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March 13, 2013

Andrea Larson
Energy Resources Conservation Board
640-5th Avenue SW
Calgary, AB T2P 3G4

Dear Ms. Larson:

Re: Coal Valley Resources Inc. Proposed Robb Trend Project
ERCB Application No. 1725257
EPEA Application No. 028-00011066

In support of the above application, Alberta Environment and Sustainable Resource Development and associated government agencies have reviewed the Environmental Impact Assessment (EIA) report received on April 13, 2012 and the Supplemental Information Request Responses submitted on December 21, 2012.

We require the following Supplemental Information, as outlined in the enclosure, to complete our evaluation of the EIA report. Upon review of all the information submitted, a final determination will be made on the completeness of the EIA report.

Sincerely,

<original signed by>

Corinne Kristensen
Environmental Assessment Team Leader
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(Designated Director under the Act)

cc: D. Helmer (AESRD)
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Coal Valley Resources Inc Robb Trend Project
Supplemental Information Request
EPEA Application No. 028-00011066
ERCB Application No.1725257
March 13, 2013

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1. Acronyms used in this Supplemental Information Request

The following acronyms are used in this Supplemental Information Request.

CR	Consultant Report
CVM	Coal Valley Mine
CVRI	Coal Valley Resources Inc.
ESRD	Alberta Environment and Sustainable Resource Development
HHRA	Human Health Risk Assessment
PM	Particulate Matter
TOR	Terms of Reference
TSP	Total Suspended Particulate

2. Board

The responses to questions in this Board section will not be considered as part of the EIA completeness decision made by Alberta Environment.

3. Alberta Environment and Sustainable Resource Development

3.1. Public Engagement and Aboriginal Consultation

1. Supplemental Information Request Responses, Question 5c, Page 10

Coal Valley Resources Inc. (CVRI) states that ….*since the EIA was prepared, the Sunchild First Nation has provided two brief reports as a result of traditional studies of the Project area*.

a. Describe how CVRI intends to discuss and avoid or mitigate the concerns brought forward by Sunchild First Nation in the reports

2. Supplemental Information Request Responses, Question 10b, Table 10-1, Page 16

Coal Valley was asked to provide a table similar to the table found in Volume 1, Section G, Appendix 7 Public Engagement, Appendix 4 Public Engagement Report, with potential impacts to treaty Rights and Traditional uses by First Nation, proposed avoidance and/or mitigation, and First Nations response to proposed avoidance/mitigation. Table 10-1 found in SIR Responses provided a summary of all potential impacts and avoidance/mitigation.

a. Provide an expanded table that categorizes this information for each First Nation along with their responses to proposed avoidance/mitigation plans, any outstanding

concerns that could not be avoided/mitigated and a listing of ESRD approvals and disposition types that were consulted on.

3.2. Air

3. Supplemental Information Request Responses, Question 24, Page 53

CVRI has reconfirmed the assumption of 90% dust control during the winter even though the data they present from Grande Cache Coal and from unpaved Highway 40 clearly do not justify it. CVRI seem to be discounting their cited dustfall measurements