane, Hexachloro- § Carbon Hexachloride § Ethane Hexachloride § Ethylene Hexachloride § 1,1,1,2,2,2-Hexachloroethane § RCRA Waste Number U131	67-72-1 KI 4025000 HCI000	Carcinogen			86.9	14 PP	30 HA	N/A	1
Hexazinone §§	51235-04-2	Toxic				400 HA	400 HA	1	0.02

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Hydrogen Sulfide §§ § Stink Damp § Sulfur Hydride § Hydrogen Sulphide § Dihydrogen Sulfide § Dihydrogen Monosulfide § Hydrogen Sulfuric Acid § Hydrosulfuric Acid § Sulfurated Hydrogen § RCRA Waste Number U135	7783-06-4 MX 1225000 HIC500	Toxic		2 NPP					20
Hydroxyatrazine §§ § Hydroxydechloroatrazine	2163-68-0	Toxic				70 HA	70 HA		7
Imazalil (Parent name Enilconazole) §§ 1-(2-(2,4-dichlorophenyl)-2-(2-propenyloxy)ethyl)-1H-imidazole § Enilconazole § BRN 054683 § Caswell #497AB § Chloramizol § Deccozil § Secozil S 75 § Fungaflor § HSDB 6672 § R 23979 § EPA Pesticide Code 111901	35554-44-0	Carcinogen				6 HA	6 HA	N/A	0.6
Imazamethabenz-methyl ester (includes the metabolite imazamethabenz methyl acid) (33) §§ Assert §	81405-85-8	Toxic				400 HA	400 HA		40
Imazamox §§ § Ammonium salt of imazamox	114311-32-9	Toxic				$2x10^4$ HA	$2x10^4$ HA		0.04
Imazapic §§ Imazapic § AC263222, Cadre, Imazameth, Imazamethapyr, Imazmethapyr	104098-48-8	Toxic				4,000 HA	4,000 HA		0.01
Imazapyr §§ Arsenal §	81334-34-1	Toxic				$2.1x10^4$ HA	$2.1x10^4$ HA		0.01

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Imazethapyr §§ 3-pyridinecarboxilic acid, 2-(4,5-dihydro-4-methyl-4-(1-methylethyl)-5oxo-1H-imidazol-2-yl)-5-ethyl- § AC 263,499 § CL263499 § HSDB 6678 § Pivot § Pursuit § EPA Pesticide Code# 128922	81335-77-5	Toxic				$2x10^4$ HA	$2x10^4$ HA		0.03
Imidacloprid §§	105827-78-9 138261-41-3	Toxic				400 HA	400 HA		0.07
Indeno(l,2,3-cd)pyrene (PAH) §§ § o-Phenylenepyrene § 2,3-Phenylenepyrene § 2,3-o-Phenylenepyrene § Indeno (l,2,3-cd) Pyrene § 1,10-(o-Phenylene)Pyrene § 1,10-(1,2-Phenylene)Pyrene § RCRA Waste Number U137	193-39-5 NK 9300000 IBZ000	Carcinogen			30	0.038 PP	0.5 (29) HA	N/A	0.08
Iron §§ Fe § Ancor EN 80/150+A622 § Armco Iron	7439-89-6 NO 4565500 IGK800	Harmful (aquatic life)		1,000 NPP				N/A	20
Isophorone §§ § Isoforon § NCI C55618 § Isoacetophorone § alpha-Isophorone § 1,1,3-Trimethyl-3-Cyclohexene-5-One § 3,5,5-Trimethyl-2-Cyclohexene-1-One § 3,5,5-Trimethyl-2-Cyclohexone	78-59-1 GW 7700000 IHO000	Carcinogen			4.38	350 PP	400 HA	N/A	10
Lead §§ Pb § C.I. 77575 § C.I. Pigment Metal 4 § Glover § Lead Flake § Lead 22 § Omaha § Omaha & Grant § SI § SO	7439-92-1 OF 7525000 LCF000	Toxic	13.98 @ 25 mg/L hardness (12) PP	0.545 @ 25 mg/L hardness (12) PP	49	15 MCL	15 MCL	0.1	0.3

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
m-Xylene §§ § m-Xylol § 1,3-Xylene § meta-Xylene § m-Dimethylbenzene § m-Methyltolulene § 1.3-Dimethylbenzene § 1,3 Dimethyl Benzene	108-38-3 ZE 2275000 XHA000	Toxic			1.17	$1x10^4$ MCL	$1x10^4$ MCL	0.5	2
Malathion §§ § Formal § Sumitox § Emmatos § Celthion § Forthion § Malacide § Kop-Thion § Calmathion § Carbethoxy § NCI C00215 § Carbethoxy Malathion § SHA 057701 § Phosphothion § S-1,2-Bis(Ethoxycarbonyl)Ethyl-O,O-Dimethyl Thiophosphate § O, O-Dimethyl-S-(1,2-Dicarbethoxyethyl) Dithiophosphate § O,O-Dimethyl S-1,2-Di(Ethoxycarbamyl)Ethyl Phosphorodithioate § Succinic Acid, mercapto-, diethyl ester, S-Ester with O,O-Dimethyl Phosphorodithioate	121-75-5 WM 8400000 CBP000	Toxic		0.1 NPP		100 HA	100 HA		0.09
MCPA §§ 4-chloro-2 methylphenoxy acetic acid	94-74-6	Toxic				~~4~~ HA	~~4~~ HA		0.008

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
MCPP §§ 2-(4-chloro-2-methylphenoxy)propionic acid § Mecoprop § 2M 4KhP § 2M-4CP § Anicon B § Anicon P § CMPP § Caswell #559 § Celatox CMPP § iso-Cornox § Isocarnox § Kilprop § Liranox § Mechlorprop § Mecomec § Mecopar § Mecopeop § Mecoper § Mecopex § Mecoprop § Mecoturf § Mecprop § Mepro § Methoxone § Morogal § Okultin § Proponex-pluse § RD 4593 § Rankotex § Runcatex § SYS 67 Mecmin § U 46 KV fluid § Vi-Par § Vi-Pex § EPA pesticide Code #031501	7085-19-0 93-65-2	Toxic				300 HA	300 HA		0.007
Mercury §§ Hg § Colloidal Mercury § Mercury, Metallic § NCI C60399 § Quick Silver § RCRA Waste Number U151	7439-97-6 OV 4550000 MCW250	Toxic with BCF >300	1.7 PP	0.91 PP	5,500	0.05 PP	2 MCL		0.005
Metalaxyl § Ridomil §	57837-19-1	Toxic				600 HA	600 HA	3.5	0.04
Methamidophos §§ Monitor §	10265-92-6	Toxic				2 HA	2 HA		0.2
Methomyl §§ Lannate §	16752-77-5	Toxic				200 HA	200 HA	1	1

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Methoxychlor §§ § DMDT § Metox § Moxie § Methoxcide § NCI C00497 § Methoxy-DDT § Dimethoxy-DDT § 1,1,1-Trichloro-2,2-Bis(p-Methoxyphenyl)Ethane § Benzene, 1,1'-(2,2,2-Trichloroethylidene)Bis[4-Methoxy- § 1,1'-(2,2,2-Trichloroethylidene)Bis[4-Methoxybenzene] § Ethane, 1,1,1-Trichloro-2,2-Bis(p-Methoxyphenyl)- § RCRA Waste Number U247	72-43-5 KJ 3675000 DOB400	Toxic		0.03 NPP		40 MCL	40 MCL		0.02
Metsulfuron Methyl §§ Ally §	74223-64-6	Toxic				2,000 HA	2,000 HA	0.1	0.08
Methyl Bromide §§Bromomethane (HM) § EDCO § Celfume § Dowfume § Methogas § SHA 053201 § Brom-O-Sol § Brom-O-Gas § Terr-O-Gas § Halon 1001 § Terr-O-Cide § Bromo-O-Gas § Bromo Methane § Methylbromide § Methane, Bromo- § Monobromomethane § RCRA Waste Number U029	74-83-9 PA 4900000 BNM500	Toxic			3.75	47 PP	10 HA	0.11	1
Methyl Chloride §§ Chloromethane § Arctic § Monochloromethane § RCRA Waste Number U045	74-87-3 PA 6300000 CHX500	Toxic			3.75	30 HA	30 HA	0.08	1
Methylene chloride §§ Dichloromethane (HM) § R 30 § DCM § Freon 30 § Aerothene MM § NCI C50102 § Solmethine § Methane Dichloride § Methane, Dichloro- § 1,1-Dichloromethane § Methylene Bichloride § Methylene Dichloride	75-09-2 PA 8050000 MDR000	Carcinogen			0.9	5 MCL	5 MCL	N/A	2

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Metolachlor (includes the metabolites metolachlor ESA and metolachlor OA (34) §§ Dual §	51218-45-2	Carcinogen				700 HA	700 HA	N/A	0.2
Metribuzin §§ Sencor §	21087-64-9	Toxic				200 HA	200 HA	10	0.1
Mirex §§ § NCI C06428 § Dechlorane § Bichlorendo § Ferriamicide § Perchloropentacyclodecane § Dodecachloropentacyclodecane § Hexachlorocyclopentadiene Dimer § Cyclopentadiene, Hexachloro-, Dimer § Perchloropentacyclo(5.2.1.0[sup 2,6].0[sup 3,9].0[sup 5,8])Decane § Dodecachlorooctahydro-1,3,4-Metheno-2H-Cyclobuta (c,d)Pentalene § 1,3,4-Metheno-1H-Cyclobuta[cd]Pentalene, 1,1a,2,2,3,3a,4,5,5,5a,5b,6,-Dodecachlorooctahydro-	2385-85-5 PC 8225000 MQW500	Carcinogen		0.001 NPP		1 NPP	1 NPP	N/A	0.01
MTBE §§ Methyl Tertiary-Butyl Ether	1634-04-4	Harmful				30 (21)	30 (21)	N/A	1
Myclobutanil §§ § EPA PCC 128857 § Nova § Rally § Systhane § Systhane 12E § Systhane 6 Flo	88671-89-0	Toxic				200 HA	200 HA		0.03

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
N-Nitrosodimethylamine §§ Dimethylnitrosamine A707 § DMN § NDMA § DMNA § Nitrosodimethylamine § Dimethylnitrosoamine § N-Nitrosodimethylamine § N,N-Dimethylnitrosamine § Methylamine, N-Nitrosodi- § Dimethylamine, N-Nitroso- § N-Methyl-N-Nitrosomethanamine § Methamine, N-Methyl-N-Nitroso- § Methanamine, N-Methyl-N-Nitroso- § RCRA Waste Number P082	62-75-9 IQ 0525000 DSY400	Carcinogen			0.026	0.0069 PP	0.0069 PP	N/A	5
N-Nitrosodiphenylamine §§ § NDPA § NDPhA § Vultrol § Curetard A § NCI C02880 § Redax § TJP § Retarder J § Vulcalent A § Vulcatard § Vultrol § Nitrosodiphenylamine § Diphenylnitrosamine § N,N-Diphenylnitrosamine § N-Nitroso-N-Phenylaniline § Diphenylamine, N-Nitroso- § Benzenamine, N-Nitroso-N-Phenyl-	86-30-6 JJ 9800000 DWI000	Carcinogen			136	33 PP	33 PP	N/A	10
n-Dioctyl Phthalate §§ § DNOP § PX-138 § Vinicizer 85 § Dinopol NOP § n-Octyl Phthalate § Octyl Phthalate § Dioctyl Phthalate § Di-n-Octyl Phthalate § Di-sec-Octyl Phthalate § 1,2-Benzenedicarboxylic Acid, Dioctyl Ester § RCRA Waste Number U107	117-84-0 TI 1925000 DVL600	Carcinogen						N/A	10

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
N-Nitrosodi-N-Propylamine §§ § DPN § DPNA § NDPA § Dipropylnitrosamine § N-Nitrosodipropylamine § Di-n-Propylnitrosamine § Dipropylamine, N-Nitroso- § N-Nitrosodi-n-propylamine § N-Nitroso-di-n-propylamine § 1-Propanamine, N-Nitroso-n-Propyl- § RCRA Waste Number U111	621-64-7 JL 9700000 DWU600	Carcinogen			1.13	0.05 PP	0.05 PP	N/A	5
N-Nitrosopyrrolidine §§ § NPYR § NO-pyr § N-N-pyr § 1-Nitrosopyrrolidene § Pyrrolidine, 1-Nitroso- § Tetrahydro-N-Nitrosopyrrole § Pyrrole, Tetrahydro-N-Nitroso- § RCRA Waste Number U180	930-55-2 UY 1575000 NLP500	Carcinogen			0.055	0.16 NPP	0.16 NPP	N/A	0.02
Naphthalene §§ Moth Balls § Mighty 150 § NCI C52904 § Naphthene § White Tar§ Naphthalin § Tar Camphor § Caswell Number 587 § EPA Pesticide Chemical Code 055801 § RCRA Waste Number U165	91-20-3 QJ 0525000 NAJ500	Carcinogen			10.5	100 HA	100 HA	N/A	10
Nickel §§ Ni § C.I. 77775 § Ni 270 § Nickel 270 § Ni 0901-S § Ni 4303T § NP 2 § Raney Alloy § Raney Nickel	7440-02-0 QR 5950000 NCW500	Toxic	145@ 25mg/L hardness (12) PP	16.1 @ 25 mg/L hardness (12) PP	47	100 HA	100 HA	0.5	2
Nicosulfuron §§ Accent §	111991-09-4	Toxic				9,000 HA	9,000 HA	0.01	0.03

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Nitrate (as Nitrogen[N]) §§ NO3	14797-55-8	Toxic	(8)	(8)		$1x10^4$ NPP	$1x10^4$ NPP	surface water 5000, ground water, see ARM 17.30. 715	20
Nitrate plus nitrite (as Nitrogen[N]) §§ NO3 + NO2	See nitrate and nitrite	Toxic	(8)	(8)		$1x10^4$ MCL	$1x10^4$ MCL	surface water 5000, ground water, see ARM 17.30. 715	20
Nitrite (as Nitrogen[N]) §§ NO2	14797-65-0	Toxic	(8)	(8)		1,000 MCL	1,000 MCL	4	10
Nitrobenzene §§ § NCI C60082 § Mirbane Oil § Nitrobenzol § Oil of Mirbane § Benzene, Nitro- § Essence of Myrbane § RCRA Waste Number U169	98-95-3 DA 6475000 NEX000	Carcinogen			2.89	17 PP	17 PP	N/A	10
Nitrogen, total inorganic (as Nitrogen[N]) §§ the sum of ammonia, nitrite, and nitrate	See ammonia, nitrate and nitrite	Nutrient	(8)	(8)				10	10
Nitrophenol, 4- §§p-Nitropheno (DOT)l § 4-Hydroxynitrobenzene § NCI C55992) § RCRA Waste Number U170	100-02-7 SM 2275000 NIF000	Toxic			3.31	60 HA	60 HA	2.4	60
o-Nitrophenol §§ § 2-Nitrophenol oxynitrobenzene	88-75-5 SM 2100000 NIE500	Toxic			2.33			0.45	10
Nitrosamines §§ -Nitrosamide § -NSC223080	35576-91-1	Carcinogen				0.008 NPP	0.008 NPP	N/A	$8x10^{-4}$

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Nitrosodibutylamine, N §§ Dibutylnitrosamine § -1-Butanamine § BRN 1760378 § CCRIS 217 § EINECS 213-101-1 § HSDB 5107 § N-butyl-N-nitroso-1-butamine § NDBA § NSC 6830 § RCRA waste number U172	924-16-3	Carcinogen				0.063 NPP	0.063 NPP	N/A	3
Nitrosodiethylamine, N §§ Diethylnitrosamine § -BRN 1744991 § CCRIS 239 § DEN § EINECS 200-226-1 § Ethanamine, N-ethyl-N-nitroso § HSDB 4001 § NDEA § NSC 132 § RCRA waste number U174	55-18-5	Carcinogen				0.008 NPP	0.008 NPP	N/A	$8x10^{-4}$
Nonylphenol §§ § 2,6-Dimethyl-4-heptylphenol § Hydroxyl No. 253	25154-52-3	Toxic	28 NPP	6.6 NPP					0.7
o-Xylene §§ § o-Xylol § 1,2-Xylene § ortho-Xylene § o-Methyltoluene § o-Dimethylbenzene § 1,2-Dimethylbenzene § 1,2-Dimethyl Benzene	95-47-6 ZE 2450000 XHJ000	Toxic			1.17	$1x10^{4}$ MCL	$1x10^{4}$ MCL	0.5	1

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Oxamyl §§ § D-1410 § DPX 1410 § Insecticide-Nematicide 1410 § Vydate § Thioxamyl § Methyl 2-(Dimethylamino)-N- § Vydate L, Insecticide/Nematicide § ({[Methylamino]Carbonyl} Oxy)-2-Oxoethanimidothioate § 2-Dimethylamino-1-(Methylthio)Glyoxal O-Methylcarbamoylmonozime § Methyl N',N'-Dimethyl-N-({Methylcarbamoyl}Oxy)-1-Thiooxamimidate § N',N'-Dimethyl-N-[(Methylcarbamoyl)oxy]-1-Methylthiooxamimidic Acid	23135-22-0 RP 2300000 DSP600	Toxic				200 MCL	200 MCL	1	1
Oxydemeton Methyl §§ Metasystox R §	301-12-2	Toxic				0.7 HA	0.7 HA	1.4	0.07
Oxygen, dissolved (20) §§ O2 § Oxygen, Compressed § Oxygen, Refrigerated Liquid	7782-44-7 RS 2060000 OQW000	Toxic	(15)	(15)					0.3 mg/L

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
p,p'-Dichlorodiphenyldichloroethylene §§ DDE § DDE § p,p'-DDE § 4,4'-DDE § NCI C00555 § Dichlorodiphenyldichloroethylene § Dichlorodiphenyldichloroethylene, p,p'- § 2,2'-bis(4-Chlorophenyl)-1,1-Dichloroethylene § 1,1'-(Dichloroethenylidene)bis(4-Chlorobenzene) § 2,2'-bis(p-Chlorophenyl)-1,1-Dichloroethylene § Benzene, 1,1'-(DichloroethenylideneBis[4-Chloro-	72-55-9 KV 9450000 BIM750	Carcinogen			53,600	0.0022 PP	0.0022 PP	N/A	0.02
p,p'-Dichlorodiphenyldichloroethane §§ DDD § TDE § Dilene § NCI C00475 § Rothane § Rhothane § 4,4'-DDD § p,p'-DDD § p,p'-TDE § 4',4'-D-DDD § RCRA Waste Number U060 § Tetrachlorodiphenylethane § Dichlorodiphenyldichloroethane § Dichlorodiphenyl Dichloroethane § 2,2-bis(4-Chlorophenyl)-1,1-Dichloroethane § 1,1-Dichloro-2,2-bis(p-Chlorophenyl) Ethane § 1,1-bis(4-Chlorophenyl)-2,2-Dichloroethane § 2,2-bis(p-Chlorophenyl)-1,1-Dichloroethane § Benzene, 1,1'(2,2-Dichloroethylidene)Bis[4-Chloro-	72-54-8 KI 0700000 BIM500	Carcinogen			53,600	0.0031 PP	0.0031 PP	N/A	0.02

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
p,p'-Dichlorodiphenyltrichloroethane §§ DDT § DDT § 4,4'-DDT § Agritan § Anoflex § Arkotine § Azotox § Bosan Supra § Bovidermol § Chlorophenothan § Chlorophenothane § Chlorophenotoxum § Citox § Clofenotane § Dedelo § § Chlorophenothane § Diphenyltrichloroethane § Dichlorodiphenyltrichloroethane § 4,4'-Dichlorodiphenyltrichloroethane § 1,1,1-Trichloro-2,2,-bis(p-Chlorophenyl) Ethane § 1,1,1-Trichloro-2,2,-bis(p-Chlorophenyl)Ethane	50-29-3 KJ 3325000 DAD200	Carcinogen	0.5 PP	0.001 PP	53,600	0.0022 PP	0.0022 PP	N/A	0.02
p-Bromodiphenyl Ether §§ Benzene, 1-Bromo-4-Phenoxy- § p-Bromodiphenyl Ether § 4-Bromophenoxybenzene § 4-Bromodiphenyl Ether § 1-Bromo-4-Phenoxybenzene § p-Bromophenylphenyl Ether § 4-Bromophenyl Phenyl Ether	101-55-3	Toxic with BCF >300			1,640				10
p-Chloro-m-Cresol §§3-methyl-4-chlorophenol § PCMC § Parol § Aptal § Baktol § Baktolan § Ottafact § Raschit § Rasen-Anicon § Parmetol § Candasetpic § Chlorocresol § Preventol CMK § Parachlorometra Cresol § 4-Chloro-3-methylphenol § 2-Chloro-Hydroxytoluene § Phenol, 4-Chloro-3-methyl- § Chlorophenol, 4-, methyl, 3- § RCRA Waste Number U039	59-50-7 GO 7100000 CFE250	Harmful				3,000 OL	3,000 OL	N/A	10

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
p-Xylene §§ § p-Xylol § Chromar § Scintillar § 1,4-Xylene § para-Xylene § p-Methyltoluene § p-Dimethylbenzene § 1,4-Dimethylbenzene § 1,4-Dimethyl Benzene	106-42-3 ZE 2625000 XHS000	Toxic			1.17	$1x10^4$ MCL	$1x10^4$ MCL	0.5	2
Paraquat Dichloride §§	1910-42-5	Toxic				30 HA	30 HA	0.8	3
Parathion §§ § DNTP § Niran § Phoskil § Paradust § Stathion § Strathion § Pestox Plus § Nitrostigmine § Parathion Ethyl § Parathion-ethyl § Ethyl Parathion § Diethylparathion § Diethyl para-Nitrophenol Thiophosphate § Diethyl-p-Nitrophenyl Monothiophosphate § O,O-Diethyl O-4-Nitrophenyl Thiophosphate § Phosphorothioic Acid, O,O-Diethyl O-(4-Nitrophenyl) Ester § Caswell Number 637 § EPA Pesticide Chemical Code 057501 § RCRA Waste Number P089	56-38-2 TF 4920000,dry-liquid PAC250,dry	Carcinogen	0.065 NPP	0.013 NPP				N/A	0.2
Pentachlorobenzene §§ Benzene, Pentachloro- § QCB- § RCRA Waste Number U183	608-93-5 DA 6640000 PAV500	Toxic with BCF >300			2,125	1.4 NPP	1.4 NPP		5

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Pentachlorophenol §§ Penta § PCP § Durotox § Weedone § Chem-Tol § Lauxtol A § NCI C54933 § NCI C55378 § NCI C56655 § Permite § Dowcide 7 § Permacide § Penta-Kil§ Permagard § Penchlorol § Chlorophen § Pentachlorphenol § Pentaclorofenolo § Thompson's Wood Fix § Phenol, Pentachloro- § 2,3,4,5,6-Pentachlorophenol § 1-Hydroxy- 2,3,4,5,6-Pentachlorobenzene	87-86-5 SM 6300000 PAX250	Carcinogen	5.3 @ pH of 6.5 (14) PP	4 @ pH of 6.5 (14) PP	11	1 MCL	1 MCL	N/A	0.1
pH §§	N/A	Harmful	(13)	(13)		(18)	(18)	N/A	
Phenanthrene (PAH) §§ § Phenantrin	85-01-8 SF 7175000 PCW250	Toxic			30			0.01	0.2
Phenol §§ § Baker's P and S Liquid and Ointment § NCI C50124 § Benzenol § Monophenol § Oxybenzene § Phenic Acid § Carbolic Acid § Phenylic Acid § Hydroxybenzene § Hydroxybenzene § Phenyl Alcohol § Phenyl Hydrate § Phenylic Alcohol § Phenyl Hydroxide § Benzene, Hydroxy- § Monohydroxybenzene § RCRA Waste Number U188	108-95-2 SJ 3325000 PDN750	Toxic			1.4	300 OL	300 OL	100	10
Phosphorus, inorganic (20) §§ § Ortho-phosphorus § phosphorus, Ortho- § reactive phosphorus	14265-44-2 7723-14-0	Nutrient	(8)	(8)				1	1

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Picloram §§ Tordon § ATCP § K-Pin § Borolin § Amdon Grazon § NCI C00237 § Tordon 10K § Tordon 22K § Tordon 101 Mixture § 3,5,6-Trichloro-4-Aminopicolinic Acid § 4-Amino-3,5,6-Trichloropicolinic Acid	1918-02-1 TJ 7525000 AMU250	Toxic				500 MCL	500 MCL	0.14	1
Pinoxaden (NOA 407855) (includes metabolites Pinoxaden NOA 407854 and pinoxaden NOA 447204) (35) §§	N/A	Toxic				2,000 HA	2,000 HA		200
Polychlorinated Biphenyls, (sum of all homolog, all isomer, all congener or all Aroclor analyses) §§ PCB's § Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1268, 2565, 4465 § Chlophen § Chlorextol § Chlorinated Biphenyl § Chlorinated Diphenyl § Chlorinated Diphenylene § Chloro Biphenyl § Chloro-1,1-Biphenyl § Clophen § Dykanol § Fenclor § Inerteen § Kanechlor 300, 400, 500 § Montar § Noflamol § PCB (DOT) § Phenochlor § Polychlorobiphenyl § Pyralene § Pyranol § Santotherm § Sovol § Therminol FR-1	Multiple	Carcinogen		0.014 PP	31,200	$6.4x10^{-4}$ PP	0.5 MCL	N/A	0.08
Primisulfuron Methyl §§ Beacon § Exceed	86209-51-0	Toxic				2,000 HA	2,000 HA	0.1	200
Prometon §§ Pramitol §	1610-18-0	Toxic				100 HA	100 HA	0.3	0.002

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Pronamide §§ Kerb §	23950-58-5	Carcinogen				50 HA	50 HA	N/A	5
Propachlor §§ Ramrod §	1918-16-7	Toxic				90 HA	90 HA	0.5	0.2
Propane, 1,2-Dibromo-3-Chloro- §§ Dibromochloropropane § 1,2-Dibromo-3-Chloropopane § Fumagon § Fumazone § NCI C00500 § Nemabrom § Nemafume § Nemagon § Nemagone § Nemagone Soil Fumigant § Nemanax § Nemapaz § Nemaset § Nematocide § Nematox § OS 1897 § OXY DBCP § SD 1897 § Caswell Number 287 § 1-Chloro-2,3-Dibromopropane § DBCP § EPA Pesticide Chemical Code 011301 § RCRA Waste Number U066	96-12-8 TX 8750000 DDL800	Toxic				0.2 MCL	0.2 MCL		0.02
Propazine §§	139-40-2	Carcinogen				10 HA	10 HA	N/A	0.03
Propham §§	122-42-9	Toxic				100 HA	100 HA	0.13	0.5
Propioconazole §§ 1-((2-(2,4-dichlorophenyl)-4propyl-1,3-dioxolan-2-yl)methyl)-1H-1,2,4-triazole § Banner § CGA-64250 § Caswell#323EE § Desmel § HSDB 6731 § Orbit § Radar § Tilt § EPA Pesticide # 122101	60207-90-1	Carcinogen				700 HA	700 HA	N/A	70
Propoxur §§ Baygon §	114-26-1	Carcinogen				3 HA	3 HA	N/A	0.4
Prosulfuron §§ Benezenesulfonamide, N(((4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino)carbonyl)-2-(3,3,3-trifluoropropyl)-	94125-34-5	Toxic				100 HA	100 HA		0.02

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Pyrasulfotole §§ pyrasulfotole §	365400-11-9	Toxic				70 HA	70 HA		0.07
Pyrene (PAH) §§ § ß-Pyrine § beta-Pyrene § Benzo(def)Phenanthrene § Benzo[def]Phenanthrene	129-00-0 UR 2450000 PON250	Toxic			30	830 PP	830 PP	0.25	10
Pyroxsulam	422556-08-9	Toxic				7,000 HA	7,000 HA		0.09
Radium 226 §§	13982-63-6	Carcinogen / Radioactive				5 picoC/ liter Note: The sum of Radium 226 and 228. MCL	5 picoC/ liter Note: The sum of Radium 226 and 228. MCL	N/A	
Radium 228 §§	15262-20-1	Carcinogen / Radioactive				5 picoC/ liter Note: The sum of Radium 226 and 228. MCL	5 picoC/ liter Note: The sum of Radium 226 and 228. MCL	N/A	
Radon 222 §§	14859-67-7	Carcinogen / Radioactive				300 picoC/ liter MCL	300 picoC/ liter MCL	N/A	

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Selenium §§ Se § C.I. 77805 § Colloidal Selenium § Elemental Selenium § Selenium Alloy § Selenium Base § Selenium Dust § Selenium Elemental § Selinium Homopolymer§ Selenium Metal Powder, Non-Pyrophoric § Vandex	7782-49-2 VS 7700000 and VS 8310000, colloidal SBO500 and SBP000, colloidal	Toxic	20 PP	5 PP	4.8	50 MCL	50 MCL	0.6	1
Silver §§ Ag § Argentum § C.I. 77820 § Shell Silver § Silver Atom	7440-22-4 NIOSH: VW 3500000 SAX: SDI500	Toxic	0.374 @ 25 mg/L hardness (12) PP		0.5	100 HA	100 HA	0.2	0.2
Simazine §§ § CDT § Herbex § Framed § Bitemol § Radokor § A 2079 § Batazina § Cat (Herbicide) § CET § G 27692 § Geigy 27,692 § Gesaran § Gesatop 50 § Simazine 80W § Symazine § Taphazine § W 6658 § Zeapur § Princep § Aquazine § Herbazin § Tafazine § 2,4-bis(Ethylamino)-6-Chloro-s-Triazine § 1-Chloro, 3,5-Bisethylamino-2,4,6-Triazine § 2-Chloro-4,6-Bis(Ethylamino)-1,3,5-Triazine § 6-Chloro-N,N'-Diethyl-1,3,5-Triazine-2,4-Diyldiamine	122-34-9 XY 5250000 BJP000	Carcinogen				4 MCL	4 MCL	N/A	0.5
Strontium §§	7447-24-6	Toxic				4,000 HA	4,000 HA	100	20

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			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Styrene §§ § Styrol § Cinnamol § Cinnamene § Cinnamenol § NCI C02200 § Styrole § Strolene § Styron § Stropor § Vinylbenzol § Phenethylene § Phenylethene § Vinylbenzene § Ethenylbenzene § Phenylethylene § Benzene, Vinyl- § Stryene, Monomer	100-42-5 WL 3675000 SMQ000	Carcinogen				100 HA	100 HA	N/A	0.9
Sulfometuron Methyl §§ Oust §	74222-97-2	Toxic				2,000 HA	2,000 HA	0.01	0.02
Sulfosulfuron §§ imidazo(1,2-a)pyridine-3-sulfonamide,N-(((4,6-dimethoxy-2-pyrimidinyl)amino)cabonyl)-2-(ethylsulfonyl)- § Sulfosulfuron (ISO)	141776-32-1	Toxic				300 HA	300 HA		30
Tebuconazole §§ 1H-1,2,4-Triazole-1-ethanol,alpha-(2-(4-chlorophenyl)ethyl)-apha-(1,1-dimethylethyl)- § BAY-HWG 1608 § Elite § Ethyltrianol § Etiltrianol § Fenetrazole § Folicur § LYNX § Preventol A 8 § Raxil § Terbucanazole § Terbutrazole § HWG 1608 § HSDB 7448	107534-96-3	Carcinogen				200 HA	200 HA	N/A	0.04
Tebuthiuron §§ TebuconazoleSpike	34014-18-1	Toxic				500 HA	500 HA	2	0.002
Temperature §§	N/A	Harmful	(13)	(13)				N/A	
Terbacil §§ Sinbar §	5902-51-1	Toxic				90 HA	90 HA	2.2	0.02
Terbufos §§ Counter §	13071-79-9	Toxic				0.9 HA	0.9 HA	0.5	0.07

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Tetrachlorobenzene, 1,2,4,5- §§ Benzene, 1,2,4,5-Tetrachloro- § RCRA Waste Number U207 § 1,2,4,5-Tetrachlorobenzene	95-94-3 DB 9450000 TBN750	Toxic with BCF >300			1,125	0.97 NPP	0.97 NPP		5
Tetrachloroethane, 1,1,2,2- §§ Tetrachloroethane § TCE § Cellon § Westron § Bonoform § sym-Tetrachloroethane § Acetylene Tetrachloride § 1,1,2,2-Tetrachloroethane § Ethane, 1,1,2,2-Tetrachloro- § 1,1-Dichloro-2,2-Dichloroethane § RCRA Waste Number U209	79-34-5 NIOSH: KI 8575000 SAX: ACK500	Carcinogen			5	1.7 PP	2.0 HA	N/A	0.5
Tetrachloroethylene §§ Perchlorethylene § NCI C04580 § PCE § Perk § PERC § ENMA § Dow-Per § Perchlor § Perclene § Perklone § Didakene § Tetra Cap § Percosolve § Perchloroethylene § Tetrachloroethene § Carbon Bichloride § Carbon Dichloride § Ethylene Tetrachloride § Ethylene, Tetrachloro- § 1,1,2,2-Tetrachloroethylene § RCRA Waste Number U210	127-18-4 KX 3850000 TBQ250	Carcinogen			30.6	5 MCL	5 MCL	N/A	0.7
Thallium §§ Tl § Ramor	7440-28-0 XG 3425000 TEI000	Toxic			119	0.24 PP	2 MCL	0.3	0.2
Thifensulfuron Methyl §§ § Pinnacle	79277-27-3	Toxic				910 HA	910 HA	1	90

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Toluene §§ § Antisal 1a § NCI C07272 § Toluol § Tolu-Sol § Methacide § Methylbenzol § Methylbenzene § Phenylmethane § Phenyl-Methane § Methyl-Benzene § Benzene, Methyl § RCRA Waste Number U220	108-88-3 XS 5250000 TGK750	Toxic			10.7	1,000 MCL	1,000 MCL	0.01	1
Toxaphene §§ § Attac 4-2 § Alltox § Alltex § Attac 6 § Toxakil § Agricide § Chem-Phene § Clor Chem T-590 § Compound 3956 § Crestoxo § Estonox § Geniphene § Gy-Phene § Hercules 3956 § Melipax § Motox § PCC § Phenacide § Toxaphene mixture § Chlorinated-Camphene § Camphene, Octachloro- § RCRA Waste Number P123	8001-35-2 XW 5250000 THH750	Carcinogen	0.73 PP	0.0002 PP	13,100	0.0028 PP	0.3 HA	N/A	1
Tralkoxydim (28) §§ Achieve	87820-88-0	Carcinogen	3,750			20 HA	20 HA	N/A	2
trans-1,2-Dichloroethylene §§ § trans-Dichloroethylene § RCRA Waste Number U079 § trans-1,2-Dichloroethane § trans-1,2-Dichloroethene § Dichloroethylene, trans-§ trans-Acetylene Dichloride § 1,2-trans-Dichloroethylene § Ethene, 1,2-Dichloro-, (E)- § 1,2-Dichloroethylene, trans-	156-60-5 KV 9400000 DFI600	Toxic			1.58	100 MCL	100 MCL	0.05	0.6

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
trans-1,3-Dichloropropene §§ Telone II § 1,3-Dichloropropene § 1,3-Dichloropropylene § (E)-1,3-Dichloropropene § trans-1,3-Dichloropropylene § 1-Propene, 1,3-Dichloro-, (E)-	10061-02-6 UC 8320000 DGH000	Carcinogen			1.91	2 HA	2 HA	N/A	0.3
trans-Nonachlor (Chlordane component) §§ § Chlordane, trans-Isomer	39765-80-5	Carcinogen			14,100	0.008 PP	1 HA	N/A	0.1
Triallate §§ § Avadex BW § BRN 1875853 § Dipthal § Far-Go § Triamyl	2303-17-5	Carcinogen				5 HA	5 HA	N/A	5
Triasulfuron §§ Amber	82097-50-5	Toxic				70 HA	70 HA	1	0.03
Tribenuron Methyl §§ Express	101200-48-0	Carcinogen				60 HA	60 HA	N/A	6
Tributyltin (TBT) §§ §Tin-San § Tributylin chloride complex § EPA Pesticide Chemical #083108	56573-85-4	Toxic	0.46 NPP	0.072 NPP					0.007
Trichlorobenzene, 1,2,4- §§ Benzene, 1,2,4-Trichloro- § unsym-Trichlorobenzene § 1,2,4-Trichlorobenzene	120-82-1 DC 2100000 TIK250	Toxic			114	35 PP	70 MCL	0.02	10
Trichloroethane, 1,1,2- §§ Vinyl Trichloride § 1,1,2-Trichloroethane § ß-T § Ethane Trichloride § beta-Trichloroethane § NCI C04579 § Ethane, 1,1,2-Trichloro- § Caswell Number 875A [NLM] § EPA Pesticide Chemical Code 081203 [NLM]§ 1,2,2-Trichloroethane § RCRA Waste Number U227	79-00-5 KJ 3150000 TIN000	Carcinogen			4.5	3 HA	3 HA	N/A	0.7

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Trichloroethane, 1,1,1- §§ Methyl Chloroform § -T § Strobane § Inhibisol § 1,1,1-TCE § Tri-Ethane § Solvent 111 § Aerothene TT § Chloroethene § Chlorten § NCI C04626 § Methylchloroform § Chloroform, Methyl- § 1,1,1-Trichloroethene § alpha-Trichloroethane § Methyltrichloromethane § 1,1,1-Trichloroethane § Ethane, 1,1,1-Trichloro-§ RCRA WAste Number U226	71-55-6 KJ 2975000 TIM750	Toxic			5.6	200 MCL	200 MCL	0.5	0.7
Trichloroethylene §§ § TCE § Triad § Vitran § Algylen § Dow-Tri § Lanadin § Vestrol § Anamenth § Benzinol § Tri- Plus § Tri-Clene § Trichlorethene § Trichloroethene § Trichloroethane § Trichlorethylene § Ethene, Trichloro- § Ethylene Trichloride § Ethylene, Trichloro- § Acetylene Trichloride § 1,1,2- Trichloroethylene § 1,2,2- Trichloroethylene § 1- Chloro-2,2- Dichloroethylene § 1, 1- Dichloro-2-Chloroethylene	79-01-6 KX 4550000 TIO750	Carcinogen			10.6	5 MCL	5 MCL	N/A	0.5

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Trichlorofluoromethane (HM) §§ Freon 11 § F 11 § FC 11 § Arcton 9 § Eskimon 11 § Halocarbon 11 § Algofrene Type 1 § Fluorocarbon Number 11 § NCI C04637 § Isotron 11 § Fluorotrichloromethane § Isceon 131 § Monofluorotrichloromethane § Ucon Refrigerant 11 § Trichloromonofluoromethane § RCRA Waste Number U121	75-69-4 PB 6125000 TIP500	Toxic			3.75	$1x10^4$ HA	$1x10^4$ HA	0.07	0.8
Trichlorophenol, 2,4,5- §§ Dowcide B § 2,4,5-Trichlorophenol § Nurelle § Dowcide 2 § Collunosol § Preventol 1 § NCI C61187 § RCRA Waste Number U230	95-95-4 SN 1400000 TIV750	Toxic			110	1,800 NPP	1,800 NPP	10	60
Trichlorophenol, 2,4,6- §§ Phenachlor § Omal § Phenol, 2,4,6-trichloro- § NCI C02904 § 2,4,6-Trichlorophenol § Dowcide 2S § RCRA Waste Number U231	88-06-2 SN 1575000 TIW000	Carcinogen			150	14 PP	30 HA	N/A	10

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Trichlorophenoxy Proprionic Acid, 2 (2,4,5-) §§ Fenoprop § 2 (2,4,5-Trichlorophenoxy) Proprionic Acid § Kuran § Propon § Silvex § Aqua-Vex § Ded-Weed § Sta-Fast § 2,4,5-TP § Color-Set § Weed-B-Gon § Double Strength § 2,4,5-Trichlorophenoxypropionic Acid § (2,4,5-Trichlorophenoxy)Propionic Acid § 2-(2,4,5-Trichlorophenoxy)-Proprionic Acid § (+/-)-2-(2,4,5-Trichlorophenoxy)propanoic Acid § RCRA Waste Number U233	93-72-1 UF 8225000 TIX500	Toxic				10 NPP	50 MCL	0.075	0.2
Trichlorophenoxyacetic Acid §§ Brush-Rhap § 2,4,5-T (Brush-Rhap)	93-76-5	Toxic				70 HA	70 HA		0.2
Triclopyr §§ 3,4,5-Trichloro-2pyridinyloxyacetic acid § Confront § Dowco 233 § Garlon § Garlon 2 § Garlon 250 § Grazon 250 § Redeem § Release § Turflon § Caswell# 8821 § HSDB 7060 § EPA Pesticide Chemical #116001	55335-06-3	Toxic				400 HA	400 HA		0.5
Trifluralin §§ Treflan § Buckle	1582-09-8	Carcinogen				5 HA	5 HA	N/A	0.5
Trihalomethanes, total §§ § TTHMs	Multiple	Carcinogen				100 MCL	100 MCL	N/A	3
Triticonazole §§	131983-72-7	Toxic				1,000 HA	1,000 HA		0.1
Turbidity (20) §§	N/A	Harmful	(13)	(13)				N/A	1 NTU

Pollutant Element / Chemical Compound or Condition §§ - Primary Synonym § - Other Names	CASRN numbers, NIOSH number, SAX Number (25) (26) (27)	Category (1) (2)	Aquatic Life Standards		Bio-concentration Factor (BCF) (5)	Human Health Standards (17) (16)		Trigger Value (22)	Required Reporting Value (19)
			Acute (3)	Chronic (4)		Surface Water	Ground Water		
Uranium, natural §§ U § Uranium Metal, Pyrophoric	7440-61-1 YR 3490000 UNS000	Carcinogen / Radioactive				30 MCL	30 MCL	N/A	0.2
Vinyl 2-Chloroethyl Ether §§ Vinyl ß-Chloroethyl Ether- § 2-Chloroethyl Vinyl Ether § (2-Chloroethoxy)Ethene § RCRA Waste Number U042	110-75-8 KN 6300000 CHI250	Carcinogen			0.557			N/A	2
Vinyl Chloride §§ § VC § VCM § Chlorethene § Chloroethene § Chlorethylene § Chloroethylene § Ethylene, Chloro- § Monochloroethylene § Ethylene Monochloride § Vinyl Chloride Monomer § Vinyl C Monomer § Trovidur § RCRA Waste Number U043	75-01-4 KU 9625000 VNP000	Carcinogen			1.17	0.25 PP	0.2 HA	N/A	0.4
Xylenes §§ § Xylol § Violet 3 § Mixed Xylenes § Methyl Toluene § Dimethylbenzene § NCI C55232 § Total equals the sum of meta, ortho, and para. § RCRA Waste Number U239	1330-20-7 ZE 2100000 XGS000	Toxic			1.17	$1x10^4$ MCL	$1x10^4$ MCL	0.5	3
Zinc §§ Zn § Blue Powder § C.I. 77945 § C.I. Pigment Black 16 § C.I. Pigment Metal 6 § Emanay Zinc Dust § Granular Zinc § Jasad § Merrillite § Pasco § Zinc, Powder or Dust, non-Pyrophoric § Zinc, Powder or Dust, Pyrophoric	7440-66-6 ZG 8600000 ZBJ000	Toxic	37 @ 25 mg/L hardness (12) PP	37 @ 25 mg/L hardness (12) PP	47	2,000 HA	2,000 HA	5	8

FOOTNOTES

(1) Based on EPA's Integrated Risk Information System (IRIS) categories and includes parameters determined to be toxic (toxin) or carcinogenic (carcinogen). Harmful parameters are not defined by IRIS but are used in DEQ-7 and include biological agents (such as E. coli), those parameters which are detrimental to aesthetics (such as color), parameters that cause taste and/or odor effects (such as MTBE), or parameters that generate physical effects (such as iron).

(2) Chemicals classified by EPA as carcinogens for an oral route of exposure in the drinking water regulations and health advisories (EPA 822-B-96-002 and EPA 820-R-11-002) and those listed as carcinogens in the EPA priority pollutants list. In 2005, the EPA added a new scale to describe carcinogens and both the 1986 and 2005 scales are now in simultaneous use. The classifications considered carcinogenic in the 1986 scale are as follows: A (human carcinogen); B1 or B2 (probable human carcinogens); and C (possible human carcinogen). In the 2005 scale, the following categories are considered carcinogens: H (human carcinogen); L (likely carcinogen); L/N (likely to be carcinogenic above a specified dose) and S (suggestive evidence of carcinogenic potential).

(3) The one-hour average concentration of these parameters in surface waters may not exceed these values more than once in any three year period, on average, with the exception of silver, which, at present, is interpreted as a “not to exceed” value.

(4) The 96 hour average concentration of these parameters in surface waters may not exceed these values more than once in any three year period, on average.

(5) All bioconcentration factors (BCFs) were developed by the EPA as part of the Standards development as mandated by Section 304(a) of the federal Clean Water Act. National Recommended Water Quality Criteria: 2002 Human Health Criteria Calculation Matrix (EPA-822-R-02-012).

(6) The 24 hour geometric mean value must not exceed these values.

(7) Freshwater Aquatic Life Standards for total ammonia nitrogen (µg/L NH_3-N plus NH_4-N).

Because these formulas are non-linear in pH and temperature, the Standard is the average of separate evaluations of the formulas reflective of the fluctuations of pH and temperature within the averaging period; it is not appropriate to apply the formula to average pH and temperature.

1. The one-hour average concentration of total ammonia nitrogen (in µg/L) does not exceed the CMC (acute criterion) calculated using the following equations.

Where salmonid fish are present:

$$\text{CMC} = \frac{0.275}{1 + 10^{7.204 - \text{pH}}} + \frac{39.0}{1 + 10^{\text{pH} - 7.204}}$$

Or where salmonid fish are not present:

$$\text{CMC} = \frac{0.411}{1 + 10^{7.204 - \text{pH}}} + \frac{58.4}{1 + 10^{\text{pH} - 7.204}}$$

2. The thirty-day average concentration of total ammonia nitrogen (in µg/L) does not exceed the CCC (chronic criterion) calculated using the following equations.

When fish early life stages[1] are present:

$$CCC = \left(\frac{0.0577}{1 + 10^{7.688 - pH}} + \frac{2.487}{1 + 10^{pH - 7.688}} \right) \times MIN\left(2.85, 1.45 \times 10^{0.028 \times (25 - T)}\right)$$

When fish early life stages[1] are absent:

$$CCC = \left(\frac{0.0577}{1 + 10^{7.688 - pH}} + \frac{2.487}{1 + 10^{pH - 7.688}} \right) \times 1.45 \times 10^{0.028 \times (25 - MAX(T,7))}$$

[1] Includes all embryonic and larval stages and all juvenile forms of fish to 30-days following hatching.

3. In addition, the highest four-day average within the 30-day period should not exceed 2.5 times the CCC.

Table 1. pH-Dependent Values of the CMC (Acute Criterion) Ammonia Standard.

CMC, total ammonia nitrogen (µg/L NH_3-N plus NH_4-N)		
pH	**Salmonids Present**	**Salmonids Absent**
6.5	32600	48800
6.6	31300	46800
6.7	29800	44600
6.8	28100	42000
6.9	26200	39100
7.0	24100	36100
7.1	22000	32800
7.2	19700	29500
7.3	17500	26200
7.4	15400	23000
7.5	13300	19900
7.6	11400	17000
7.7	9650	14400
7.8	8110	12100
7.9	6770	10100
8.0	5620	8400
8.1	4640	6950
8.2	3830	5720
8.3	3150	4710
8.4	2590	3880
8.5	2140	3200
8.6	1770	2650
8.7	1470	2200
8.8	1230	1840
8.9	1040	1560
9.0	885	1320

Table 2. Temperature and pH-Dependent Values of the CCC (Chronic Criterion) for *Fish Early Life Stages Present* and for *Fish Early Life Stages Absent*.

CCC for Fish Early Life Stages Present, total ammonia nitrogen (µg/L NH_3-N plus NH_4-N)										
pH	**Temperature, °C**									
	0	**14**	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**
6.5	6670	6670	6060	5333	4680	4120	3620	3180	2800	2460
6.6	6570	6570	5970	5250	4610	4050	3560	3130	2750	2420
6.7	6440	6440	5860	5150	4520	3980	3500	3070	2700	2370
6.8	6290	6290	5720	5030	4420	3890	3420	3000	2640	2320
6.9	6120	6120	5560	4890	4300	3780	3320	2920	2570	2250
7.0	5910	5910	5370	4720	4150	3650	3210	2820	2480	2180
7.1	5670	5670	5150	4530	3980	3500	3080	2700	2380	2090
7.2	5390	5390	4900	4310	3780	3330	2920	2570	2260	1990
7.3	5080	5080	4610	4060	3570	3130	2760	2420	2130	1870
7.4	4730	4730	4300	3780	3320	2920	2570	2260	1980	1740
7.5	4360	4360	3970	3490	3060	2690	2370	2080	1830	1610
7.6	3980	3980	3610	3180	2790	2450	2160	1900	1670	1470
7.7	3580	3580	3250	2860	2510	2210	1940	1710	1500	1320
7.8	3180	3180	2890	2540	2230	1960	1730	1530	1330	1170
7.9	2800	2800	2540	2240	1960	1730	1520	1330	1170	1030
8.0	2430	2430	2210	1940	1710	1500	1320	1160	1020	897
8.1	2101	2101	1910	1680	1470	1290	1140	1000	879	773
8.2	1790	1790	1630	1430	1260	1110	973	855	752	661
8.3	1520	1520	1390	1220	1070	941	827	727	639	562
8.4	1290	1290	1170	1030	906	796	700	615	541	475
8.5	1090	1090	990	870	765	672	591	520	457	401
8.6	920	920	836	735	646	568	499	439	386	339
8.7	788	788	707	622	547	480	422	371	326	287
8.8	661	661	601	528	464	408	359	315	277	244
8.9	565	565	513	451	397	349	306	269	237	208
9.0	486	486	442	389	342	300	264	232	204	179

*At 15 C and above, the criterion for fish *ELS absent* is the same as the criterion for fish *ELS present*

(8) A plant nutrient, excessive amounts of which may cause violations of Administrative Rules of Montana (ARM) 17.30.637 (1)(e).

(9) Approved methods of sample preservation, collection, and analysis for determining compliance with the standards set forth in DEQ-7 are found in the surface water quality standards (ARM17.30.601, et seq.) and the ground water rules (ARM 17.30.1001, et seq.).

Standards for metals (except aluminum) in surface water are based upon the analysis of samples following a "total recoverable" digestion procedure (EPA Method 200.2, Supplement I, Rev. 2.8, May, 1994).

Standards for alpha emitters, beta emitters and gamma emitters in surface waters are based upon the analysis of unfiltered samples and appropriate EPA approved analysis methods.

Standards for metals in ground water are based upon the dissolved portion of the sample (after filtration through a 0.45 µm membrane filter, as specified in "Methods for Analysis of Water and Wastes" 1983, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, EPA-600/4-79-020, or equivalent). Standards for alpha emitters, beta emitters and gamma emitters in ground water are based upon the analysis of filtered samples and appropriate EPA approved analysis methods.

Standard for organic parameters in surface water and ground water are based on unfiltered samples.

(10) Calculation of an equivalent concentration of 2,3,7,8-TCDD is to be based on congeners of CDDs/CDFs and the toxicity equivalency factors (TEF) in van den Berg, M: et al. (2006) The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 93(2):223-241. The analysis method to be used is EPA Method 1613, Revision B, Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS), EPA Method 8290, or other method approved by the department on case by case basis. The Required Reporting Value(s) (RRV) for Dioxin and congeners are to be the lowest detection level for the analysis method approved by the Department.

(11) Radionuclides consisting of alpha emitters, beta emitters and gamma emitters are classified as carcinogens. “Alpha emitters” means the total radioactivity due to alpha particle emission. “Beta emitters” means the total radioactivity due to beta particle emission. “Gamma emitters” means the total radioactivity due to gamma particle emission. The emitters covered under this Standard include but are not limited to: Cesium, radioactive Iodine, radioactive Strontium-89 and -90, radioactive Tritium Gamma photon emitters.

(12) Freshwater Aquatic Life Standards for these metals are expressed as a function of total hardness (mg/L, CaCO3). The values displayed in the chart correspond to a total hardness of 25 mg/L. The hardness relationships are:

	Acute = exp.{ma[ln(hardness)]+ba}			**Chronic = exp.{mc[ln(hardness)]+bc}**	
	ma	**ba**		**mc**	**Bc**
Cadmium	1.0166	-3.924		0.7409	-4.719
Copper	0.9422	-1.700		0.8545	-1.702
Chromium (III)	0.819	3.7256		0.819	0.6848
Lead	1.273	-1.46		1.273	-4.705
Nickel	0.846	2.255		0.846	0.0584
Silver	1.72	-6.52			
Zinc	0.8473	0.884		0.8473	0.884

Note: If the hardness is <25mg/L as CaCO3, the number 25 must be used in the calculation. If the hardness is greater than or equal to 400 mg/L as CaCO3, 400 mg/L must be used in the calculation.

(13) This standard is based upon Water-Use Classifications. See Administrative Rules of Montana (ARM), title 17, Chapter 30 - Water Quality, Sub-Chapter 6 - Surface Water Quality Standards.

(14) Freshwater Aquatic Life Standard for pentachlorophenol is dependent on pH. Values displayed in the chart correspond to a pH of 6.5 and are calculated as follows:

Acute = exp[1.005(pH) - 4.869] Chronic = exp[1.005(pH) - 5.134]

(15) Freshwater Aquatic Life Standards for dissolved oxygen in milligrams per liter are as follows:

	Standards for Waters Classified A-1, B-1, B-2, C-1, and C-2		**Standards for Waters Classified B-3, C-3, and I**	
	Early Life Stages[1,2]	**Other Life Stages**	**Early Life Stages[2]**	**Other Life Stages**
30 Day Mean	N/A[3]	6.5	N/A[3]	5.5
7 Day Mean	9.5 (6.5)	N/A[3]	6.0	N/A[3]
7 Day Mean Minimum	N/A[3]	5.0	N/A[3]	4.0
1 Day Minimum[4]	8.0 (5.0)	4.0	5.0	3.0

[1] These are water column concentrations recommended to achieve the required inter-gravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the figures in parentheses apply.
[2] Includes all embryonic and larval stages and all juvenile forms of fish to 30-days following hatching.
[3] N/A (Not Applicable).
[4] All minima should be considered as instantaneous concentrations to be achieved at all times.

(16) Surface or groundwater concentrations may not exceed these values.

(17) Source of the criteria used to derive the standard:
PP = priority pollutant criteria
NPP = non-priority pollutant criteria
OL= organoleptic pollutant criteria
MCL = Maximum contaminant level from the drinking water regulations
HA = health advisory developed from EPA's "Drinking Water Standards and Health Advisories" (October 1996) guidance, using recent scientific evidence and verified by EPA Region VIII toxicologist

(18) The Narrative Standards are located in the Administrative Rules of Montana (ARM) 17.30.601 et seq. and ARM 17.30.1001 et seq.

(19) The required reporting value (RRV) is the Department's selection of a laboratory reporting limit that is sufficiently sensitive to meet the most stringent numeric water quality standard. The RRV shall be used when reporting surface water or ground water monitoring or compliance data to the Department unless otherwise specified by the Department in a permit, approval or authorization issued by the Department. It is the responsibility of the sampling entity to ensure that appropriate methods and reporting limits are requested from the laboratory to meet analytical and reporting limit needs.

(20) Applicable to surface waters only.

(21) Based on taste and odor thresholds given in EPA 822-f-97-008 December 1997.

(22) Trigger Values are used to determine if a given increase in the concentration of toxic parameters is significant or non-significant as per the non-degradation rules ARM 17.30.701 et seq. The acronym "N/A" means "not applicable".

(23) Reserved

(24) Reserved

(25) CASRN is an acronym for the American Chemical Society's Chemical Abstracts Service Registry Number.

(26) The NIOSH RTECS number is a unique number used for identification in the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances.

(27) SAX number, in the format AAA123, is a unique number for identification of materials in the Dangerous Properties of Industrial Materials, authors N. Irving Sax and Richard J. Lewis, publisher Van Nostrand Reinhold.

(28) The sum of the concentrations of tralkoxydim and its breakdown products shall not exceed the standards listed. For a list of known breakdown products, see EPA memorandum "EFED's Section 3 Review for Tralkoxydim (Chemical #121000; Case # 060780; DP Barcodes 0234682, 0234752, 0238697, 0235723 & 0239519)," and the associated "Environmental Fate Assessment for Tralkoxydim."

(29) Ground water human health standard is based on the relative potency for selected PAH compounds listed in Table 8 of the EPA “Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons” July 1993, EPA/600/R-93/089.

(30) The sum of the concentrations of acetochlor and the breakdown products, acetochlor ESA and acetochlor OA, shall not exceed the standards listed.

(31) The sum of the concentrations of alachlor and the breakdown products, alachlor ESA and alachlor OA, shall not exceed the standards listed.

(32) The sum of the concentrations of atrazine and the breakdown products, deethyl atrazine, deisopropyl atrazine, and deethyl deisopropyl atrazine, shall not exceed the standards listed.

(33) The sum of the concentrations of imazamethabenz-methyl ester and the breakdown product, imazamethabenz-methyl acid, shall not exceed the standards listed.

(34) The sum of the concentrations of metolachlor and the breakdown products, metolachlor ESA and metolachlor OA, shall not exceed the standards listed.

(35) The sum of the concentrations of pinoxaden (NOA 407855) and the breakdown products, pinoxaden NOA 407854 and pinoxaden NOA 447204, shall not exceed the standards listed.

(36) The human health criteria for arsenic is the more restrictive of the risk based level of 1 in 1000 [$1x10^{-3}$], or the MCL.

(37) The quantitative combination of two or more of Aldicarb, Aldicarb sulfone and Aldicarb sulfoxide shall not exceed 7 µg/L because each has a similar mode of action.

(38) The quantitative sum of all listed Haloacetic acids is used in determining the total Haloacetic acid concentration.

(39) The sum of the concentrations of Endosulfan and its isomers Endosulfan I and Endosulfan II shall not exceed the standards listed.

Circular DEQ-12A
EXHIBIT 5

DEPARTMENT CIRCULAR

DEQ-12A

Montana Base Numeric Nutrient Standards

GENERAL INTRODUCTION

This circular (DEQ-12A) contains information pertaining to the base numeric nutrients standards (§75-5-103(2), MCA) and their implementation. This information includes the standards' concentration limits, where the standards apply, and their period of application. DEQ-12A is adopted by the Board of Environmental Review under its rulemaking authority in §75-5-301(2), MCA.

Circular DEQ-12B contains information about variances from the base numeric nutrient standards and is a separate document available from the Department. DEQ-12B addresses effluent treatment requirements associated with general nutrient standards variances, as well as effluent treatment requirements for individual nutrient standards variances and to whom these apply. Unlike DEQ-12A, DEQ-12B is not adopted by the Board of Environmental Review; DEQ-12B is adopted by the Department following its formal rulemaking process, pursuant to §75-5-313, MCA.

The Department has reviewed a considerable amount of scientific literature and has carried out scientific research on its own in order to derive the base numeric nutrient standards (see **References** in this circular). Because many of the base numeric nutrient standards are stringent and may be difficult for MPDES permit holders to meet in the short term, Montana's Legislature adopted laws (e.g., §75-5-313, MCA) allowing for the achievement of the standards over time via the variance procedures in Circular DEQ-12B. This approach should allow time for nitrogen and phosphorus removal technologies to improve and become less costly and to allow time for nonpoint sources of nitrogen and phosphorus pollution to be better addressed.

Circular DEQ-12A

JULY 2014 EDITION

1.0 Introduction

Elements comprising Circular DEQ-12A are found below. These elements are adopted by the Montana Board of Environmental Review. The nitrogen and phosphorus concentrations provided here have been set at levels that will protect beneficial uses and prevent exceedences of other surface water quality standards which are commonly linked to nitrogen and phosphorus concentrations (e.g., pH and dissolved oxygen; see Circular DEQ-7 for those standards). The nitrogen and phosphorus concentrations provided here also reflect the intent of the narrative standard at ARM 17.30.637(1)(e) and will preclude the need for case-by-case interpretations of that standard in most cases.

1.1 Definitions

1. **Ecoregion** means mapped regions of relative homogeneity in ecological systems derived from perceived patterns of a combination of causal and integrative factors including land use, land surface form, potential natural vegetation, soils, and geology. See also Endnote 1.

2. **Large river** means a perennial waterbody which has, during summer and fall baseflow (August 1 to October 31 each year), a wadeability index (product of river depth [in feet] and mean velocity [in ft/sec]) of 7.24 ft^2/sec or greater, a depth of 3.15 ft or greater, or a baseflow annual discharge of 1,500 ft^3/sec or greater. See also, Endnote 6.

3. **Total nitrogen** means the sum of all nitrate, nitrite, ammonia, and organic nitrogen, as N, in an unfiltered water sample. Total nitrogen in a sample may also be determined via persulfate digestion or as the sum of total kjeldahl nitrogen plus nitrate plus nitrite.

4. **Total phosphorus** means the sum of orthophosphates, polyphosphates, and organically bound phosphates, as P, in an unfiltered water sample. Total phosphorus may also be determined directly by persulfate digestion.

5. **Wadeable stream** means a perennial or intermittent stream in which most of the wetted channel is safely wadeable by a person during baseflow conditions.

2.0 Base Numeric Nutrient Standards

Table 12A-1 contains the base numeric nutrient standards for Montana's flowing waters. In **Table 12A-1** nutrient standards for wadeable streams are grouped by ecoregion, either at level III (coarse scale) or level IV (fine scale). Following the ecoregional standards is a list of wadeable streams with reach-specific standards. These waterbodies have characteristics disimilar from those of the ecoregions in which they reside and have therefore been provided reach-specific values. **For wadeable streams, the standards should be applied in this order: named stream reach first (if applicable) then level IV ecoregion (if applicable) then level III ecoregion. Table 12A-1** also contains a list of large river segments for which base numeric nutrient standards have been developed. Note that the ecoregional values in **Table 12A-1** do not apply to large rivers within those ecoregions. See Endnote 6 for a list of all large Montana rivers. If a particular large river reach is not listed in **Table 12A-1**, standards for it have not yet been developed.

Table 12A-2 is a placeholder table for future base numeric nutrient standards for Montana's lakes and reservoirs. The Department has not yet developed regional lake criteria, but it is expected that when they are developed they will be grouped by ecoregion. As such, placeholders for future ecoregionally-based criteria are provided in the table. The table also provides for lake-specific standards. The Department anticipates that reservoir standards will generally be developed case-by-case and, therefore, will be individually listed, as provided for in the table.

Table 12A-1. Base Numeric Nutrient Standards for Wadeable Streams in Different Montana Ecoregions. If standards have been developed for level IV ecoregions (subcomponents of the level III ecoregions) they are shown in italics below the applicable level III ecoregion. Individual reaches are in the continuation of this table.

Ecoregion[1,2] (level III or IV) and Number	Ecoregion Level	Period When Criteria Apply[3]	Numeric Nutrient Standard[4]	
			Total Phosphorus (µg/L)	Total Nitrogen (µg/L)
Northern Rockies (15)	III	July 1 to September 30	25	275
Canadian Rockies (41)	III	July 1 to September 30	25	325
Idaho Batholith (16)	III	July 1 to September 30	25	275
Middle Rockies (17)	III	July 1 to September 30	30	300
Absaroka-Gallatin Volcanic Mountains (17i)	IV	July 1 to September 30	105	250
Northwestern Glaciated Plains (42)	III	June 16 to September 30	110	1300
Sweetgrass Upland (42l), Milk River Pothole Upland (42n), Rocky Mountain Front Foothill Potholes (42q), and Foothill Grassland (42r)	IV	July 1 to September 30	80	560
Northwestern Great Plains (43) and Wyoming Basin (18)	III	July 1 to September 30	150	1300
River Breaks (43c)	IV	See Endnote 5	See Endnote 5	See Endnote 5
*Non-calcareous Foothill Grassland (43s), Shields-Smith Valleys (43t), Limy Foothill Grassland (43u), Pryor-Bighorn Foothills (43v), and Unglaciated Montana High Plains (43o)**	IV	July 1 to September 30	33	440

*For the Unglaciated High Plains ecoregion (43o), criteria only apply to the polygon located just south of Great Falls, MT.

[1] See Endnote 1

[2] See Endnote 2

[3] See Endnote 3

[4] See Endnote 4

Table 12A-1, Continued. Base Numeric Nutrient Standards for Individual Wadeable Streams (and Wadeable-stream Reaches), and Large-river Reaches.

		Numeric Nutrient Standard[4]	
Individual Stream or Reach Description[2]	**Period When Criteria Apply[3]**	**Total Phosphorus (µg/L)**	**Total Nitrogen (µg/L)**
Wadeable Streams: Clark Fork River basin			
Flint Creek, from Georgetown Lake outlet to the ecoregion 17ak boundary (46.4002, -113.3055)	July 1 to September 30	72	500
Wadeable Streams: Gallatin River basin			
Bozeman Creek, from headwaters to Forest Service Boundary (45.5833, -111.0184)	July 1 to September 30	105	250
Bozeman Creek, from Forest Service Boundary (45.5833, -111.0184) to mouth at East Gallatin River	July 1 to September 30	76	270
Hyalite Creek, from headwaters to Forest Service Boundary (45.5833,-111.0835)	July 1 to September 30	105	250
Hyalalite Creek, from Forest Service Boundary (45.5833,-111.0835) to mouth at East Gallatin River	July 1 to September 30	90	260
East Gallatin River between Bozeman Creek and Bridger Creek confluences	July 1 to September 30	50	290
East Gallatin River between Bridger Creek and Hyalite Creek confluences	July 1 to September 30	40	300
East Gallatin River between Hyalite Creek and Smith Creek confluences	July 1 to September 30	60	290
East Gallatin River from Smith Creek confluence mouth (Gallatin River)	July 1 to September 30	40	300
Large Rivers[6]:			
Yellowstone River (Bighorn River confluence to Powder River confluence)	August 1 -October 31	55	655
Yellowstone River (Powder River confluence to stateline)	August 1 -October 31	95	815

[2] See Endnote 2

[3] See Endnote 3

[4] See Endnote 4

[6] See Endnote 6

Table 12A-2. Base Numeric Nutrient Standards and Other Standards for Lakes and Reservoirs.

		Numeric Nutrient Standard[7]		
Ecoregion[1] (level III) and Number, or Individual Lake or Reservoir Description	**Period of Application**	**Total Phosphorus (µg/L)**	**Total Nitrogen (µg/L)**	**Other Standards[8]**
LAKES/RESERVOIRS by ecoregion:				
Middle Rockies (17)	Year-round	[]	[]	
Northern Rockies (15)	Year-round	[]	[]	
Canadian Rockies (41)	Year-round	[]	[]	
Idaho Batholith (16)	Year-round	[]	[]	
LAKE SPECIFIC CRITERIA:				
	Year-round	[]	[]	
RESERVOIR SPECIFIC CRITERIA:				
	Year-round	[]	[]	

[1] See Endnote 1

[7] See Endnote 7

[8] See Endnote 8

2.1 Required Reporting Values for Base Numeric Nutrient Standards

Table 12A-3 presents the required reporting values (RRVs) for total phosphorus and total nitrogen, as well as the RRVs for nitrogen fractions that can be used to compute total nitrogen.

Table 12A-3. Required reporting values[a,b] for total nitrogen and phosphorus measurements.

Nutrient		Method of Measurement	Required Reporting Value
Total phosphorus		Persulfate digestion	3 µg/L
Total nitrogen		Persulfate digestion	70 µg/L
Total nitrogen	Sum of:	(a) total kjeldahl nitrogen	225 µg/L
		(b) nitrate + nitrite	See RRVs below
Nitrate- as N			20 µg/L
Nitrite- as N			10 µg/L
Nitrate + Nitrite-as N			20 µg/L

[a] See definition for required reporting values found in footnote 19 of Department Circular DEQ-7.

[b] Concentrations in Table 12A-3 must be achieved unless otherwise specified in a permit, approval, or authorization issued by the Department (DEQ-7; ARM 17.30.702).

2.2 Developing Permit Limits for Base Numeric Nutrient Standards

For total nitrogen and total phosphorus, the critical low-flow for the design of disposal systems shall be based on the seasonal 14Q5 of the receiving water (ARM 17.30.635(2)). When developing permit limits for base numeric nutrient standards, the Department will use an average monthly limit (AML) only, based on a calendar month, using methods appropriate for criterion continuous concentrations (i.e., chronic concentrations). Permit limits will be established using a value corresponding to the 95th percentile probability distribution of the effluent. Nitrogen and phosphorus concentrations of the receiving waterbody upstream of the discharge may be characterized using other frequency distribution percentiles. The Department shall use methods that are appropriate for criterion continuous concentrations which are found in the document "*Technical Support Document for Water Quality-based Toxics Control*," Document No. EPA/505/2-90-001, United States Environmental Protection Agency, 1991.

3.0 Endnotes

(1) Ecoregions are based on the 2009 version (version 2) of the U.S. Environmental Protection Agency maps. These can be found at: http://www.epa.gov/wed/pages/ecoregions/mt_eco.htm . For Geographic Information System (GIS) use within the Department, the GIS layers may be found at: L:\DEQ\Layers\Reference\Ecoregions.lyr

(2) Within and among the geographic regions or watersheds listed, base numeric nutrient standards of the downstream reaches or other downstream waterbodies must continue to be maintained. Where possible, modeling methods will be utilized to determine the limitations required which provide for the attainment and maintenance of water quality standards of downstream waterbodies.

(3) For the purposes of ambient surface water monitoring and assessment only, a ten-day window (plus/minus) on the beginning and ending dates of the period when the criteria apply is allowed in order to accommodate year-specific conditions (an early-ending spring runoff, for example).

(4) The average concentration during a period when the standards apply may not exceed the standards more than once in any five-year period, on average.

(5) In this level IV ecoregion, the narrative standard for nuisance aquatic life (ARM 17.30.637(1)(e)) applies in lieu of specific base numeric nutrient standards.

(6) **Table E-1** below shows the beginning and ending locations for large rivers in Montana.

Table E-1. Large river segments within the state of Montana.

River Name	Segment Description
Big Horn River	Yellowtail Dam to mouth
Clark Fork River	Bitterroot River to state-line
Flathead River	Origin to mouth
Kootenai River	Libby Dam to state-line
Madison River	Ennis Lake to mouth
Missouri River	Origin to state-line
South Fork Flathead River	Hungry Horse Dam to mouth
Yellowstone River	State-line to state-line

(7) No lake or reservoir in **Table12A-2** shall have a total nutrient concentration that exceeds the values shown, as an annual average, more than once in any three year period, on average. The Department will determine on a case-by-case basis whether or not a permitted discharge to a stream or river is likely to be affecting any downstream lake or reservoir. If so, the permittee would be required to meet its average monthly nutrient limit year-round.

(8) Parameters listed under this column are standards specific to lakes and reservoirs.

4.0 References

The following are citations for key scientific and technical literature used to derive the base numeric nutrient standards. This is not a complete list; rather, it contains the most pertinent citations. Many other articles and reports were reviewed during the development of the standards.

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Suplee, M.W., V. Watson, A. Varghese, and J. Cleland, 2008. Scientific and Technical Basis of the Numeric Nutrient Criteria for Montana's Wadeable Streams and Rivers. Helena, MT: Montana Department of Environmental Quality, 86 p. http://deq.mt.gov/wqinfo/standards/NumericNutrientCriteria.mcpx

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Nicklin Declaration
EXHIBIT 6

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
_____	)	

DECLARATION OF DR. MICHAEL NICKLIN IN SUPPORT OF RESPONDENT INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Michael Nicklin, PhD, PE, declare under the penalty of perjury as follows:

1. I, Michael E. Nicklin, am a Registered Professional Engineer with about 35 years of professional experience in civil engineering, hydrology, hydrogeology, water resources, and environmental sciences. I have B.S. degrees in Geology and Civil Engineering, an M.S. degree in Water Resources, and a PhD in Civil Engineering with an emphasis in surface water and groundwater hydraulics. I am the principal and owner of Nicklin Earth & Water, Inc., which I founded in 1995. After working as a hydrogeologist at the Montana Bureau of Mines and Geology from 1976 to 1978, I attended Montana State University to attain my PhD. During that time, I served as an Instructor and Research Assistant at the University and taught undergraduate courses in Engineering Mechanics. In 1983, I joined the faculty at the University of Nebraska-Lincoln as an Assistant Professor, where I taught collegiate and graduate courses in Fluid Mechanics, Hydrology, and Optimization Theory. I have published several papers on groundwater flow and am a member of both the Association of Ground Water Scientists and Engineers and the American Society of Civil Engineers.

2. I specialize in using computer simulation methodologies to simulate groundwater flow, contaminant transport, surface water/groundwater interaction, and water quality in streams. I have applied these methodologies to evaluate the hydrologic consequences of mining throughout Montana, as well as a variety of other sites from gasoline service stations to contaminated sites on the National Priority List.

3. I am familiar with Western Energy Company's ("Western Energy's") Rosebud Mine and with Rosebud Strip Mine Area B Permit Number C1984003B issued to Western Energy on December 4, 2015 ("AM4 Permit"). The Rosebud Mine is located near Colstrip, Montana and supplies coal to the nearby Colstrip Power Generating Station. I have conducted groundwater modeling and reviewed multiple sources of data on hydrology and the general environment on and near the Rosebud Mine. I understand the hydrological consequences associated with the AM4 Permit.

4. The methodology I have employed in my evaluation of the hydrologic consequences of mining at the Rosebud Mine is based upon well-accepted principles of hydrology. They have been tested and subjected to peer review and these principles of hydrology have been employed in many publications. In developing my opinions, I have relied facts and data that hydrologists, engineers and other experts in this field rely upon.

5. In my capacity as principal and owner of Nicklin Earth & Water, I evaluated the probable hydrologic consequences of the proposed AM4 Permit on the proposed mine plan area and adjacent areas. My determinations are included in the "Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B, and C" ("PHC") submitted as part of Western Energy's AM4 Permit application. I was assisted by professional staff members in the development of the PHC. I have reviewed and confirmed their work.

6. I also helped prepare components of several of Western Energy's responses to deficiency notices from the Montana Department of Environmental Quality ("DEQ").

7. After DEQ issued its fourth round of technical comments, DEQ requested that Western Energy update the PHC. I was hired to perform that task. To that end, I developed a regional groundwater model (Rosebud Mine model) which was used to evaluate the hydrologic impacts of AM4 on the surrounding areas; the Rosebud Mine model was applied to characterize the Rosebud Mine area as a whole; the Rosebud Mine model was also applied at a smaller scale to evaluate the localized impacts of AM4. Results from two modeling efforts using the Rosebud Mine model are included in the PHC. *See* PHC Attachment D ("Rosebud Mine Groundwater Modeling Report"); PHC Attachment E ("Area B-AM4 [Amendment Application 00184] Groundwater Model Report").

8. I have submitted several supplements to the PHC in response to comments and questions posed by the DEQ.

9. On July 23, 2013, DEQ issued its fifth round of technical comments to Western Energy requesting additional information about AM4's hydrologic consequences. I collected information responsive to DEQ's inquiry, which Western Energy submitted to the Department on November 1, 2013.

10. DEQ issued two more rounds of comments and deficiencies between 2013 and 2015. I collected information and data in response to each deficiency letter. Western Energy submitted that supplemental information to DEQ.

11. On June 3, 2014 DEQ issued a deficiency letter requesting a water balance study and an aquatic life survey. It also asked for more information about the use of lignin sulfonate at the

mine for dust control on mine roads. Further evaluations of the aquatic life and lignin sulfonate were conducted respectively by Penelope Hunter and William Schafer PhD.

12. I included the aquatic life survey and the evaluation of lignin sulfonate in the PHC Addendum. The PHC Addendum also addressed AM4's potential impact on the alluvium of East Fork Armells Creek. Western Energy submitted the PHC Addendum to DEQ in February 2015.

13. The PHC provides information which can be used to develop a number of conclusions regarding the following: (1) whether drainage from AM4 would impact Rosebud Creek and its tributaries; (2) whether AM4 mining will, or will not interact, with Section 15 of East Fork Armells Creek; (3) significance or lack thereof of nutrient standards exceedances for nitrogen/nitrate as it relates to East Fork Armells Creek; (4) potential for affecting total dissolved solid concentrations in East Fork Armells Creek; (5) AM4's significance with regard to groundwater classifications; (6) the migration of spoil groundwater from AM4 to EFAC; (7) potential for AM4 to dewater East Fork Armells Creek; (8) assessment of the potential that AM4 could result in violations of water quality standards; (9) whether AM4 will cause migration of spoils water toward East Fork Armells Creek; and (10) whether there is an interaction between AM4 and proposed Area F.

Neither Surface nor Groundwater Will Move from AM4 into the Rosebud Creek Drainage; There Will be No Damage to Water in the Rosebud Creek Drainage.

14. Surface water from AM4 will not drain into Rosebud Creek. All surface water drainage from AM4 flows north toward East Fork Armells Creek. *See* MPDES Permit No. MT0023965. According to information in this permit, all AM4 surface water will be directed to engineered sediment ponds. None of the flow will be directed to Rosebud Creek or its tributaries, including Lee Coulee and Emilee Coulee.

15. All of the AM4 mining is designed to occur within the East Fork Armells Creek drainage. A small volume of surface water runoff from Area B extension (west of AM4) occurs within the Lee Coulee drainage. Any of this surface water runoff from Area B extension's southern edge is prevented from flowing toward Rosebud Creek and its tributaries by sediment ponds that are designed to contain surface water from Area B. The sediment ponds in Area B extension located in the Lee Coulee drainage are much larger than are needed to collect a 10 year 24-hour storm. Hence, there is very little risk of surface water runoff reaching Lee Coulee and/or Rosebud Creek. The following photo depicts one of these sediment ponds.

16. Again, runoff from the mine is captured in these sediment ponds. Any potential discharge from the ponds is monitored to ensure that it meets water quality standards so as not to degrade any surface water down-gradient of those ponds. Furthermore, the water quality is equal to or better than what naturally occurs in the streams in the area and in the groundwater. Thus, a

discharge from the sediment ponds will not diminish water quality either in groundwater or in surface water.

17. Groundwater movement from AM4's mining spoils is prevented from seeping into Lee Coulee by a groundwater drainage divide located south of AM4. Groundwater seepage from north of this divide is directed toward East Fork Armells Creek whereas seepage south of this divide is directed toward the Rosebud Creek drainage (including its tributaries Lee Coulee and Emile Coulee). AM4 is some distance away from the edge of the divide, so no spoils from AM4 will seep into the divide.

18. Even in the very remote possibility that some groundwater would somehow make its way to any of the Rosebud Creek drainage, the rate and volume would be so limited that groundwater from the area would not be detectable in the alluvium or surface waters of the Rosebud Creek drainage.

19. In summary, based upon data and information assembled in this permitting process, it is my opinion that (i) neither surface water nor groundwater from AM4 will flow to the Rosebud drainage, and (ii) even if somehow some groundwater from AM4 made its way into the Rosebud drainage, the groundwater would not have a material effect and would not be detectable in the surface or groundwater (i.e., alluvium) of these streams.

20. Neither the uses of water in the Rosebud drainage nor applicable water quality standards for Rosebud Creek will be affected by the AM4 mining.

AM4 Effects Will Not Interact With Section 15 of East Fork Armells Creek.

21. Petitioners argue that AM4 will dewater intermittent segments of Section 15 of East Fork Armells Creek. But in fact, AM4 will not interact with, and will have no impact on, Section 15. The projected AM4 mine passes are located over two miles downgradient from Section 15.

22. Figure E-5 of Attachment E to the PHC demonstrates that any drawdown in water due to AM4 is highly localized, meaning that any significant drawdown will be limited to the immediate vicinity of AM4. No drawdown associated with AM4 mining will reach Section 15. The same figure demonstrates that Area C—which is located between AM4 and Area F—will not experience drawdown in water levels due to AM4.

23. I have reviewed the data provided by Petitioners in support of their assertion that Section 15 is intermittent, namely citations from a 30-year-old probable hydrologic consequences report. To the extent that the channel showed temporal wet conditions, or intermittent conditions, other potential contributing factors include cumulative years of above average precipitation that preceded the observations described in the 1986 PHC for Section 15; a pond is documented up-gradient (Section 8) and, an embankment exists in the vicinity of this so-called intermittent reach in Section 15 (DEQ CHIA). Ponding of storm water runoff leads to recharge to the alluvium, which in turn, may lead to "intermittent" flow. I also understand that surface flow occasionally occurs in this portion of the stream. Hence, it is unclear if the conditions described for Section 15 in the 1986 PHC are purely indicative of natural intermittent conditions.

24. It is noteworthy that the 1986 PHC states that the flow ranges from no flow to flows up to 30 gpm. Note that 30 gpm is approximately 3 garden hoses of flow. It is also noteworthy that flow has been observed recently in Section 15. Thus, at times it flows and other times it does not; it has not even been confirmed that this reach has even been affected by mining. See Photographs in Exhibit A to my declaration which shows surface water present in the reach of

question collected during an East Fork Armells Creek Benthic Survey conducted in September 2015.

25. Finally, while AM4 will not impact Section 15, one should recognize that mining in this part of Montana will cause some localized drawdown in groundwater. But evidence of past mining at the Rosebud Mine demonstrates that groundwater level declines are followed by recovery. Hence, there is no permanent damage to groundwater supplies. For example, alluvial groundwater levels just downgradient of Section 15 declined during mining that primarily occurred during the 1980s through the mid-1990s. Groundwater levels have recovered their prior levels in this area of East Fork Armells Creek. Intermittent flow conditions have returned to those portions of East Fork Armells Creek. *See* PHC Addendum Attachment 2, Fig. 2 (illustrating recovery of groundwater levels in wells). Observation well WA-209 did exhibit drawdown which is likely associated with mining. Groundwater levels will recover in this area. It is noteworthy that this well has been reported to be dry in recent years, but, very recently began to show signs of such recovery. In fact, groundwater was recently observed in this well on March 16, 2016. In essence, this serves as evidence that alluvial groundwater levels are showing recovery in the vicinity of Section 15.

26. In summary, based on the data and information assembled in this permitting process, (i) the mining in the area of AM4 will exhibit localized drawdown and will not dewater areas in Section 15; and (ii) a decline in groundwater levels caused by mining is not permanent. Again, as seen in down-gradient portions of EFAC, alluvial groundwater levels recover after mining is completed (See PHC Addendum, Attachment 2, Figure 2) Hence, for all these reasons, mining in AM4 will not cause any material damage to groundwater or surface water in Section 15.

AM4 Does Not Pose a Risk of Nitrogen Contamination to East Fork Armells Creek.

27. There is no evidence that AM4 will increase nitrogen/nitrate in East Fork Armells Creek. Although some local/temporal increases in nitrate plus nitrite nitrogen are seen in mine spoils when they are first saturated, the potential for material impacts on the groundwater quality of EFAC is remote. To this day, not a single surface water sample in the surface water of East Fork Armells Creek collected up-stream (west) of Colstrip has exhibited a nitrate plus nitrite concentration above the 10 mg/L standard (between mine Areas A, B and C). Yet, downstream of Colstrip, a location identified as SW-01, exhibited 12 samples (all collected from 1980 through 1990) showed nitrate plus nitrite nitrogen concentrations above the 10 mg/L standard. It is noteworthy that this location is downgradient of Colstrip's wastewater treatment plant and also downstream of residential/commercial lawns of Colstrip which are common sources of nitrate plus nitrite nitrogen. Further north yet is a golf course, another common source of nitrate.

28. In an early version of the PHC, Western Energy noted that these levels of nitrogen levels in spoil groundwater, "could possibly be due to dissolved residuals from ammonium-nitrate explosives" used at the mine. PHC at 53. Again, such changes tend to be localized within mine spoils, and they are temporary. Moreover, given the low rate and volume of groundwater seepage within the mine spoil compared to the alluvium groundwater flow rates, it is highly unlikely that these nitrogen levels cause either a violation of water quality standards or change the use of any stream or groundwater outside the permit area. There is another potential source of nitrate at well location WS-100. The well is located very near a tree which provides shade for cattle. It is reported by Western Energy that numerous cattle congregate under this tree during hot summer days. The well is very shallow being only 27 feet deep. Shallow wells are commonly impacted by nitrates. Hence, the actual source of the nitrate may not even be associated with explosives at this location, but more likely, is associated with livestock.

29. In summary, there is no basis to believe that AM4 will increase nitrogen/nitrate in East Fork Armells Creek or in groundwater outside the permit area to any statistically discernible level.

Any Increase in Total Dissolved Solids in East Fork Armells Creek is not Significant and Will Have No Discernible Impact on East Fork Armells Creek.

30. Total dissolved solids is a measure of the degree of mineralization of the water by dissolved constituents such as sulfate, bicarbonate, magnesium and calcium. Based on my research, groundwater flow from the vicinity of AM4 will not cause a significant increase in total dissolved solids in East Fork Armells Creek.

31. Discharges from outfalls into the stream will not cause any increase in total dissolved solids in the East Fork Armells Creek alluvium. In fact, on average, discharges from the mine's outfalls have *lower* total dissolved solids than in the alluvium of East Fork Armells Creek. *See e.g.* PHC Addendum, Attachment 1 at 22. I have estimated that a reach between Area A and Area B is projected to see a 13 percent increase in the total dissolved solids as a result of permitted mining in both areas Area A and B over the baseline (i.e., background concentration) once groundwater levels recover. *See* PHC Addendum – Attachment 1 at 26. However, such an increase is not significant relative to the natural variability of total dissolved solids in East Fork Armells Creek alluvium.

There will be no net increase in the projected Total Dissolved Solids concentration as a result of AM4 mining.

32. The 13 percent increase that is projected is based upon current mining conditions at Area A and B. The concentrations in spoil water is projected to reach equilibrium concentrations with time. That same equilibrium concentration is projected to be about the same in AM4 mine

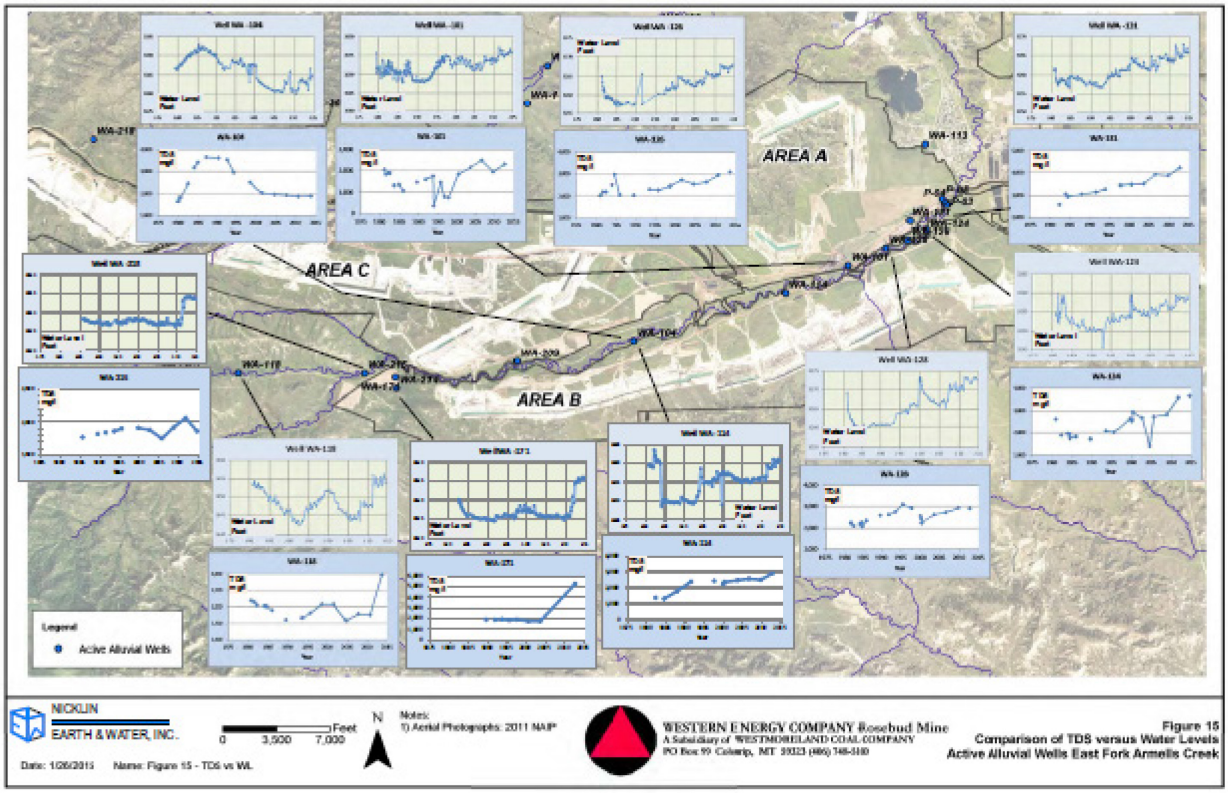
spoils. In effect, there will be no net increase in spoil water concentrations as a result of AM4 mining. Thus, the main effect of mining at AM4 will be simply to increase the duration of time that spoil groundwater will seep toward East Fork Armells Creek alluvium from Area B. In effect, the 13 percent increase that is projected will occur as a result of prior mining, not as a result of mining in AM4.

33. The natural level of total dissolved solids in East Fork Armells Creek and its alluvium vary widely. The projected 13 percent increase in the alluvium is insignificant compared to baseline concentrations given the natural variability of TDS concentrations. In other words, the natural variation in total dissolved solids will mask any impacts from such an increase. For example, as described in Table 16 of the PHC, TDS in the downstream portion of East Fork Armells Creek alluvium varies from a low of 186 milligrams per liter (mg/L) to a high of 11,400 mg/L. The TDS standard deviation of the data set is 1,770 mg/L (downstream section of EFAC). *See* PHC at Table 16, Alluvium Water Quality Statistics Major Ions. An increase of 13 percent over the average baseline concentration of 2,299 mg/L in the alluvium would mean an increase to an average of 2,599 mg/L (once equilibrium is reached). Such a change is well within the range of *natural variation* (e.g., from 186 to 11,400 mg/L in the alluvium of downstream portions of East Fork Armells Creek). It is also well within one standard deviation of the average TDS concentration of the downstream portion of alluvium (i.e., the range using one standard deviation is from 2,314 to 5,854 mg/L).

34. The projected 13 percent increase for the reach of East Fork Armells Creek between Areas A and B associated with mining in these areas will not be significant. Given the wide natural variation in total dissolved solids, this projected 13 percent increase associated with mining to date, and with mining at AM4, will not affect either uses surface water, or,

classification and uses of ground waters. Note that the average classification of the alluvial groundwater between Areas A and B is Class III with a range extending from Class I through Class III.

35. The data demonstrate that recent increases total dissolved solids within East Fork Armells Creek alluvium are caused primarily by increases in groundwater levels. PHC Addendum at 5; PHC Addendum, Attachment 1 at 22. In Figure 15 from the PHC Addendum, I have provided a graphical illustration of the correlation between total dissolved solids and groundwater levels. *See* PHC Addendum, Attachment 1.



36. This figure illustrates how the level of total dissolved solids in East Fork Armells Creek correlates with groundwater levels in the stream. Thus, to the extent that the stream receives greater volumes of water from runoff or other sources and recharges the alluvium, total dissolved

solids in the alluvium of East Fork Armells Creek increase accordingly. Any effect from mining, if it exists, is currently minor in comparison. Presently, there is no discernible evidence that mining to date has caused an increase in total dissolved solids in either the alluvium or surface water of East Fork Armells Creek.

37. In summary, the (i) discharges from outfalls to East Fork Armells Creek will *not* increase total dissolved solids in the stream because discharges from the mine possess equal to, or lower levels of, total dissolved solids compared to what occurs naturally in the alluvium and surface water, (ii) the levels of total dissolved solids naturally vary widely and the estimated 13 percent future increase will not affect uses or cause a water quality standard violation, and (iii) recent increases in total dissolved solids in the East Fork Armells Creek alluvium are primarily a function of increases in groundwater levels.

AM4 Will Not Affect Groundwater Classifications in East Fork Armells Creek Alluvium.

38. Currently, groundwater classification in the East Fork Armells Creek alluvium varies between Class I and Class III. The average classification of the alluvium between areas A and B is Class III. As demonstrated by Table 16 and on page 22 of the PHC Addendum Attachment I, surface water discharged from Areas A and B has a concentration of total dissolved solids that is slightly lower than what naturally occurs in East Fork Armells Creek's alluvial waters. Likewise, the baseline data in Table 5-a of the PHC demonstrate that if surface water is discharged water from AM4, it will contain a concentration of total dissolved solids within the range of total dissolved solids observed in East Fork Armells Creek's surface waters.

39. Groundwater uses in East Fork Armells Creek will not be impaired. As Table 17 of the PHC demonstrates, the uses permitted by each classification overlap. Groundwater classifications for the alluvium range from Class I to Class III prior to mining under baseline

conditions with most being Class II or Class III. *See* Addendum to the PHC at 6. The average classification between Areas A and B is Class III. The slight increase in TDS will not have an impact on these groundwater classifications as the ranges will remain the same as before mining.

40. A majority of groundwater samples from the Rosebud coal stratum is either Class II or Class III groundwater under both baseline and post-mine conditions. A more limited fraction of groundwater samples from the Rosebud coal stratum groundwater have been classified as Class I waters.

Sulfate Variation In East Fork Armells Creek Is Also Very High

41. Table 5-A of the PHC shows that sulfate concentrations of surface water in East Fork Armells Creek are highly variable. The average sulfate concentration is 846 mg/L with a standard deviation of 1,061 mg/L. Likewise, the sulfate concentrations of groundwater in East Fork Armells Creek alluvium are also highly variable. *See* PHC Table 15-b. Changes in sulfate concentrations in alluvium outside the permit boundary in the vicinity of Area B as a result of mining are projected to comparably small and insignificant.

Migration of Groundwater from Spoils Will Not Materially Affect the Water Quality of East Fork Armells Creek Alluvium.

42. Migration of spoils from AM4 will not materially affect the surface water quality of East Fork Armells Creek.

43. Figure 1 of the Attachment 1 to the PHC Addendum delineates the permit boundaries. Comparing the flow and relying on a 1977 Van Voast report, I evaluated the potential for the offsite impacts of AM4 under four scenarios. Scenario 1 defines the baseline calculation. Scenario 2 projects the conditions that were likely during prior (early) mining. Scenario 3 represents the current mine conditions. And Scenario 4 projects post-mine conditions.

44. Under scenario 3, the water balance shows that presently groundwater from Area B is not flowing toward East Fork Armells Creek. This is shown by Attachment 1, Figure 13 to the PHC Addendum. In effect, mining to the south of East Fork Armells Creek creates a cone of depression which draws the spoils groundwater toward the mine pit. The spoils water from Area B does not reach East Fork Armells Creek or the alluvium. Nor is mining in Area B a factor responsible for the recent changes in TDS observed in alluvial groundwater of East Fork Armells Creek.

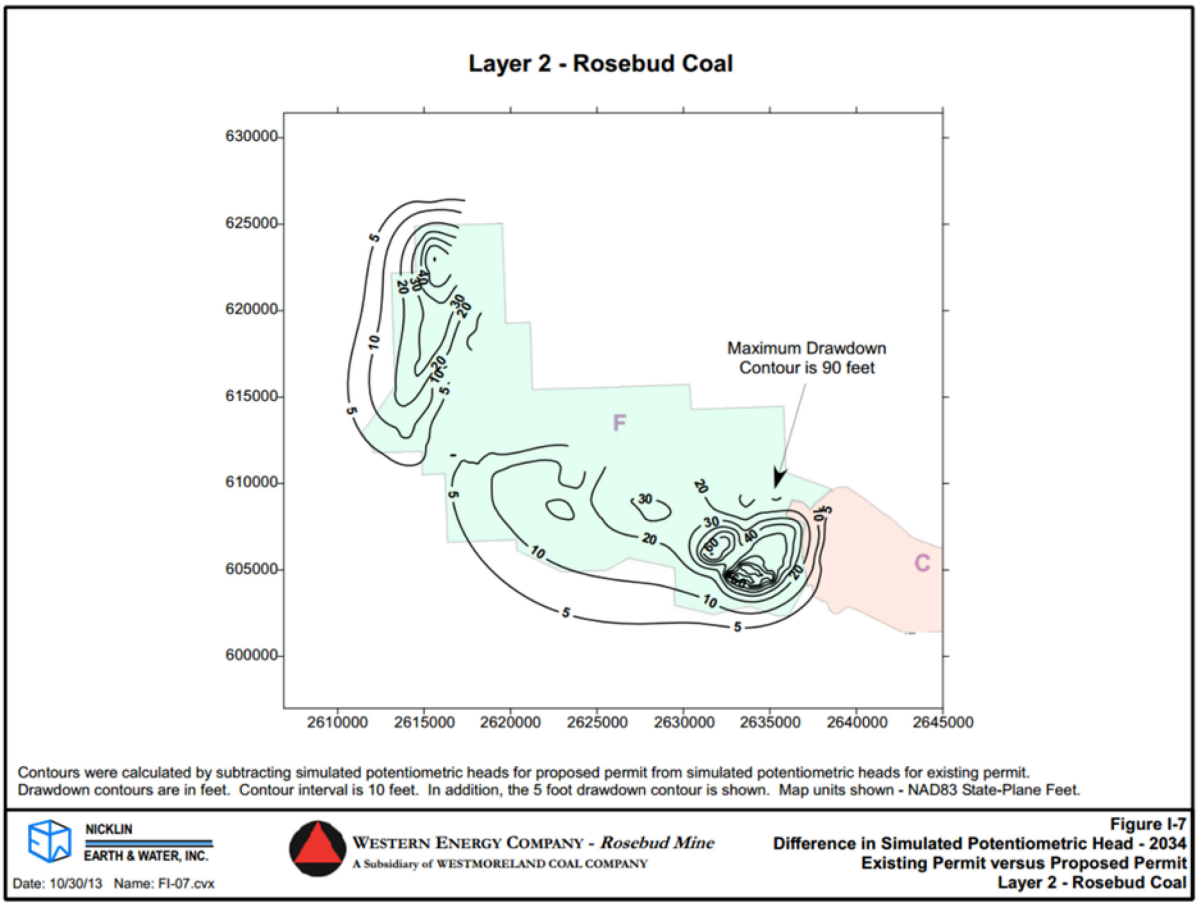
45. The data plotted in figure 15 demonstrate that the primary factor causing an increase in total dissolved solids in East Fork Armells Creek alluvium involves increases in groundwater levels, not mining. There is a strong correlation between increased observed groundwater level changes and total dissolved solids in East Fork Armells Creek. *See* PHC Addendum, Attachment 1, Figure 15.

46. Scenario 4 projects the post-mining conditions of East Fork Armells Creek alluvium. After mining, the spoil TDS concentrations will reach an equilibrium point. Eventually groundwater levels will recover leading to groundwater flowing from mined areas toward the East Fork Armells Creek alluvium. The mass balance calculations are then used to project the effect the relative change in alluvium TDS concentrations when groundwater levels recover.

47. In summary, based upon current observations, it is unlikely that (i) groundwater from Area B spoils will flow to East Fork Armells Creek alluvium when mining occurs in AM4, and (ii) eventually, after mining, groundwater will flow toward East Fork Armells Creek alluvium and reach the equilibrium described above.

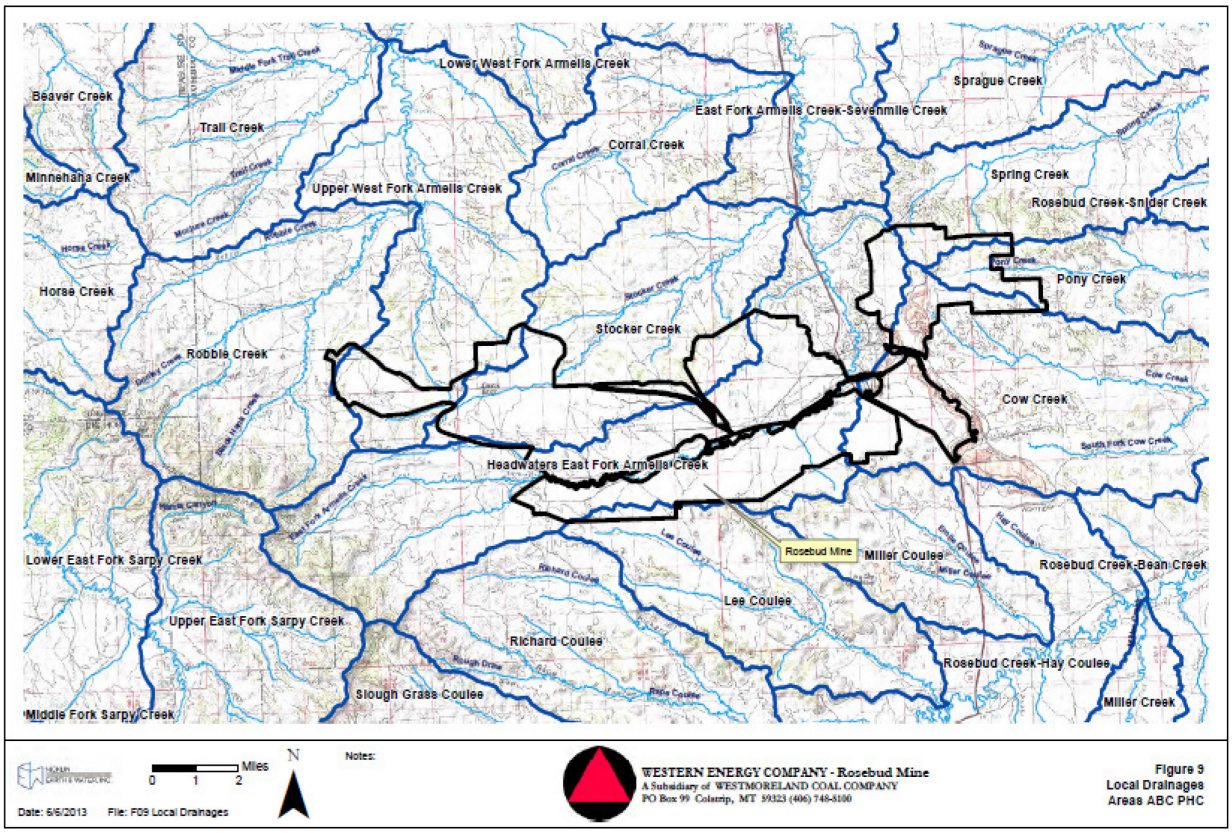
AM4 Will Not Interact With, Let Alone Impact, Area F

48. Groundwater effects associated with AM4 will not interact with those of Area F. Area F is located more than 10 miles from AM4. Figures E-5 and E-9 of Attachment E of the PHC shows that the drawdown impacts of AM4 will be highly localized. Figure I-7 of the PHC for Area F, which has been submitted to DEQ and was provided to Petitioners, shows that the drawdown effects of Area F are localized and solely due to mining in Area F. These figures show that groundwater from AM4 will not impact or interact with groundwater from Area F.



49. Surface water drainage and groundwater flow from the vicinity of Area B (including AM4) does not and will not interact with that from Area F (see Exhibit B to this declaration). Most portions of surface water in Area B flow into East Fork Armells Creek. No surface water from Area B flows into West Fork Armells Creek. Most portions of groundwater in the vicinity

of Area B flow toward East Fork Armells Creek. No groundwater from Area B flows toward Area F. Area F surface water flows to the north and into West Fork. None flows toward East Fork Armells Creek. Groundwater beneath Area F flows to the north generally following along the axis of West Fork Armells Creek. None flows toward and into Area B. *See* Groundwater Model Report, Attachment D; Attachment GM-B; Figure 9 of the PHC.



50. The point of confluence (where the streams join) between East Fork Armells Creek and West Fork Armells Creek is about 14 miles north of the mine, and 17 miles from the edge of the Area B permit area. This is far outside the cumulative impact area. By the time the waters do join, the water will be dominated by contributions from other portions of each of the East Fork Armells Creek and West Fork Armells Creek drainages. Any potential changes associated with AM4, in the unlikely event they occur, would not be discernible. There will be no material

interactive impact associated with mining at AM4 for down-gradient surface waters of East Fork Armells Creek, West Fork Armells Creek or in Armells Creek (after confluence of West and East Forks).

51. In summary, any potential impacts from mining in Area B will not interact with potential impacts of Area F leading to any material effects, from either a surface water or groundwater perspective.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 7/22, 2016.

s/ Michael Nicklin

NICKLIN DECLARATION
EXHIBIT A

PHOTOGRAPH 3: EAST FORK ARMELLS CREEK #3 (WEST) LOOKING SOUTH SOUTHEAST FROM THE EXTENT OF SURFACE WATER. 9/24/2015; N 45.843908 W 106.754457

PHOTOGRAPH 4: EAST FORK ARMELLS CREEK #3 (WEST) LOOKING NORTHWEST. 9/24/2015; N 45.843165 W 106.753972

NICKLIN DECLARATION
EXHIBIT B

West Fork
Armells Creek Drainage

East Fork
Armells Creek Drainage

Rosebud Creek
Drainage

Area F

Area C

Area A

Area B

Area D

Area E

Area B AM4

West Fork Armells Creek

East Fork Armells Creek

Rosebud Creek

Legend

Area_B_AM4

USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset, U.S. Census Bureau - TIGER/Line, HERE Road Data

5 Miles

Major Drainages
Vicinity Area B AM4
Rosebud Mine

Schafer Declaration
EXHIBIT 7

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
_____	)	

DECLARATION OF DR. WILLIAM M. SCHAFER IN SUPPORT OF RESPONDENT-INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, William M. Schafer, PhD, declare under the penalty of perjury as follows:

1. I, William M. Schafer, am a scientist with over 35 years of work in the environmental field, including experience in environmental geochemistry, hydrology, and soil science. I earned my Bachelor of Science in Watershed Science from Colorado State University, my Masters in Soil Science from the University of California at Davis, and my Ph.D. in Soil Science from Montana State University. I am the founder and principal of Schafer Limited LLC, an environmental consulting practice that specializes in environmental geochemistry, vadose zone and surface water hydrology, and soil science.

2. I served on the faculty at Montana State University from 1976 to 1985, first as a research scientist specializing in land reclamation research on coal-mined lands in the Northern Great Plains, and then as a state soil scientist with the Montana Agricultural Experiment Station and the Extension Service. I also taught courses at Montana State University on mine reclamation. Since 1985, I have taught short courses on a number of subjects, including mine closure, acid rock drainage prediction, and the groundwater impacts of petroleum exploration, to name a few. I have also authored or co-authored well over 50 articles and publications on hydrology, geochemistry, and soil science.

3. In addition to teaching, I have also served as project manager or technical director for over 200 projects involving the environmental aspects of mining. This includes work for numerous state and federal agencies including the Montana Department of Environmental Quality ("DEQ"), the United States Forest Service, the Bureau of Land Management, and the Bureau of Mines. I have attached a more extensive summary of my experience and qualifications to this Affidavit.

4. I am familiar with Western Energy Company's ("Western Energy's") Rosebud Mine and with Rosebud Strip Mine Area B Permit Number C1984003B issued to Western Energy on December 4, 2015 ("AM4 Permit"). The Rosebud Mine is located near Colstrip, Montana and supplies coal to the nearby Colstrip Power Generating Station. I have reviewed water quality records collected and maintained by Western Energy and data collected by the United States Geological Survey as part of its surface water monitoring program for the entire state, which includes data on East Fork Armells Creek, Rosebud Creek, and their tributaries. I understand the hydrological consequences associated with the AM4 Permit.

5. On June 3 2014, DEQ issued its Seventh Round Acceptability Deficiency. The Coal Bureau expressed concerns that increasing levels of chloride in East Fork Armells Creek were due to the use of magnesium chloride to suppress dust. I evaluated whether using calcium lignin sulfonate as an alternative would increase levels of sulfate in East Fork Armells Creek, and concluded, based on the solubility of calcium lignin sulfonate and its likelihood to degrade, that it would not have a measureable effect on East Fork Armells Creek. *See* Addendum to the Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B and C ("PHC"), Attachment 3.

I evaluated these impacts and provided that information to Western Energy, which in turn submitted my data to DEQ as part of the Addendum to the Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B, and C.

The Water Discharged from the Rosebud Mine has Equivalent or Lower Concentrations of Pollutants than the Naturally Occurring Water in East Fork Armells Creek.

6. I have also evaluated the impact of discharges from outfalls permitted under the Montana Discharge Elimination System permit renewal for permit Number 0023965 held by Western Energy Company. Although that permit is not specific to AM4, it governs discharges from the Rosebud Mine, which includes AM4.

7. I ran statistical (Mann-Whitney) tests to assess differences between the mine's effluent water quality and the quality of water flow in East Fork Armells Creek, West Fork Armells Creek, and Rosebud Creek (the "receiving waters"). The data demonstrated that the quality of water discharged from the Rosebud Mine does not statistically differ from the receiving waters, and what little difference might exist would certainly not cause harm to the streams or their uses.

8. In the few instances where mine discharges differ in quality from the receiving streams, the mine's effluent has a lower concentration of relevant pollutants than the receiving waters. For instance, the tests showed that sulfate and total dissolved solids were lower in the mine's discharges than in East Fork Armells Creek; only the concentration of selenium was higher in the effluent than in East Fork Armells Creek, but I concluded that it would not have a material effect on East Fork Armells Creek. Likewise, tests of outfalls located in Rosebud Creek found that effluent had the same concentrations of total dissolved solids and electrical conductivity as Rosebud Creek itself—only sulfate was higher.

9. These permitted discharges do not have a negative impact on uses of surface water including fish or wildlife downstream from the discharge or irrigation use of Rosebud Creek.

10. The Montana Department of Environmental Quality reports on the status of stream segments in Montana regarding their attainment of water quality standards. In the most recent report (MDEQ 2016), Lower East Fork Armells Creek (the reach of East Fork Armells Creek from Colstrip to the confluence with the Yellowstone River) was reported to have elevated specific conductance and total dissolved solids, total nitrogen, nitrate plus nitrite as nitrogen and chloride. *See* Assessment Unit MT42K002_110, Appendix A, page 164.

11. As was discussed previously, discharge water from the mine is lower in TDS and specific conductance than average levels in East Fork Armells Creek. As a result, the mine is not a potential cause of increases in these constituents in East Fork Armells Creek.

Any Increase in Nitrogen in East Fork Armells Creek is Likely Due to the Local Municipal Wastewater Treatment Facility, lawn fertilizers, and/or the Presence of Cattle, Not to Mining.

12. Some activities at the mine have the theoretical potential to increase nitrogen and nitrate loading in East Fork Armells Creek. Blasting operations, such as those used at mines, typically utilize a combination of ammonium nitrate and fuel oil to break up overburden. If blasting is not conducted properly, some nitrate can remain in the overburden and be leached into groundwater and/or stormwater. However, monitoring results of effluent from the mine demonstrate that stormwater discharge is not contributing nitrogen and nitrate to East Fork Armells Creek (based on water quality records from Rosebud Mine).

13. Instead, the source of nitrogen causing elevated levels of total nitrogen and nitrate in East Fork Armells Creek is likely the local municipal wastewater treatment facility, the presence of cattle grazing and watering near East Fork Armells Creek, or some combination of the two.

Municipal wastewater treatment facilities would be expected to release nitrate in their discharge water. The local facility would affect Lower East Fork Armells Creek and not Upper East Fork Armells Creek. This effect is consistent with the data. The presence of cattle grazing and watering near East Fork Armells Creek is another likely source of nitrogen. Both urine and manure release abundant ammonia as they decompose, which then can readily convert to nitrate in riparian soil or surface water.

The Confluence of Water from East Fork Armells Creek and West Fork Armells Creek 17 Miles North of the Mine Site Will Not Have an Effect on Armells Creek's Water Quality.

14. East Fork Armells Creek joins the West Fork about 17 miles north of Colstrip. The Mine, and specifically AM4, is not likely to cause a measurable impact on water quality in either the drainage or on the mainstem of Armells Creek. My analysis considered two time periods: operational and post-closure.

15. During mine operations, discharges from the mine have similar to lower concentrations of most constituent pollutants than East Fork Armells Creek. As such, any discharge would, on average, cause either no change or an improvement in water quality parameters at the downstream point where East Fork and West Fork join.

16. After mine closure, the water levels in the overburden will slowly rise and according to the PHC, some water will discharge to alluvium of East Fork Armells Creek. The net effect of these discharges is predicted to increase the average TDS by about 13 %. *See* PHC Addendum Attachment 1 at 26; PHC Table 16. The TDS levels in East Fork Armells Creek naturally exhibit a wide range in TDS levels (Figure 1) so that the actual effect of the increased alluvial groundwater contribution will vary. During periods when TDS in East Fork Armells Creek is lower than in the alluvial groundwater, the TDS in East Fork Armells Creek will increase. During periods when TDS in East Fork Armells Creek is higher than in the alluvial groundwater,

the TDS in East Fork Armells Creek will decrease. So the overall effect is to reduce the range in TDS levels – increasing the minimum TDS but also decreasing the maximum observed TDS in East Fork Armells Creek. Since any impact to wildlife or livestock use would be associated with high TDS, the increased alluvial discharges would actually improve quality by decreasing the peak TDS values that now occur naturally. Therefore, despite the increase in average TDS the Rosebud Mine is not expected to have an adverse water quality effect at the point where East and West Fork join after mine closure.

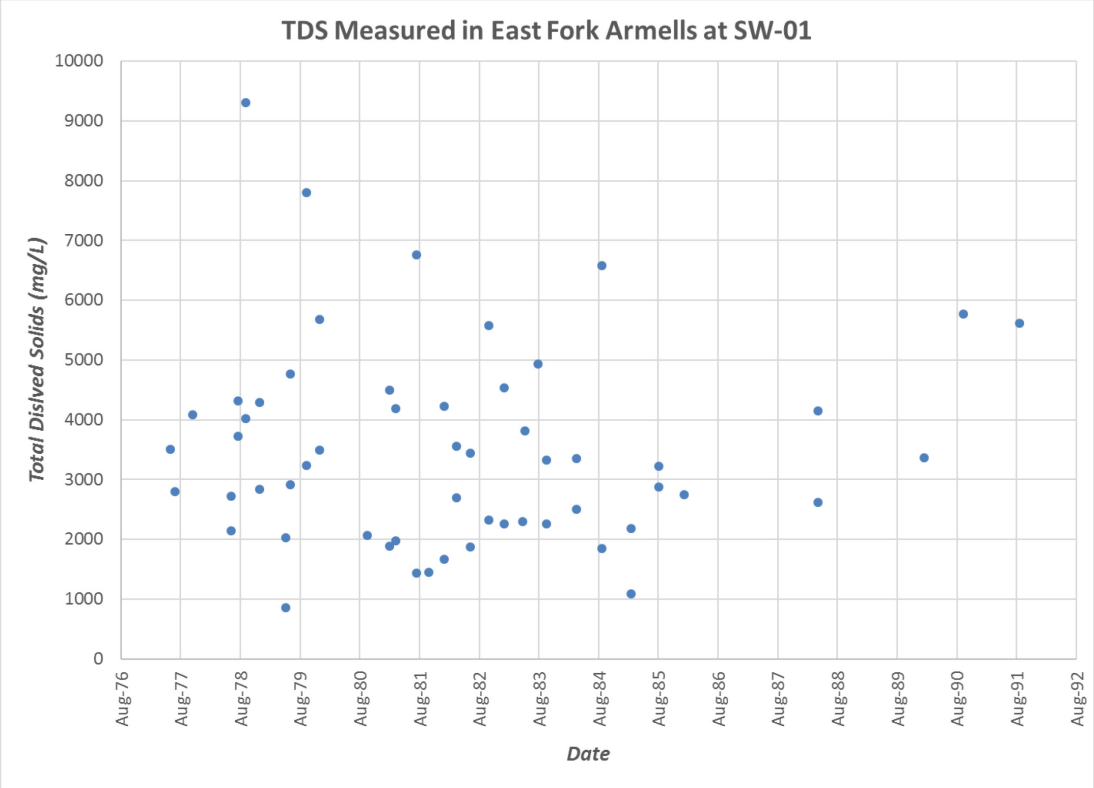


Figure 1. Total Dissolved Solids in East Fork Armells Creek at SW-01.

Discharge from AM4 Will Not Degrade Rosebud Creek.

17. I understand that some have suggested that Western Energy cannot meet the Water Quality Standards for electrical conductivity ("EC") for tributaries to Rosebud Creek. Tributaries

to Rosebud Creek have an EC limit of 500 uS/cm. *See* ARM 17.30.670. The reason that the EC limit is so challenging is that all area surface waters, including Rosebud Creek itself, have natural background EC levels that are higher than 500 uS/cm water quality limit. *See* Figure 2 (below). For example, a graph of EC from various monitoring stations on Rosebud Creek show that EC in Rosebud Creek averages around 1,000 uS/cm on the uppermost station near Kirby and that stations in the middle reaches of Rosebud Creek above Colstrip have average EC values of around 1,500 uS/cm. By the time Rosebud Creek reaches the Yellowstone River, its average EC is around 2,000 uS/cm. The gradual increases in EC from the upper to lower reaches of Rosebud Creek indicate that tributary flows have higher EC values than the mainstem, which accounts for the EC increase. Therefore, discharge of waters from the mine site, given that their TDS and EC values are not significantly different than Rosebud Creek, would not cause any degradation of water in Rosebud Creek.

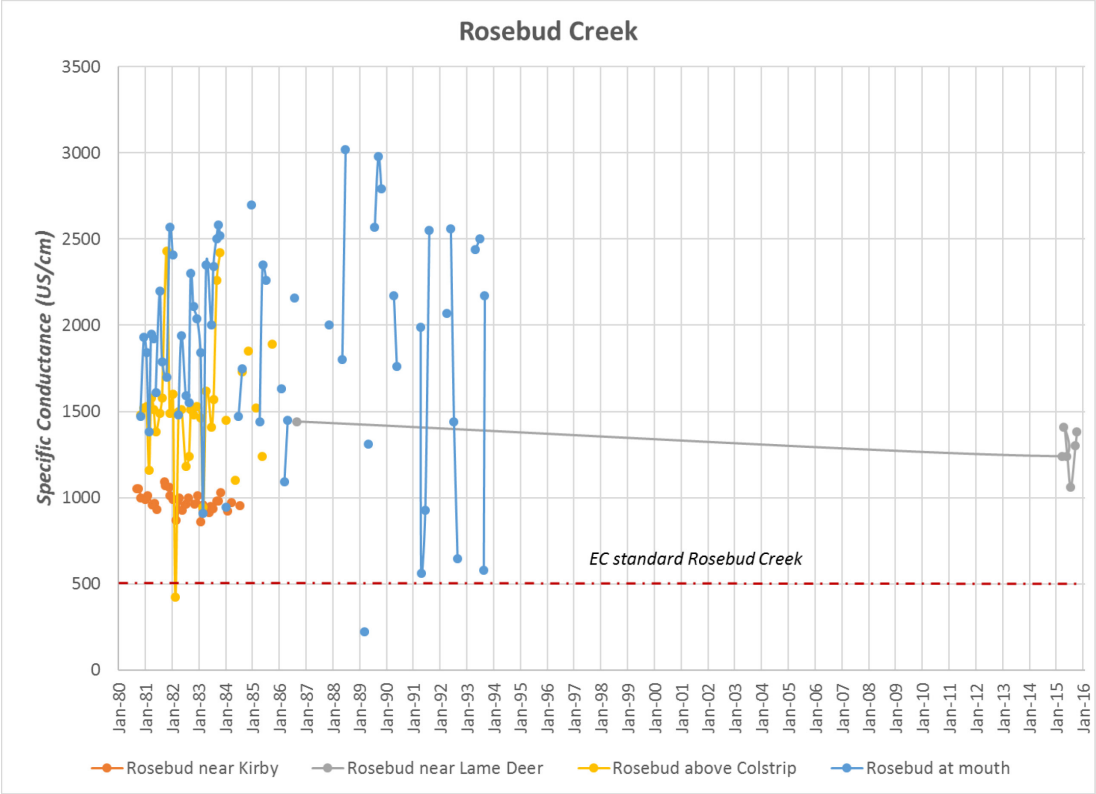


Figure 2. Specific Conductance in Rosebud Creek at upstream and downstream locations.

18. As such there is no evidence that effluent from the Mine would cause a change in total dissolved solids or electrical conductivity in Rosebud Creek or its tributaries. Data indicate that the effluent from the mine is equal to or lower in dissolved solids and electrical conductivity than in streams within the Rosebud drainage.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 20, 2016.

William M. Schafer

/s/ William Schafer

References

I. MDEQ. 2016. Montana Draft - 2016 Water Quality Integrated Report.

Noel Declaration
EXHIBIT 8

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
_____	)	

DECLARATION OF JESSE NOEL IN SUPPORT OF RESPONDENT-INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Jesse Noel, P.E., declare under the penalty of perjury as follows:

Background

1. I, Jesse Noel, am a Registered Professional Engineer with 21 years of professional experiencing in mining engineering and environmental engineering, including hydrology. I have a B.S. in Environmental Engineering and a M.S. in Mining Engineering, with a focus on mine waste management. I am registered with the State of Montana as both a Professional Engineer and a Surface Mine Foreman.

2. Since October of 2013, I have been employed by Westmoreland Resources, Inc. as an Engineering Manager at the Absaloka Mine. In this position, I manage the environmental and engineering departments, which together are responsible for the design and permitting of all phases of the mining life. Prior to starting in my current position, between December 2012 and October of 2013, I worked at the Absaloka Mine as the Production Manager.

3. Between July of 2009 and December of 2012, I was employed as an Engineering Manager by Western Energy Company ("Western Energy"), a subsidiary of Westmoreland Resources, Inc., at the Rosebud Mine. In this position, I was responsible for the engineering and

environmental departments, which included responsibility for obtaining and complying with all required permits and ensuring the environmental and safety goals of the mine were met.

4. Prior to serving as the Engineering Manager at the Rosebud Mine, I had previously worked at the mine between 1997 and 2004 as a Mining Engineer and Surveying Supervisor. In this position, my projects included hydrologic design, mine plan design, and Post-Mining Topographical (PMT) design. In 2005, one of my PMT designs received a reclamation award from the Montana Office of Surface Mining.

June 13, 2012, Comment Letter to the Department of Environmental Quality

5. On June 13, 2012, I submitted a comment letter on behalf of Western Energy to the Montana Department of Environmental Quality (DEQ) ("Comment Letter"). I certify that a true and correct copy of the Comment Letter is attached as Exhibit A.

6. The Comment Letter was submitted in response to the DEQ's solicitation for public comments on its draft Montana Pollutant Discharge Elimination System (MPDES) Individual Permit to Western Energy Company for the Rosebud Mine ("Draft MPDES Permit").

7. Over the course of my career, I have had occasion to submit comments to state and federal agencies on numerous draft permits, including other discharge elimination system permits. Public comments are an important piece of the permitting process insofar as they provide an avenue for the project proponent, as well as any other interested parties, to provide relevant information to inform the agency prior to a final agency action.

8. The Draft MPDES Permit was prepared to provide coverage for all discharges associated with the Rosebud Mine, and was not specific to Western Energy's application for a fourth amendment to the Rosebud Strip Mine Area B Permit ("AM4 Permit"), which had not yet been

deemed "acceptable" by DEQ. For this reason, the Comment Letter was not specific to the AM4 Permit area, nor was it fully known at the time the extent to which the proposed operations in the AM4 Permit area would have an interaction with the surface waters covered by the Draft MPDES Permit.

9. The Comment Letter was based on my technical review of the Draft MPDES Permit, my understanding of hydrology and principles of environmental and mining engineering, and my knowledge of the Rosebud Mine and its surrounding environment. Additionally, as noted in the comment letter, my review was supported by third-party technical analyses of the Draft MPDES Permit by Dr. William Hartsog, a specialist in surface water hydraulics and sediment transport, Michael Nicklin, of Nicklin Earth & Water, Inc. and KC Harvey Environmental, LLC.

10. One of the issues raised in the Comment Letter related to the effluent limitations in the Draft MPDES Permit for Electrical Conductivity (EC). EC means the ability of water to conduct an electrical current at 25° C. The EC of water is a function of the amount of total dissolved solids (TDS) in the water and is expressed as microSeimens/centimeter (µS/cm) or microhos/centimeter (µmhos/cm). Given the relationship between EC and TDS, correlations are commonly used to relate the two parameters. For example, one 1999 study calculated the correlation as EC = 1000*TDS/640 (Hanson et. al., 1999).

11. In the Comment Letter, Western Energy noted that the effluent limitation was not consistent with the effluent limitation in the Draft MPDES Permit for TDS. Had the DEQ calculated the EC limit for the Draft MPDES Permit based on the TDS effluent limit, the EC limit would have been nearly ten times higher. Instead of calculating the EC limit based on the TDS effluent limit, the DEQ incorporated EC limits from ARM 17.30.670, which set numeric Water Quality Standards (WQS) for EC for the mainstems of Rosebud Creek, the Tongue,

Powder, and Little Powder rivers, and all tributaries and surface waters within the watersheds of these rivers and creeks.

12. Also noted in the Comment Letter, was that the Draft MPDES Permit effluent limitation for EC was lower than the naturally occurring EC levels found in effluent samples from some of the receiving waters subject to the permit. This was problematic, given Western Energy's understanding at the time, based on Montana Code 75-5-306(1), that it would not be required to treat discharges to a purer condition than that which was naturally occurring in the receiving water.

13. Based on these issues, I stated in the Comment Letter that "[g]iven these factors, it would not be likely that [Western Energy] could comply with the proposed limits using the proposed [Best Practicable Control Technology Currently Available (BPCTCA)]."

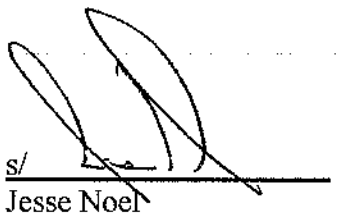
14. At the time I wrote the Comment Letter, Western Energy had not evaluated whether technology other than BPCTCA could facilitate compliance with the proposed EC limitation. Western Energy had also not evaluated whether, to the extent that its effluents had lower EC values than the receiving waters, its effluents would "clean-up" the receiving waters such that they met the EC value of 500 µS/cm set forth in ARM 17.30.670.

15. Additionally, my theorizing regarding this potential compliance issue was not specific to discharges associated with the AM4 Permit. At the time the Comment Letter was submitted, it was not fully known the extent to which outfalls covered by the AM4 Permit would interact with the receiving waters covered by the Draft MPDES Permit and be subject to the EC effluent limitation.

16. The hydrological consequences of the AM4 Permit continued to be evaluated and assessed between the time Western Energy submitted its application for the AM4 Permit in July of 2009, and the time that its application was deemed complete by DEQ in July of 2015. DEQ required Western Energy to submit a significant quantity of additional data, studies and analyses relating to the potential impacts of the AM4 Permit. DEQ approved the AM4 Permit in December 2015.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on Sept 21, 2016.



s/
Jesse Noel

NOEL DECLARATION
EXHIBIT A

WESTERN ENERGY COMPANY

A Westmoreland Mining LLC Company
138 ROSEBUD LANE • P.O. BOX 99 • COLSTRIP, MT 59323
(406) 748-5100

June 13, 2012

Ms. Jenny Chambers
Water Protection Bureau
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

Permit ID: MPDES Permit MT0023965
Revision Type:
Permitting Action:
Subject: MPDES Proposed Permit – Public Comments

Dear Ms. Chambers:

Nicklin Earth & Water, Inc. (NE&W) and KC Harvey Environmental, LLC (KCH) have been recently retained by Western Energy Company (WECo) to assist with the review of the draft proposed permit MT0023965 prepared by the Montana Department of Environmental Quality (DEQ) Permitting and Compliance Division Montana Pollutant Discharge Elimination System (MPDES) Permit Fact Sheet for Permit No. MT0023965. WECo have also retained the services of Dr. William Hartsog, a specialist in surface water hydraulics and sediment transport to assist in this review.

WET Testing for Planned Discharge

WECo's Rosebud Mine has 151 outfalls that drain into the following receiving waters: East Fork Armells, West Fork Armells, Stocker, Black Hank, Cow, Pony, Lee, and Spring Creeks and Lee Coulee. These are classified as ephemeral streams.

The Whole Effluent Toxicity test that is proposed in the draft MPDES Permit # MT0023965 has been proven effective by the EPA in the variability study entitled "Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Vol. 1[WECo1]" using the following sample preparation (Section 2.2.4):

"For each test method, four test sample types were prepared in bulk by the referee laboratory, divided, and distributed to participant laboratories for testing. The four sample types included: 1) blank sample, 2) reference toxicant sample, 3) effluent sample, and 4) receiving water sample. Blank and reference toxicant samples were distributed to participant laboratories as liquid ampule samples (to mix and dilute to the required volume at the participant laboratory), while effluent and receiving water samples were distributed as whole-volume samples (consisting of the full volume necessary to conduct the test). The blank sample was a non-toxic sample prepared as the typical synthetic control dilution water for each test method. Testing of the blank sample provided a means of determining the false positive rate for each test method. Interlaboratory precision was evaluated through testing of the reference toxicant, effluent, and receiving water sample types."

As is evident the test requires a sample of the receiving water to determine degradation of the natural chemistry. As was afore mentioned, the receiving waters of WECo's mine are ephemeral and do not facilitate a sample unless ample runoff has caused the stream to flow. Therefore a sample from any planned discharge from the mine would not include a sample of receiving water. C.3.a.i of the draft permit states "If a sample of the receiving water is unavailable, because of its ephemeral nature, standard synthetic water may be used." This is of concern due to the introduction of uncertainty in the accuracy of the test. Cindy Rohrer, a representative from Energy Labs in Billings stated "It's difficult to speculate on the uncertainty of using laboratory prepared receiving water versus the actual stream receiving water. However, the test would give a good indication of the effect of the effluent on aquatic life prior to being discharged into the receiving water." FS-10 and FS-11 (pg 19 and 20) of the Permit Fact Sheet show that East Fork Armells and its Tributaries and Rosebud Creek Tributaries sustain no salmonid fish or fish in early life stages. This means that the water that WECo discharges will be in contact with no fish life until it reaches either Rosebud Creek (approximately 15 miles away) or the Yellowstone River (approximately 30 miles away). Due to the uncertainty of accuracy and the remoteness of the mine to aquatic life WECo proposes that WET testing not be required for planned discharges to ephemeral streams.

WET Testing for Unplanned Discharge

Unplanned discharges from the mine are usually a result of runoff overtopping sediment control structures. Per MCA 17.24.639(2) WECo's sedimentation ponds are designed to contain the runoff from a 10-year 24-hour precipitation event for the worst case drainage scenario. Therefore most overtopping is due to a precipitation event greater than a 10-year 24-hour event. As one might expect, this cannot be predicted or planned for. Cindy Rohrer, a representative from Energy Labs in Billings, stated "Energy Labs needs 1 week prior notice to perform the Acute WET test in order to ensure sufficient incubator space for the test, sufficient organisms, and staff to perform the test. Additionally, the time the sample spends in the process of shipping tends to eat up a lot of the 36 hour hold time. Scheduling the tests ahead of time allows us to get as much of it set up as possible in order to meet the hold time." This also brings to light the fact that the lab is not available on weekends and holidays. This issue is compounded by the approximate 2-hour drive to Billings to submit a competent sample and the issues discussed in the previous section. It is not feasible to perform the WET test during an unplanned discharge due to the holding time and inaccessibility of the laboratory. Due to theses issues WECo proposes that WET testing not be required for unplanned discharges.

Effluent Requirements for Unplanned Discharges Resulting from >10-Year 24-Hour Precipitation Events

Tables 9-15 of the draft permit indicate that the limitation for Settleable Solids is the only effluent limitation that is not required for discharges resulting from a precipitation event greater than or equal to the 10-year 24-hour event. MCA 17.24.639(2) only requires the containment of runoff from the 10-year 24-hour precipitation event. These seem to contradict each other in basis. How is WECo to be held accountable for the quality of runoff if the precipitation event exceeds that which we are required to contain? WECo proposes that effluent limitations be required for discharges resulting from precipitation events less than or equal to the 10-year 24-hour event.

Mislabeled Outfalls

Table 1 of the draft permit shows the incorrect receiving waters for the following outfalls:

- 039 – Receiving water is Stocker Creek
- 040 – Receiving water is Stocker Creek
- 041 – Receiving water is Stocker Creek
- 075 – Receiving water is Castle Rock Lake

Nondegredation of Receiving Waters

ARM 17.30.629(2)(k) states "it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water...". Due to the ephemeral nature of the receiving

waters, how can this rule be enforced? What type of data does WECo need to present in order to satisfy a discharge of this nature?

Representative Outfalls

Representative outfalls are vaguely defined in the permit and leave considerable room for personal interpretation. The following questions need to be addressed before the permit becomes a legal document:

- Does a representative outfall represent a defined number of non-representative outfalls? If so, which representative outfall represents which non-representative outfall?
- What is the relationship between representative and non-representative outfalls?
- If a representative outfall discharges during a precipitation event is it assumed that all the outfalls that it represents discharged as well?
- Will non-representative outfalls need to be inspected during/after a precipitation event?
- Will the non-representative outfalls be held to the sample taken at the representative outfall?
- If a non-representative outfall, which is inaccessible during a precipitation event, is accessed after the precipitation event and is found to be discharging does a sample need to be taken? Or does the representative outfalls sample over-rule?
- If a non-representative outfall discharges and its representative outfall does not discharge during the same precipitation event, is it considered a discharge or not?
- What if a sample cannot be taken due to inaccessibility? (Ex. Outfall 083 is very inaccessible during precipitation events)
- If a representative outfall and at least one of the non-representative outfalls that it represents discharges during a precipitation event and a violation occurs because of the sample at a representative outfall, what are our options of contesting the violation for the non-representative outfall?
- What is the relationship between representative outfalls and "New Outfalls"?
- As "New Outfalls" have more stringent standards are they to be considered individually and not included in any representative outfall discussion?
- If both a representative outfall and a "New Outfall" discharge during a precipitation event and a sample is taken at a representative outfall and not at a "New Outfall" then the intent of the New Source Performance Standards would not be met because the sample was not taken at the new source. How is this justified?

Cost-Effectiveness of Continuous Flow Measurement and Automatic Sampling

There are 23 outfalls classified as representative outfalls. I.B.1.a states "Sampling equipment must be installed at representative monitoring locations to ensure flow measurement and automatic sample collection regardless of weather and/or site conditions" due to a precipitation event. During the past 20 years (June 1992 to June 2012) the 23 outfalls had 43 unplanned

discharges (including precipitation events less than and greater than the 10-year 24-hour event) reported on the monthly Discharge Monitoring Report (DMR) at the representative outfall locations. If the extent of each discharge was conservatively assumed at 7 days then there were 301 discharge days. To put this number in perspective, if all 23 outfalls would have discharged each day of the last 20 years there would have been 168,015 discharge days. This means that, conservatively, these automatic samplers and continuous flow measuring devices are only going to operate less than 0.2% of the time they are installed. Also, 33 out of the 43 discharges were sampled and results are contained in the respective DMR reports. WECo retains that the small increase of data from that which is already being reported is not worth the upfront cost (which is in the tens of thousands per outfall) plus the resources for regular calibration and maintenance/replacement costs.

Prevention of discharge is one of WECo's main goals. WECo proposes that a more frequent monitoring plan for the ponds and sediment traps be implemented in place of installation of automatic samplers and continuous flow measuring devices. Current monitoring for the ponds and sediment traps is as follows: quarterly for ponds and annually for the sediment traps. WECo proposes monitoring frequency be increased to monthly for all sediment control devices to ensure that their capacity will adequately contain the 10-year 24-hour event or be dewatered in a timely manner to achieve such capacity. As a preventative measure it would implement the best practicable method to remain compliant. Sampling of unplanned discharges would remain the same as it has for the previous permit.

Representative Monitoring Outfalls

The following is a summary of the travel time to each representative outfall from the engineering office:

Representative Outfall	Travel Time (min:sec)
009	13:35
09A	11:30
10C	12:08
011	10:48
16A	9:00
021	9:33
035	2:27
043	6:22
046	7:20
058	9:15
075	25:31
095	7:07
096	9:48
105	5:41
109	5:26
128	12:00
133	8:45
139	7:00
143	18:51
144	17:58
151	17:50
083	26:02
194	16:48

WECo proposes that the representative outfalls be re-examined to determine accessibility and that the "grab samples should be taken during the first 30 minutes of discharge" be replaced by "representative outfalls should be inspected during or immediately following a precipitation event that may produce runoff and grab samples shall be taken at that time, if discharging." This would be feasible because there is, at minimum, a supervisor on the mine site 24 hours a day 7 days a week 365 days a year.

References

WECo1 – Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Vol. 1,
http://water.epa.gov/scitech/methods/cwa/wet/upload/2007_08_06_methods_wet_finalwetv1.pdf
September 2001

Representative Monitoring Outfalls

Table 16 includes 23 locations designated as representative monitoring outfalls, (Section I.B.1.a). Per I.B.1.b grab samples should be taken during the first 30 minutes of discharge. This would be

feasible if the discharge was controlled during discharge from the outfall, but sampling at the 23 locations (during the first 30 minutes) identified in Table 16 would be problematic during a site wide precipitation event. Due to the accessibility of the various outfalls, time required for sampling and timing of the discharge at each location, it would be logistically impossible to sample all 23 locations within the first 30 minutes of discharge during significant rainfall or snowmelt events. WECO proposes that fewer outfalls be selected as representative outfalls. Many of the outfalls could be considered "substantially identical outfalls" based on the similarities of the general mining and reclamation activities, control measures, and runoff coefficients of their drainage areas. WECO requests a reduction in the number of outfalls sampled, considering that substantially identical outfalls exists for the active mine areas, reclaimed mine areas, and coal preparation plants and associated areas. The draft permit should be revised to identify representative outfalls that fall within either 40 CFR 434 subparts B, D and H. The permit should emphasize the use of representative outfalls for Subpart H where reclamation activities have been completed and past monitoring indicates compliance.

The draft permit includes 14 different tables that outline effluent limits and monitoring frequency and Table 16 describes representative monitoring outfalls for precipitation driven events. The detail provided in the tables is vague and confusing, and does not provide a concise description of the required monitoring. WECO requests that the final permit be specific in defining the monitoring requirements, number of outfalls and frequency of sampling required.

TBELs

Technology Based Effluent Limits (TBELs) are included in fourteen separate tables and are applicable to the seven different site areas associated with the different drainage basins. TBELs have been defined by the USEPA and are found in 40 CFR Part 434. Subpart B, addresses coal preparation plants and coal preparation plant associated areas. Subpart D addresses alkaline mine drainage from an active mining area resulting from the mining of coal. Subpart H addresses western alkaline coal mining and applies to alkaline mine drainage at western coal mining operations from reclamation areas, brushing and grubbing areas, topsoil stockpiling areas, and regraded areas. Subpart F addresses miscellaneous provisions including effluent limitations for precipitation events. The following TBELs are applicable to each 40 CFR 434 subpart:

Subpart	TBELs	Reference
B	Iron (total), TSS, pH	§ 434.22.b **Coal Preparation Plants and Coal Preparation Plant Associated Areas,** from such point sources normally exhibit a pH equal to or greater than 6.0 prior to treatment
D	Iron (total), TSS, pH	§ 434.42 **Alkaline Mine Drainage** applicable to alkaline mine drainage from an active mining area resulting from the mining of coal of any rank including, but not limited to, bituminous, lignite, and anthracite.
H	Sediment control plan with BMPs	§ 434.81 **Western Alkaline Coal Mining.** This subpart applies to alkaline mine drainage at western coal mining operations from reclamation areas, brushing and grubbing areas, topsoil stockpiling areas, and regraded areas. (a) The operator must submit a site-specific Sediment Control Plan to the permitting authority that is designed to prevent an increase in the average annual sediment yield from pre-mined, undisturbed conditions. The Sediment Control Plan must be approved by the permitting authority and be incorporated into the permit as an effluent limitation. The Sediment Control Plan must identify best management practices (BMPs) and also must describe design specifications, construction specifications, maintenance schedules, criteria for inspection, as well as expected performance and longevity of the best management practices. (b) Using watershed models, the operator must demonstrate that implementation of the Sediment Control Plan will result in average annual sediment yields that will not be greater than the sediment yield levels from pre-mined, undisturbed conditions. The operator must use the same watershed model that was, or will be, used to acquire the SMCRA permit. (c) The operator must design, implement, and maintain BMPs in the manner specified in the Sediment Control Plan.

F	Alternate Limitations	**§ 434.63 Effluent limitations for precipitation events.** The provisions of this subpart F apply to subparts **B**, C, **D**, E and G.
	pH, SS	Discharge caused by precipitation within any 24 hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume)
	pH	Discharge caused by precipitation within any 24 hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume)

Application of TBELs provided in the draft permit is not consistent with the requirements of 40 CFR 434. The draft permit provides effluent limits and monitoring requirements for seven different areas consisting of different drainage basins in the mine area. The area within each of these basins may include areas where requirements for Subparts B, D and H are applicable. By organizing the effluent limits and monitoring requirements in this fashion the most rigorous requirements are applied to all of the outfalls in the drainage basin. This approach increases the required monitoring in cases where outfalls regulated under Subpart H (reclaimed areas) are located in the same drainage as outfalls regulated under Subparts B and D. WECO believes that the permit should be reorganized to eliminate the excessive effluent limits and monitoring requirements resulting from this factor. The effluent limits and monitoring requirements in tables 3-15 need to be consolidated with respect to the applicable 40 CFR 434 subparts. WECO believes that the increased level of monitoring required by the draft permit is not justified for reclaimed mine areas where successful reclamation has occurred and continued use of BMPs in accordance with subpart H is occurring.

Alternative TBELs are provided in Tables 9 through 15. The alternative limits are applicable to precipitation and snowmelt driven runoff events. I.B indicates that the final limits in Tables 2 through 8 are applicable were effluent "discharges as overflow". Given this factor it is not clear if the intent is to use the alternative limits for all runoff events or runoff events that result in overflow. Footnotes 2 and 3 of Table FS-36 indicate variable effluent limits for discharges less or greater than the 10-year 24-hour precipitation event (although the footnotes are not cited in the table). This approach would be consistent with the requirements in 40 CFR 434.63 as summarized in the table above. This would also be consistent with the previous permit (November 8, 1999) where:

- Less than the 10-year, 24-hour storm: monitor for settleable solids instead of TSS.
- Greater than the 10-year, 24-hour storm: monitor for TDS

This issue requires more attention and clarification in the permit. The alternative numeric effluent limits and monitoring requirements tables also should be organized with respect to the applicable 40 CFR 434 subparts. The tables need to clarify TBELs required for different runoff events to be consistent with 40 CFR 434. The alternative TBELs included in Tables 9 through 15 have included outfalls consisting of reclaimed areas regulated under 40 CFR 434 subpart H. The requirements in subpart F are not applicable to subpart H and WECO requests that the draft permit be revised to remove the requirement for alternative limits for reclaimed areas.

WQBELs

The draft permit includes Water Quality Based Effluent Limits (WQBELs) for Aluminum (dissolved), Copper (total recoverable), and Selenium (total recoverable). Monitoring of these parameters was not included in the previous permit and limited data was available (only two samples) that were used to complete the Reasonable Potential Analysis (RPA). WECO is concerned that this data set may not be adequate for completing the RPA. The following table provides a summary of monitoring data for the parameter used in the RPA and development of WQBELs:

Parameter (WQBEL)	Min. Value	Max Value	Number Samples	Average Value	Min. Value	Max Value	Number Samples	Average Value
	Effluent Data µg/L				Receiving Water[1] µg/L			
Aluminum, dissolved (63/127)	<30	600	2	300	<30	12,000	24	2,000
Copper, total (4.4/8.8)	<1	4	2	3	4	300	24	60
Selenium, total Rec. (3.6/7.3)	<2	15	2	9	<1	5	23	2

[1] Data for W. Fork Armells, Stocker, Donley and Blank Hank Creeks.

As illustrated in the above table, the receiving water quality exhibits average aluminum and copper concentrations in excess of the maximum daily limit provided in the draft permit. The maximum effluent concentration for selenium (one sample) exceeded the maximum selenium WQBEL. In accordance with 75-5-306 (1) , MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water as long as the minimum treatment requirements, adopted pursuant to 75-5-305 , MCA, are met. As illustrated by the

effluent and receiving water quality data this may be the case for aluminum, copper and selenium. WECO request that the DEQ delay the inclusion of WQBELs for these parameters until additional monitoring is completed to determine if the effluent loading exceeds the naturally occurring levels, and if necessary to support a rigorous RPA.

The receiving waters are classified as C-3 streams. ARM 17.30.629 defines the water quality standards for streams classified as C-3. Since the discharges will be to ephemeral streams they are not subject to the specific water quality standards of ARM 17.30.629 in accordance with ARM 17.30.637.6. Industrial waste must receive, as a minimum, treatment equivalent to the Best Practicable Control Technology Currently Available (BPCTCA) as defined in 40 CFR Chapter I, Subchapter N.

WECO did not anticipate that WQBELs would be needed for aluminum, copper and selenium and therefore did not request a mixing zone for these parameters. Given the outcome that WQBELs are required, WECO requests an opportunity to reconsider a request for mixing zones for these parameters. It must be noted however, in accordance with 75-5-306 , MCA, it is not necessary that industrial wastes, sewage, or other wastes, as defined in 75-5-103 , MCA, be treated to a purer condition than the natural condition of the receiving water as long as the minimum treatment requirements are met and provided all reasonable land, soil, and water conservation practices have been applied. This factor further negates the requirement for the WQBELs included in the draft permit.

Effluent Limitations for EC

The draft permit includes an effluent limitation for Electrical Conductivity (EC). EC means the ability of water to conduct an electrical current at 25 ^{0}C. The electrical conductivity of water represents the amount of total dissolved solids (TDS) in the water and is expressed as microSiemens/centimeter (µS/cm) or micromhos/centimeter (µmhos/cm) or equivalent units and is corrected to 25 ^{0}C. Since EC and TDS are closely related, correlations are commonly used between the two parameters. One such correlation EC = 1000*TDS/640 (Hanson et.al., 1999). In order to evaluate the reasonableness of the TDS and EC limits in the draft permit, EC can be calculated from the TDS limits as presented below:

Draft Permit Table No.	Drainage Basin	Permit Limit Average TDS	Permit Limit Maximum TDS	Calculated Average EC	Calculated Maximum EC	Permit Limit EC
		mg/L	mg/L	µS/cm	µS/cm	µS/cm
Final Numeric Effluent Limits						
2	E. Fork Armells Ck.	3000	4500	4688	7031	Report
3	W. Fork Armells, Black Hank, and Donley Cks.	2600	3900	4063	6094	Report
4	Stocker Ck.	3950	5925	6172	9258	Report
5	Lee Coulee	2600	3900	4063	6094	500
6	Pony Ck.	2550	3825	3984	5977	500
7	Cow Crk.	3650	5475	5703	8555	500
8	Spring Ck.	2200	3300	3438	5156	500
Alternate Numeric Effluent Limitations (runoff events)						
9	E. Fork Armells Ck.	-	4500	-	7031	Report
10	W. Fork Armells, Black Hank, and Donley Cks.	-	3900	-	6094	Report
11	Stocker Ck.	-	5925	-	9258	Report
12	Lee Coulee	-	3900	-	6094	500
13	Pony Ck.	-	3825	-	5977	500
14	Cow Crk.	-	5475	-	8555	500
15	Spring Ck.	-	3300	-	5156	500

This comparison indicates that the corresponding EC calculated from the final TDS effluent limit would be in the range of approximately 5,200 to 9,200 µS/cm given the maximum daily limits provided in the draft permit. The EC limit provided in the draft permit is 500 µS/cm (less than 10 percent of the maximum calculated values above). This factor demonstrates that the proposed EC limit is not compatible with the existing limits for TDS. The permit fact sheet indicated that the basis for the EC limit is ARM 17.30.670. This rule was developed to provide an instream water quality standard for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers and related tributaries. These standards were adopted to address the potential impacts from coal bed natural gas produced water discharge on crop irrigation. DEQ has incorrectly applied these rules as effluent limits in the draft permit. WECO request that the proposed EC limits be removed from the draft permit since the basis for applying the instream criteria as an effluent limit is flawed. The current TDS limits are adequate for managing EC within the receiving water. This is demonstrated by the TDS measurements in the receiving water where an average (1289) and maximum (5340) TDS mg/L were observed in E. Fork Armells, W. Fork Armells, Stocker, Donley, and Black Hank Creeks. Likewise, monitoring in Spring, Pony and Cow Creeks, and Lee Coulee indicate an average (703) and maximum (4810) TDS mg/L. This factor indicates that the current TSD limits are more in line with the naturally occurring levels in the receiving waters. An average EC value (900 µS/cm) was observed for the two samples of effluent previously tested. The proposed EC limits would not be attainable given the observed effluent concentrations that appear to be below naturally occurring levels. Given these factors, it would not be likely that WECO could comply with the proposed limits using the proposed BPCTCA. In accordance with 75-5-306 (1) , MCA, it is not necessary that wastes be treated to a

purer condition than the natural condition of the receiving water as would be required by inclusion of the proposed EC limit.

Effluent Limitations for SAR

The draft permit includes effluent limits for Sodium Adsorption Ratio (SAR). As was the case for EC, the basis for this limit is ARM 17.30.670. Two limits are provided for different periods during the year. This rule was developed to provide an instream water quality standard for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers and related tributaries. DEQ has incorrectly applied these rules as effluent limits. WECO request that the proposed SAR limits be removed from the draft permit since the basis for applying the instream criteria as an effluent limit is flawed. The existing permit did not include a requirement to monitor SAR, although test data from two samples indicate an average value of 0.3 and a maximum value of 0.36. These values are well below the proposed limit and do not indicate a reasonable potential to exceed the standards in ARM 17.30.670, or justify the need for an SAR permit limit.

Whole Effluent Toxicity (WET) Testing

WET testing is specified on Tables 2 through 8. The location of the proposed WET testing is at outfalls regulated under 40 CFR 434 subpart B. Appendix I of the Fact Sheet indicates that subpart B applies to outfalls 009, 09A, 16A, 021, 043, and 094. These outfalls are all located within the East Fork of Armells Creek (Table 2). WET test requirements are also listed on Tables 3 through 8. These drainage areas do not include any currently regulated subpart B facilities. It is not clear where the proposed WET testing is required given the current organization of the draft permit. This issue would be eliminated if the effluent limits and monitoring requirements were organized by the categories under 40 CFR 434 as opposed to drainage basins.

Wet testing is also indicated in Tables 9 through 15 as part of the alternative effluent limits that are used for discharges related to precipitation and snowmelt events. Sampling for WET testing during storm/runoff events may not be practical given the number of outfalls where sampling is required using the alternative limits.

The previous permit (November 8, 1999) did not include WET testing nor did it include WQBELs for Aluminum, Copper, or Selenium. Additional monitoring of these parameters was also not included in the permit. These factors do not support the determination by the DEQ to include such an extensive WET testing program in the permit. WECO proposes that the WET testing requirement be removed from the draft permit since observational monitoring will be completed for any potentially toxic parameters associated with facilities regulated under subpart B. The observational monitoring will support future RPA for these parameters to determine the need for WQBELs and WET testing. The RPA for aluminum, copper and selenium presented in the fact sheet was based on two test results. Variability in these data and the small sample size has resulted in a large factor of safety in the reasonable potential analysis (RPA).

Additional observational monitoring is required to develop a better dataset to support the RPA and determining the need for WET testing.

Miscellaneous Comments

Tables 2, 4, 10 – Under existing outfalls, (typo) Iron should be Iron, total. The minimum monitoring frequencies indicated in Table 9 are not consistent with the values indicated in Table FS-36 and requires clarification. The maximum daily limitation for dissolved aluminum in Table 4 is not consistent with Table 11 or Table FS-30 and requires clarification.

References:

Hanson B., Gratten S., and Fulton A. 1999. Agricultural Salinity and Drainage. Division of Agricultural and Natural Resource Publication 3375, University of California Irrigation Program, University of California, Davis.

Discussion on DEQ Rationale/Methodology used for Calculation of Effluent Limits and Whole Effluent Toxicity Testing.

- Table FS-12 (permit fact sheet) contains an error. The Projected Receiving Water Concentration for aluminum (dissolved) should be 2,300 ug/L (as opposed to 2.3 ug/L).

- Appendix II: Summary of discharge for flow data should be reevaluated by DEQ for accuracy. For instance, it is unclear how an average annual flow rate can be the same as the maximum daily flow rate for what is likely an episodic/short duration event as DEQ shows for year 2004. There appear to be other similar issues/problems shown by DEQ on the Appendix II table as well.

- In the Permit Fact Sheet the need for water quality based effluent limitations (WQBELs) is evaluated by comparing a projected receiving water concentration (Cr) to "the lowest applicable" numeric standard (C). In some instances the aquatic life standard is used for C. This does not appear to be an applicable standard since, in effect, all the streams receiving discharge are ephemeral in nature. Furthermore, the outfalls rarely exhibit discharge, except in the instances of major, low frequency, precipitation events. One primary reason for the low frequency of outfall events is that the sediment control ponds are designed to receive/store the 10-year 24-hour event flows. For instance, Table C-1 attached hereto provides an example as to how infrequent such outfall flows are in the instance of what DEQ defines as either "coal preparation plant" or "coal plant circuit" outfalls. Even flows in East Fork Armells Creek are fairly infrequent as shown in Figure C-1. In summary, the approach used by DEQ seems counterintuitive when considering the nature of streams and the lack of flow for these streams in the vicinity near the Rosebud Mine.

- The lack of outfall discharge events, and the lack of "receiving" water flow, demonstrates that the assumption that DEQ uses, leads to results which are not

realistic. Tables FS-12 and FS-13 show that in some instances, the lowest applicable numeric standards used are "chronic" aquatic life standards from circular DEQ-7. In effect, "How can application of a chronic standard be considered a realistic "applicable standard" when there is no chronic exposure to begin with?" This lack of chronic exposure also seems to be acknowledged by DEQ when it states "Monitoring for chronic toxicity is not required because the discharges are intermittent, not continuous, and therefore chronic effects from the discharges are not anticipated." (underlined for emphasis).

In summary, if aquatic life standards are used for this evaluation, the lowest applicable numeric standard in this evaluation should be the Acute Aquatic Life Standard (as opposed to the chronic standard). It can be argued that if there is no water in the stream channel (at outfalls) there can be no aquatic life affected by an outfall event. In this case the lowest applicable numeric standards could then be inferred to be the human health standards from circular DEQ-7.

- The Permit Fact Sheet shows that once the need for WQBEL was established, then WQBELs were calculated. WQBELs are calculated using the same dilution factor (zero=no receiving water) and three water quality standards. The Average Monthly Limitations (AML) and Maximum Daily Limitations (MDL) are calculated using the Chronic Aquatic Life Standards and Acute Aquatic Life Standards. Again, the use of a dilution factor of zero (no receiving water) contradicts the applicability of the use of chronic aquatic life standards for the calculation of Limitations.

- Appendix VI shows AML and MDL level calculations which provide results that are not intuitive, or, lack common sense. For instance, in some cases, AML values are less than 50% of the most stringent chronic aquatic life standards given in the DEQ-7 circular. The effluent MDL concentrations calculated are as low as about 1/700 times the maximum concentration actually measured in the receiving water. Table C-2 shows a comparison of the MDLs from Tables FS-21 and FS-23 with Receiving Water Characteristics reported in Appendix IV of the permit. For example the MDL level calculated for total iron is 1.61 mg/L. The maximum total iron concentration reported for receiving water is 326 mg/L. In this case, if effluent limitations are met, the iron concentration would be less than 1/200 of the maximum iron concentration measured in receiving water. It is obvious that such an effluent limitation is not realistic.

- The permit specifies that a WET test with 6 specific different effluent concentrations is needed (draft permit) as opposed to the general EPA recommendation of "a minimum of 5 effluent concentrations" (Source: Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fifth Edition, October 2002.).

- EPA draft guidance for WET implementation under the NPDES Program (November 2004) was written with receiving waters in mind. Some statements to this effect are:

- Based on existing regulations, NPDES authorities must determine whether a discharge causes, has the reasonable potential to cause, or contributes to an ***in-stream*** excursion above a numeric criterion or a narrative criterion within an applicable State water quality standard and, where appropriate, establish permit limits on WET, for lethal and sub-lethal effects.

- Another advantage to using WET testing is that it enables prediction and avoidance of a toxic impact before the detrimental impact might occur (i.e., after the ***aquatic population in the receiving water*** has experienced ***prolonged exposure*** to such toxicity).

The site conditions clearly do not comport with the inferences of "in-stream incursion," "receiving water," and "prolonged exposure" that are made in this EPA guidance document.

In summary, DEQ should reassess, and then, recalculate or update the Final Numeric Limitations to values that are more directly in conformance with the conditions of the discharge and "receiving" streams in the vicinity of the Rosebud Mine.

- It is not practical to require the mine to submit water samples for WET analysis for precipitation driven flow events:

  - The laboratory requires the start of testing be within 36 hours from the time the effluent sample was taken.

  - "Energy Labs needs 1 week prior notice to perform the Acute WET test in order to ensure sufficient incubator space for the test, sufficient organisms, and staff to perform the test. Additionally, the time the sample spends in the process of shipping tends to eat up a lot of the 36 hour hold time. Scheduling the tests ahead of time allows us to get as much of it set up as possible in order to meet the hold time." (statement by Energy Labs to Western Energy).

  - Hence, it is an unrealistic expectation to require a WET test for precipitation driven flow events associated with the "coal preparation plant" or "coal plant circuit" outfalls.

- The non-exceedance EC standard for Lee Coulee, Pony Creek, Cow Creek, and Spring Creek is set at 500 uS/cm. The basis DEQ cites for this standard is ARM 17.30.670. It is noteworthy that actual/background EC values greatly exceed this standard. In effect, this non-exceedance standard is unrealistic.

Comments on DEQ Rationale/Requirements for Flow/Sampling Instrumentation.

- The language employed by DEQ in the draft MPDES permit is vague in terms of what the specific monitoring requirements are for measuring flow and collecting water quality samples. It could be interpreted by some that DEQ is requiring automatic and

continuous flow measurement and parameter sampling. If that is the case, then such a measurement program may not be that appropriate for the Rosebud Mine for the limited flow events that occur from the large number of outfalls at the mine. See example shown in Table C-1 provided hereto.

- As an illustration of practical issues, the following is a typical setup that would be required be employed to continually measure flows and also to collect the samples:
    - Flume structure
    - Pressure transducer
    - pH and conductivity probes
    - Pumping sampler; and
    - Programmable data recorder.

The capital/construction cost for this setup would be approximately $ 20,000 per location. This does not include the operation and maintenance cost at each location. Assuming this was applied to all outfalls, the capital/ construction cost would be approximately $ 3 million. If it were applied solely to the "representative" outfalls, the cost would be about $ 480,000. Again, these costs do not reflect the associated operation and maintenance, data collection and evaluation costs, which would be significant.

- There are other feasibility issues that would need to be overcome including, but are not necessarily limited to, the following specific conditions:
    - Outfalls with no pond structure. Automatic and continuous monitoring is not feasible at outfalls (with no detention pond) producing overland flow from areas of active mining and areas in various stages of reclamation and inactivity. Sediment transport and deposition cause the configuration of the drainage channels to change considerably during runoff events. Braided channels are an example of a channel resulting from excess sediment transport and deposition. This leads to uncertainty as to what the channel location and configuration will be over time as it changes during each runoff event. This factor, coupled with the sediment load issues, results in a very low probability/feasibility of proper measurements being collected using automated equipment.

Weir blades with crest gages have been suggested by some as a method of monitoring flow but these tend to be choked with sediment during the initial runoff. Weirs are more commonly than not choked by sediment which leads to flow measurement inaccuracies. In fact, the basic fundamental principle used to develop the weir equation is violated with this sediment choking. Finally, the channel cross section will change during a runoff event leading to additional flow measurement inaccuracies.

- Outfalls with pond structure. Automatic and continuous monitoring may be more feasible at outfalls with a detention pond discharging flow from areas of active mining and areas in various stages of reclamation and inactivity. It is feasible to collect samples at outfalls resulting from overland flows produced from areas of active mining and areas in various stages of reclamation if flow is from a detention pond with a discharge pipe.
    - The expense of automated sampling equipment is not justified for pond discharge pipes because there is a functional relationship between water level above the pipe and discharge flows. Collection of manual staff gage readings in the pond, coupled with details on exit piping physical parameters, can be used to calculate representative/accurate flow discharges. Pygmy flow meters could also be used at the pipe discharge. Effluent samples for various parameters can be collected via grab samples or other sampling methods.
    - One reason that automated sampling equipment is not justified is that many of the runoff events will not produce flow from the ponds because of the storage capacity of the pond or series of ponds. This greatly reduces the number of discharge events from these pond outfalls because the ponds are designed to retain a 10-year 24-hour runoff event. Another issue is that samples do not necessarily coincide with peak, or initial flows, because the pond levels, and hence storage (e.g., from prior events), will vary from empty to a full pond. This degree of storage will have a significant effect on the peak discharge exiting the pond. The existing storage will also affect the water quality of the effluent leaving the pond. It should also be noted that the frequency of runoff events is very low. Hence, the utility of such information, even if it were collected via automatic measurements, would likely be questionable.
    - For these reasons the returns on investment for the data produced from an automated data collection system is not justified.

- On average, about 6 flow events occur per year for the approximately 150 outfalls (based upon Appendix II of draft document). Hence, it seems that it would be more reasonable to collect samples at outfalls as flow occurs, and to focus on those locations where a flow event is more likely to be observed. The existing methods applied by the mine are to: 1) Collect grab samples (or use staged sample collection bottles set at outfall discharge points); and 2) Use pygmy flow meters to measure flow. This procedure is deemed to be a practical method for the environmental conditions that exist at the mine.

- One possible improvement to environmental monitoring at the mine is to include the existing four automated flow measurement sites, and the associated water quality sampling

locations, to track the overall long term flow discharge and water quality. Such information would provide an accurate overall indication of progress of the surface water hydrology and water quality for the mine over time. The flumes can be used to accurately monitor large areas of the mine and assure that the outfall data collection is reflective of the overall mine conditions. These same locations could provide for realistic baseline information for both flow conditions and for the water quality of the ephemeral streams in the area.

Please contact Wade Steere, Environmental Engineer, if you have any questions at (406) 748-5199.

Sincerely,

Jesse Noel, P.E.
Engineering & Environmental Manager
Western Energy Company
Rosebud Mine
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Enclosure

cc:	Wade Steere	William Hartsog
	Rich Spang	Michael Nicklin
	Dicki Peterson	Kevin Harvey
	IEMB	David Cameron

Steere Declaration
EXHIBIT 9

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
	)	

DECLARATION OF WADE STEERE IN SUPPORT OF RESPONDENT-INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Wade Steere, PE, declare under the penalty of perjury as follows:

1. I, Wade Steere, am a Professional Engineer and currently hold the position of Environmental Engineer with Western Energy Company. I graduated with a Bachelor of Science in Civil Engineering from Utah State University in 2008. I have been employed by Western Energy Company since March 2011.

2. In my capacity as Environmental Engineer at Western Energy Company, I primarily design and implement hydrological control plans, design and construct sedimentation ponds, and produce and implement monitoring plans for surface and groundwater. In 2013, I became involved with the permitting process for AM4. In my capacity as a member of the permitting team, I produced analyses and plans to ensure the AM4 permit application satisfied regulatory requirements and addressed any of the Montana Department of Environmental Quality's concerns.

3. The Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B, and C ("PHC") submitted by Western Energy Company identifies spoils well WS-100 as having heightened concentrations of nitrate/nitrite that exceed the standards permitted by Montana Numeric Water Quality Standards Circular DEQ-7. *See* PHC Table 18. The WS-100 well is a

shallow well (total well depth of 27 feet) drilled in mine spoil which has been observed to exhibit changes due to surficial activities. For instance, water levels have been observed to rise and fall as a result of precipitation. This well is located in pastureland, next to one of the only shade trees in the pasture. As a result, and as evidenced by the photograph of WS-100 below, cattle tend to congregate near the well. Naturally, this is an area where we would expect manure and urine, which are high in nitrogen, from the congregating cattle. Increases in nitrogen in this area are therefore expected, and data I have seen are consistent with these facts on the ground.

Photograph of WS-100 (July 22, 2016)

4. Further, the sampling in question took place immediately after an extreme precipitation event and after record precipitation in 2011. Generally we would expect high levels of precipitation to be associated with higher levels of nitrate+nitrate in shallow groundwater near a place where cattle congregate. Since 2011, precipitation has been lower and samples from WS-

100 have showed decreasing levels of nitrate+nitrate. WS-100 was completed in spoils that occurred as a result of mining in the early 1970s.

5. As I understand it, Petitioners allege that previous mining dewatered Section 15. That is contradicted by my own observations. On July 13, 2016, I witnessed water flowing in Section 15. The following photographs, which I took on July 13, 2016, clearly show the presence of water.

Photograph 1

Photograph 2

Photograph 3

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 22, 2016.

s/ Wade Steere
Wade Steere

Hunter Declaration
EXHIBIT 10

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
_____	)	

DECLARATION OF PENNY HUNTER

I, Penny Hunter, declare under the penalty of perjury as follows:

1. I, Penny Hunter, am a biologist and ecologist with 16 years' experience in human health and ecological risk assessment, permitting, aquatic toxicology, biological monitoring, and wildlife toxicology.

2. I have a B.A. in Biology from the University of Colorado and an M.S. in Rangeland Ecology from Colorado State University. I am a Program Manager at Environmental Resources Management (ERM), an environmental, health, safety, and risk consulting company. Previously, I worked for ARCADIS, another consultancy, where I performed similar work.

3. I have extensive experience in all steps of the environmental risk assessment process, including field sample collection, laboratory testing, modeling and statistical analysis, and risk characterization. I have lead the development of risk-related guidance, permitted discharge criteria, and clean up criteria for human and ecological receptors and have authored over 15 site-specific risk assessments for private industry clients, the U.S. Environmental Protection Agency ("U.S. EPA"), federal facilities, and state programs. I have particularly extensive experience in studying and mitigating ecological risk factors related to extractive industries such as mining. I have authored articles published in scholarly journals related to assessing health and ecological

risk from chemical and mineral substances and have expertise in assessing risk from ecological factors to human health, aquatic life, wildlife, and livestock.

4. I am familiar with Western Energy Company's ("Western Energy") Rosebud Coal Mine, located near Colstrip, Montana and Western Energy's application to the Montana Department of Environmental Quality ("DEQ") for a fourth amendment to the Rosebud Strip Mine Area B Permit ("AM4 Permit").

5. Western Energy engaged me to conduct an aquatic life survey of the East Fork Armells Creek in relation to the AM4 Permit application. The aquatic life survey was conducted in 2014 in response to a deficiency notice issued by DEQ on June 3, 2014. I also lead a hydrologic conditions assessment of East Fork Armells Creek in 2013 and another aquatic life survey in 2015. I conducted all of these studies in accordance with accepted scientific principles, DEQ protocol and standard operating procedure, and my own best scientific judgment.

6. I am familiar with the Cumulative Hydrologic Impact Assessment ("CHIA") document issued by DEQ in approving the AM4 Permit and with the contentions of the Petitioners in this contested case in challenging the CHIA and AM4 Permit approval. I am familiar with petitioners' contentions related to the current condition of East Fork Armells Creek as it relates to aquatic life and livestock, impacts on East Fork Armells Creek from mining activity to date, and the potential effects of future mining on East Fork Armells Creek. In addition, I am familiar with the hydrology and ecology of East Fork Armells Creek, having observed it and conducted studies of the stream, including the aquatic life surveys cited above. I have also reviewed other scientists' and DEQ's sampling and studies of the stream.

Evidence of Effects of Mining on East Fork Armells Creek

7. I do not believe there to be any biological evidence to show that, as petitioners' state, "[f]orty years of strip-mining have hammered East Fork Armells Creek." Pet'rs' Br. at 28. There is extremely limited evidence of any effects of mining on the biological conditions of East Fork Armells Creek, the absence of which, combined with the myriad of other factors affecting the biodiversity of the stream, make it impossible to conclude with scientific certainty that mining has degraded the biological community in East Fork Armells Creek or contributed to its impairment, if, indeed, it is impaired.

8. As a scientific principle, one cannot attribute an effect to a specific cause without eliminating all other possible causes. In the case of East Fork Armells Creek, and especially its lower reach, downstream of Colstrip, there are many different factors influencing aquatic life. Therefore, conditions in East Fork Armells Creek cannot, without further evidence, be attributed solely to mining.

9. As with other ephemeral and intermittent streams, the single greatest factor influencing the aquatic life community in East Fork Armells Creek is the amount and flow of water at different times and in different locations on the stream. In addition, livestock, agriculture, golf courses, and runoff from the town of Colstrip may have significant effects on East Fork Armells Creek and subsequently its aquatic life.

10. Furthermore, my aquatic life survey and a subsequent studies I conducted in 2014 and 2015 found that the aquatic life community in East Fork Armells Creek is typical for ephemeral and intermittent streams in the region and is comparable to the communities in the West Fork Armells Creek, suggesting that mining – which does not occur near those other streams – does not have a significant effect on East Fork Armells Creek's biological community.

11. In summary, I am not aware of any evidence showing that mining negatively affects aquatic life in East Fork Armells Creek.

The 303(d) Attainment Report and Impairment of East Fork Armells Creek

12. I do not believe petitioners' statement that "DEQ's own testing reveals significant impairment of East Fork Armells Creek that is linked to coal mining" to be accurate. *See* Pet'rs' Br. at 29. Moreover, regardless of DEQ's conclusion, in my opinion there is insufficient data in DEQ's proposed draft biennial water quality attainment report ("303(d) list") to draw any conclusion regarding the existence or causes of aquatic life impairment in East Fork Armells Creek.

13. Most of the data cited by DEQ in the 303(d) list are not specific to East Fork Armells Creek. DEQ did not study any aquatic life or habitat data collected along the upper segment of East Fork Armells Creek in preparing the 303(d) list. In fact, to my knowledge, no aquatic life data had been collected from upper East Fork Armells Creek since the 1970's until I conducted an aquatic life survey in 2014.

14. Benthic (i.e., bottom-dwelling) invertebrate samples were collected on one occasion on the lower segment of East Fork Armells Creek in 2005; however, the sampling was conducted far downstream of Colstrip, where water could be affected by many other factors besides mining, including runoff from agriculture, cattle, a golf course, the town of Colstrip, and the Colstrip Power Plant.

15. The 303(d) list does not consider other aquatic life studies that have been conducted along East Fork Armells Creek and nearby analogous streams since at least 1976. Data on nearby analogous streams in the same basin would provide baseline information about aquatic life communities in the absence of some land uses currently occurring in the EFAC drainage. In

my opinion, all available studies should be considered before reaching a conclusion as to the status and potential cause(s) of impairment in East Fork Armells Creek.

16. The composition of the macroinvertebrate communities found in East Fork Armells Creek reflects the low-gradient, ephemeral nature of the stream, similar to analogous streams in the region.[1] For instance, petitioners point to the observation that blackfly larvae and midges made up a large portion of macroinvertebrates collected by DEQ in their sampling of lower East Fork Armells Creek as a sign of poor water quality, *see* Pet'rs'. Br. at 29, but, as demonstrated by Klarich et al. (1980a, b), such organisms commonly make up the majority of the benthic macroinvertebrate community in intermittent and ephemeral streams in the region, not just East Fork Armells Creek.

17. Furthermore, benthic macroinvertebrate communities in intermittent and ephemeral streams in the region naturally vary greatly by season, making it difficult to attribute variation to human factors, such as mining. Seasonal studies on East Fork Armells Creek have noted the lack of consistency in sampling results from one season or year to the next.[2] Klarich et al. (1980a, b) observed the same variability in community indices in other analogous streams throughout southeast Montana.

18. Benthic macroinvertebrate samples can be further affected by patchy distribution and low flow situations leading to inadequate sample size and inability to sample all microhabitats in a

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[1] See Klarich, D.A., Regele, S.M, Bahls, LL., 1980. Structure, General Characteristics, and Salinity Relationships of Benthic Macroinvertebrate Associations in Steams Draining the Southern Fort Union Coalfield Region of Southwestern Montana. USGS Grant #14-08-0001-G-053 ("Klarich, 1980a"); Klarich, D.A., Regele, S.M. Bahls, L.L., 1980. Data Report for Benthic macroinvertebrate and periphyton community inventory of streams draining the southern Fort Union Coalfield Region of Southwestern Montana. USGS Grant #14-08-0001-G-053 ("Klarich, 1980b"); Clancy, C.G. 1978. The Fish and Aquatic Invertebrates in Sarpy Creek Montana. Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science. Montana State University.

[2] See Schwer, D.J. 1979. The Ecology of East Fork Armells Creek and Some Ponds Near Colstrip, Montana. Final Report. December; Schwer, D.J. 1981. The Ecology of East Fork Armells Creek and Some Ponds Near Colstrip, Montana. Final Report. November.

stream equally.[3] Data collected in studies I recently conducted also demonstrated the same phenomenon: sample sites frequently change due to lack of water, and results from one microhabitat to the next, and between years, are variable in terms of species diversity and community composition. This natural variability and dynamic nature of the benthic macroinvertebrate community means that a monitoring system, such as DEQ's, that relies on benthic macroinvertebrate community sampling is more apt to incorrectly attribute changes in the community to human causes – such as mining – when such changes are actually the result of natural conditions and events.

19. As an expert in this field, I believe that a review of all available data shows that macroinvertebrate communities in East Fork Armells Creek upstream of mining are comparable to those found downstream of mining. In short, the data show no evidence of mining having affected the composition of aquatic animal communities in East Fork Armells Creek.

Water Levels and Vegetation on Upper East Fork Armells Creek

20. The DEQ 303(d) list gives different potential causes for impairment of the lower and upper segments of East Fork Armells Creek. For the lower, or downstream, segment, DEQ suggests there may be impairment due to salinity, nitrate/nitrogen, total dissolved solids ("TDS"), and specific conductance, due to agriculture, mining, and hydromodification. For the reasons discussed above, the DEQ data is incomplete and does not provide any reasonable basis upon which to form a scientific opinion as to whether aquatic life is impaired in that segment of East Fork Armells Creek or what the causes of such impairment would be.

21. As noted by petitioners, DEQ lists the potential cause of impairment of the upper segment of East Fork Armells Creek as alteration in streamside or littoral vegetative covers, with

[3] See Schwer 1981.

mining as a possible cause of that alteration. However, as noted, the 303(d) list is not based on any recent data from the upper segment of East Fork Armells Creek. On the other hand, surveys I led in 2014 and 2015 found an aquatic habitat in the upper reach of East Fork Armells Creek very different from that described in the 303(d) list.[4]

22. In those surveys, I found the aquatic habitat in the upper reach of East Fork Armells Creek to contain prevalent emergent vegetation along riparian zones. Aquatic habitat measures indicated an abundance of large woody debris, silty substrate, and low flow conditions. During the hydrologic conditions assessment in 2013 (ARCADIS 2014b), I observed the bottom of the channel of upper East Fork Armells Creek to be vegetated by upland grass species: either crested wheat (*Agropyron cristatum*) or western wheatgrass (*Pascopyrum smithii*), with a mixture of riparian and upland vegetation along the banks (e.g., boxelder (*Acer negundo*), cottonwood (*Populus angustifolia* and *Populus deltoids*), and sagebrush (*Artemesia* spp)). At times, trees and sagebrush were also noted to be growing in the bottom of the channel. These characteristics are consistent with an intermittent or ephemeral flow regime.

23. East Fork Armells Creek is intermittent in certain sections and ephemeral in others. During both the aquatic survey and hydrologic conditions assessment, I observed that some areas of East Fork Armells Creek were wet while others were dry. The photographs below, taken in October 2014 and included in ARCADIS (2014a), for instance, show water in areas of the upper reach of East Fork Armells Creek, near Rosebud Mine Area B.

[4] ARCADIS. 2014a. Western Energy – Rosebud Aquatic Survey Assessment. December; ARCADIS. 2014b. Western Energy – Rosebud Hydrologic Conditions Assessment. May 3; ERM. 2016. 2015 East Fork Armells Creek Benthic Macroinvertebrate Survey. January 14.

My team visited upper East Fork Armells Creek again in November 2014 and again observed water in several segments of the stream (ARCADIS 2014b).

24. I am aware that petitioners point to a photograph taken in July 2014 (below) of a reach in upper East Fork Armells Creek as evidence of mine-related dewatering of the stream. Pet'rs' Br.

at 32. Although petitioners suggest the photograph shows that a formerly wet segment of East Fork Armells Creek is now dry, my scientific opinion is that the photograph shows evidence that the stream was wet not long before the photograph was taken.

25. I base my opinion upon the following factors: Although the photograph shows an abundance of vegetation along the banks and upland areas, there is no vegetation along the creek bottom. This is highly suggestive of water having recently flowed along the bottom. Had the stream really been dry since 1999, as petitioners claim, Pet'rs' Br. at 31, the creek would have been covered by typical upland vegetation as seen with other intermittent or ephemeral segments

of stream in the region. In addition, the bare ground and stippling along the bottom suggest that cattle have recently used this area to congregate. When cattle congregate in a stream bed such as this, they typically drink and wallow in mud. Cattle could not do so if there were not water in this segment of the stream.

26. In summary, the evidence I have collected shows that the sections of East Fork Armells Creek petitioners point to, including Section 15, are sometimes wet, as is characteristic of ephemeral or intermittent streams.

Narrative Water Quality Standards

27. Upper East Fork Armells Creek meets applicable narrative water quality standards for aquatic life. Surface waters of upper East Fork Armells Creek are designated C-3 Ephemeral for the purposes of MPDES discharge permits. Ephemeral streams are not subject to specific numeric water quality standards but are, rather, subject to narrative standards, including for sulfates, chlorides, nitrite, nitrate, and total nitrogen. Furthermore, Montana does not have numeric aquatic life standards for sulfates or chlorides for any stream classification.

28. For the purposes of the CHIA, DEQ applied material damage criteria made up of a combination of applicable narrative standards, numeric guidelines, and livestock beneficial use guidelines. Specifically, DEQ used:

a. Livestock guidelines listed in Table 2-2 of the CHIA. These guidelines are not enforceable standards but are, rather, used as guidance in evaluating the suitability of pre- and post-mine water quality for livestock watering. It is common in the area for water quality to naturally exceed the livestock guidelines and, as DEQ noted in the CHIA, surface water and shallow groundwater in eastern Montana are highly variable and locally may be marginal for supporting livestock. Yet, as stated in the

CHIA, surface and shallow groundwater have supported ranching in Montana for more than a century.

b. Aquatic life criteria. As with the livestock guidelines, the sulfate, chloride, and other constituent guidelines listed in the CHIA for aquatic life are not enforceable standards and serve only as guidance for evaluating the suitability of pre- and post-mine water quality for aquatic life use.

c. Other data. DEQ also used aquatic surveys from the 1970's and the aquatic life survey I conducted in 2014 to assess whether East Fork Armells Creek met its beneficial uses. Both the 1970's surveys and my 2014 survey showed a diverse community of macroinvertebrates using the stream reach, thereby satisfying the narrative standard of providing a beneficial use for aquatic life.

29. In my scientific opinion, it is therefore misleading to simply state that water in East Fork Armells Creek "exceeded thresholds for harm to aquatic life." *See* Pet'rs' Br. at 40. CHIA at 9-8.

No Water Quality Violation for Sulfates

30. Regardless of the concentration of sulfates found in sampling, upper East Fork Armells Creek met the narrative water quality standards for aquatic life.

31. I also note that a study petitioners cited in their objections to the permit, M.F. Raisbeck, et al., *Water Quality for Wyoming Livestock & Wildlife: A Review of the Literature Pertaining to Health Effects of Inorganic Contaminants* (2008), is not in my opinion reliable as a source for establishing reasonable sulfate threshold guidelines for livestock. The Raisbeck study, which was a non-peer reviewed review of other studies, came up with sulfate (and other constituent) thresholds anomalous among the consensus of studies on this subject. Although commissioned

by the U.S. Geological Survey ("USGS"), the study was never completed nor did the USGS adopt the interim findings reported by Raisbeck.

No Water Quality Violation for Chlorides

32. As for sulfates, Montana's chloride standard is narrative. The 230mg/L "chronic aquatic life limit" petitioners cite is but one metric considered in assessing surface water suitability for aquatic life. That EPA aquatic life criteria ("AWQC") is based on a 1986 EPA document that reviewed an extremely limited set of toxicity data for chlorine. Although it is commonly understood that high concentrations of major ions (Ca, MG, K, Na, Cl, SO4) can be toxic to aquatic organisms, precise thresholds of effects are site specific as the constituents' toxic effects are highly dependent on the combination of ions in solution. For instance, increased hardness (as $CaCO_3$) and chloride in solution are both known to reduce toxicity of sulfate to aquatic organisms. DEQ considered such interactions in the CHIA. *See, e.g.*, Table 2-3.

33. Assessing the effects of chlorides on aquatic life is complex, and relying on a single number from a limited review in 1986 is not a scientifically accurate means of determining chloride toxicity to macroinvertebrates in upper East Fork Armells Creek, particularly when sulfate and hardness levels are greater than zero. As with sulfate, the existence of a diverse macroinvertebrate community in upper East Fork Armells Creek demonstrates that chloride concentration in the stream does not prevent it from supporting its use by aquatic life.

The Aquatic Life Survey Methods and Protocol

34. I conducted an aquatic life survey of East Fork Armells Creek (ARCADIS 2014a) on October 9, 2014. As noted in the December 2014 report on that survey, my survey protocols and taxonomic identification of organisms followed both DEQ's sampling and analysis protocols, *Sample Collection, Sorting, Taxonomic Identification, and Analysis of Benthic*

Macroinvertebrate Communities Standard Operating Procedure (MDEQ 2012), and the U.S. EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers* (Barbour et al. 1999).

35. In initial email correspondence with DEQ, I asked if the Standard Operating Procedure for determining 303(d) status for surface water bodies (MDEQ 2006) was appropriate for the scope of the benthic macroinvertebrate sampling event, and DEQ responded that "The document you sent is designed for assessment of water quality for impairment decisions." This response references a formal 303(d) determination process, and that was not the scope of the request of DEQ. They then referred me to the *Sample Collection, Sorting, Taxonomic Identification, and Analysis of Benthic Macroinvertebrate Communities Standard Operating Procedure* (MDEQ 2012), which was the protocol that I followed. DEQ agreed that the protocol I followed for the aquatic life survey was the appropriate protocol for the circumstances and purpose.

36. The only modifications to the DEQ protocol were made in the field when following the protocol to the letter was impossible because the geometry of the sampling location could not accommodate the standard protocol of sampling 11 transects along a 100 meter reach (e.g., when the wetted reach was less than 100 meters long), and when riffle habitats were lacking. In all cases, scientifically representative samples were collected in all microhabitats at each location.

37. In short, it is inaccurate to state, as petitioners do, that the study did not follow DEQ protocols. *See* Pet'rs' Br. at 42-43. It is further inaccurate to state that the protocol I followed would not determine East Fork Armells Creek's compliance with water quality standards. *See id.* As discussed above, the aquatic life study identified a diverse macroinvertebrate community in East Fork Armells Creek analogous to those found previously in East Fork Armells Creek and

in other analogous streams in the region. On that basis, the DEQ determined that East Fork Armells Creek was meeting its beneficial uses for aquatic life. *See* CHIA at 9-8.

38. Petitioners' statement that the aquatic life survey did not follow DEQ's assessment metrics is similarly misleading and, furthermore, irrelevant to the accuracy or quality of the survey. *See* Pet'rs' Br. at 43. Such metrics are not part of the survey itself, but, rather, interpretive tools applied to the samples and data gathered in the survey. The application or non-application of metrics had no connection to the methods and protocols I used in conducting the survey, and had no effect on the content or accuracy of the samples and data obtained in the survey.

39. In summary, I followed DEQ protocol, as well as my best scientific judgment, in conducting the aquatic life survey. Not applying metrics to the survey results had no effect on the survey methodology or the accuracy of the survey results themselves.

The HBI

40. Nonetheless, I did calculate one metric, the Hilsenhoff Biotic Index ("HBI"), based on the data collected in the aquatic life survey, obtaining index measurements of 6.98 and 7.90.

41. It is important to note that the HBI was originally developed in 1982 to evaluate organic stream pollution based on studies performed in Wisconsin. Although the HBI was calculated based on a Montana-specific species list (as stated in the DEQ SOP), the basis of the HBI rankings (e.g., "poor" or "good") originate from the Wisconsin-based research program. Because the rankings associated with HBI were based on Wisconsin stream conditions, its qualitative rankings (e.g., "poor" to "very poor" for scores of 6.98 and 7.90) are not always applicable to other regions of the country.

42. I believe the HBI is useful to compare relative conditions between analogous streams in the same region (e.g., between East Fork Armells Creek and other streams in the southeastern Montana) but not as an absolute measurement. The quality of aquatic life communities in East Fork Armells Creek cannot reasonably or usefully be judged by comparison with the aquatic life communities found in streams in Wisconsin.

43. I have never concluded, and the aquatic life survey does not say, as petitioners assert, that HBI scores from the 2014 survey are indicative of any level of organic pollution. *See* Pet'rs' Br. at 44.

The September 2015 PowerPoint Presentation

44. I prepared the "Aquatic Study Review" (Sept. 21, 2015) PowerPoint presentation referenced by petitioners as Exhibit 10. It shows and discusses data collected on East Fork Armells Creek from 1975 to 1978 in an attempt to explain that exceedances of water quality criteria on East Fork Armells Creek are not predictive of macroinvertebrate diversity or abundance in East Fork Armells Creek. This is because the criteria are based on different types of streams and macroinvertebrate communities.

45. Comparison of current macroinvertebrate sampling results to baseline (i.e., past) conditions is a better indicator of changes in water quality on East Fork Armells Creek (keeping in mind the caveat that ephemeral streams naturally experience high variability in macroinvertebrate samples due to changes in water conditions and variability of microhabitats).

46. The line quoted by petitioners from the presentation, that "[a]lthough [East Fork Armells Creek] supports aquatic life, aquatic life criteria are not met," does not indicate that East Fork Armells Creek is not currently meeting its beneficial uses for aquatic life. Rather, it addressed sampling from the 1970s and was meant to demonstrate, as explained immediately below on the

same slide, that "[a]quatic life monitoring will likely demonstrate natural variability [and is] unlikely to demonstrate impacts from mining." Ex. 10 to Pet. Br. at 12.

47. In summary, the September 2015 presentation did not reflect any conclusion that current water quality in East Fork Armells Creek does not support aquatic life and, in fact, was meant to demonstrate that sampling of aquatic life is unlikely to show effects from mining.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 7/21, 2016.

s/
Penny Hunter

Peterson Declaration
EXHIBIT 11

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	**)**	
APPEAL AMENDMENT AM4	**)**	
WESTERN ENERGY	**)**	
COMPANY, ROSEBUD STRIP	**)**	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	**)**	
PERMIT NO. C1984003B	**)**	
_____	**)**	

DECLARATION OF DICKI PETERSON IN SUPPORT OF RESPONDENT-INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Dicki Peterson, declare under the penalty of perjury as follows:

1. I, Dicki Peterson, am the Permit Coordinator with Western Energy Company ("Western Energy"). I have been employed by Western Energy since 2001. I became Permit Coordinator in 2007. In that capacity, I maintain Western Energy's environmental permits and serve as a liaison between Western Energy Company and the Montana Department of Environmental Quality ("DEQ"). As part of these responsibilities, I compile and submit any applications for environmental permits, and coordinate Western Energy's response to any technical deficiency letters from DEQ.

2. On June 15, 2009, Western Energy submitted permit Application 00184 (AM4), Area B Permit Amendment to DEQ. I have been involved in the permit application process for AM4 since its inception. DEQ issued eight rounds of deficiencies letters during its consideration of the AM4 Permit. I was responsible for coordinating Western Energy's response to each deficiency letter. Multiple scientists assisted in responding to these inquiries, including but not limited to Michael Nicklin, Richard Spang, and Wade Steere.

3. On December 22, 2009, DEQ issued its first round of technical deficiencies to Western Energy, requesting the Company update production and acreage tables in its Application. Western Energy submitted the requested information on March 18, 2010.

4. On June 1, 2010, DEQ issued a second round deficiency letter to Western Energy. The letter requested that Western Energy review and correct the life of mine disturbance calculations for the permit, submit an updated Hydrological Control Plan, and make a number of other substantive and procedural revisions. Western Energy addressed DEQ's requests and submitted the required supplemental information on November 15, 2010.

5. On March 14, 2011, DEQ issued its third round deficiency letter to Western Energy. DEQ requested that Western Energy revise its Fish and Wildlife Plan to bring it in accord with the requirements of ARM 17.24.312, commit to making Post-Mine Topography adjustments during final regarding, and address why certain coal within the Permit area would remain un-mined. Western Energy addressed these concerns and responded to DEQ's deficiency letter on January 19, 2012.

6. On February 29, 2012, DEQ emailed Western Energy comments on the Comprehensive Evaluation of Probable Hydrologic Consequences Areas A, B and C ("PHC Report"). On April 4, 2012, it then requested that Western Energy update the PHC Report for Rosebud Mine to reflect new developments. On May 3, 2013, DEQ sent Western Energy a letter describing the requirements of the revised PHC.

7. Western Energy performs continual monitoring at the Rosebud Mine site. The revised PHC, which Western Energy submitted to DEQ on June 16, 2013, updated tables and other information to reflect new information gleaned during the monitoring process.

8. DEQ issued its fourth round deficiency letter on May 16, 2012. Western Energy responded on March 25, 2013, which included the requested updates to the Fish and Wildlife Plan, indications of how reclaimed land will be used, among other changes.

9. DEQ issued its fifth round deficiency letter on July 23, 2013. Unlike previous deficiency letters, this one also included a number of questions about the revised PHC, which was submitted on June 16, 2013. DEQ probed for information on a number of subjects that are relevant to the present litigation, including why the PHC Report applied certain standards for evaluating sulfate rather than the standards articulated by Hutcheson in Beef Briefs, inquiries as to whether certain data relied upon by Western Energy in drafting the revised PHC Report is useful for determining mining's impact on Total Dissolved Solids ("TDS"), and it also noted that certain information (including information about Areas D, E, and F) did not need to be included in the PHC Report because it was not directly relevant to Areas A, B, and C (which was the subject of the PHC). Specifically, DEQ noted that "Area F is a prospecting area, not a permit area" and therefore need not be included in the PHC. DEQ did note that "[t]he use of water level measurements in Area F to extend the potentiometric surface maps is appropriate."

10. Western Energy responded to each of DEQ's inquiries. For instance, it noted that under the criteria in the Hutcheson study, most groundwater at in the Rosebud Mine area would be unsuitable for livestock even before mining commence; that the TDS information in the PHC Report "provides information on the range and variability of TDS concentrations in each area of the Rosebud Mine;" and Western Energy agreed to remove details (such as information that it had evaluated and submitted to DEQ about Area F) from the PHC Report.

11. DEQ issued its sixth round deficiency letter on January 15, 2014. DEQ requested additional information about the surface water model used to create Tables G-1, G-2, G-3 and G-

5 of the PHC, as well as the inputs to the model and how those inputs were calculated. DEQ also requested that Western Energy include an explanation in the PHC Report of why Areas A, B, and C should be evaluated in the PHC Report while Areas D and E should be evaluated separately. Western Energy responded on February 3, 2014. It provided the supplemental information requested by DEQ into Appendix G of the PHC, and revised Page 1 of the PHC Report to explain why the PHC Report focused on Areas A, B, and C.

12. DEQ issued its seventh round deficiency letter on June 3, 2014. As part of that deficiency letter, DEQ requested "[a] more complete explanation of the hydrologic response of East Fork Armells Creek to mining." DEQ specifically requested confirmation that "the proposed operation has been designed to minimize impacts to the hydrologic balance and prevent material damage to the hydrologic balance outside the permit area." The letter also noted that no aquatic life surveys had been completed for East Fork Armells Creek since the 1970's and suggested that Western Energy "*conduct a current aquatic survey along stretches of EFAC adjacent to the Rosebud Mine permit areas (Areas A, B, and C) to identify assemblages of aquatic life using the stream habitat*." Western Energy responded to the deficiency letter on February 2, 2015 and also submitted an Amended PHC Report in February 2015 comprehensively evaluating the hydrologic impacts, if any, of mining on East Fork Armells Creek.

13. Finally, DEQ issued its eighth and final deficiency letter on March 5, 2015, requesting a number of small changes. Western Energy complied and submitted its response on March 10, 2015.

14. Western Energy takes its environmental stewardship responsibilities very seriously. In fact, Western Energy has received fourteen awards since 1987 for its reclamation, including an

award issued in 2011 for "Excellence in Surface Coal Mining & Reclamation." A complete list of the fourteen awards issued to Western Energy for its reclamation efforts at Rosebud Mine is appended to this declaration.

15. The following photos illustrate the reclamation Western Energy regularly performs at the Rosebud Mine.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 21, 2016.

s/ Dicki Peterson
Dicki Peterson

A. RECLAMATION AWARDS

• *Director's Award*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	2011
• *Good Neighbor Award*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	2006
• *Area A Final Reclamation Design*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	2005
• *Sharp-tailed Grouse Dancing Ground*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1999
• *Eagle Rock Mining – Area C*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1998
• *Rangeland Reclamation - 1991*	Hall of Fame – "Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1997
• *Eagle Rock Mining – Area C*	Finalist: "Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1997
• *Mixed Shrub Reclamation*	Finalist: "Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1997
• *Salvaging Petroglyph in Tact*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1993
• *Rangeland Reclamation*	"Excellence in Surface Coal Mining & Reclamation Award" - U.S. Department of the Interior (OSM)	1991
• *Award for Energy Innovation*	U.S. Department of Energy	1987
• *Outstanding Conservation Award*	National Institute for Urban Wildlife	1987
• *Conservation of Columbian Sharp-tailed Grouse*	The Nature Conservancy, Montana Centennial Project – Certification of Appreciation	1985 - 1989
• *Urban Wildlife Sanctuary*	National Institute for Urban Wildlife	1987

Gross Declaration
EXHIBIT 12

MONTANA BOARD OF ENVIRONMENTAL REVIEW

IN THE MATTER OF:	)	
APPEAL AMENDMENT AM4	)	
WESTERN ENERGY	)	
COMPANY, ROSEBUD STRIP	)	**CAUSE NO. BER 2016-03 SM**
MINE AREA B	)	
PERMIT NO. C1984003B	)	
	)	

DECLARATION OF STEVEN GROSS IN SUPPORT OF RESPONDENT-INTERVENORS' OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Steven Gross, declare under the penalty of perjury as follows:

1. I am the Business Manager for the International Union of Operating Engineers, Local 400 ("IUOE Local 400" or the "Union"). I offer this Declaration based on my personal knowledge.

2. The IUOE is a trade union that represents operating engineers who work with heavy equipment, stationary engineers who work in operations and maintenance, and miners.

3. Approximately 400 Montana miners are members of IUOE Local 400, including approximately 300 employees at Western Energy Company's Rosebud Mine surface mining complex near Colstrip, Montana. Those miners are subject to a collective bargaining agreement effective though February, 2019. The Union has represented workers at the Rosebud Mine complex since approximately 1970.

4. IUOE Local 400's members and their families depend on their jobs at the Rosebud Mine. These jobs depend on Western Energy's ability to obtain permits to mine. Prohibiting, curtailing, or delaying Western Energy's proposed expansion imperils union jobs at the mine and may prevent new jobs associated with that expansion.

6. A ruling that prohibits, curtails or delays Western Energy's proposed expansion would result in substantial hardship for the members of IUOE Local 400 and their families. Many could be forced to uproot their families and relocate to find employment.

7. The members of IUOE Local 400 care about the environment and are very proud of the reclamation efforts they have performed at the Rosebud Mine. In fact, the Rosebud Mine has won numerous awards for its reclamation efforts, including the Director's Award for Excellence in Surface Coal Mining & Reclamation issued by the United States Department of the Interior.

I declare under penalty of perjury that foregoing is true and correct.

Executed this 21ST day of July 2016.

Steven Gross, Business Manager for the International Union of Operating Engineers, Local 400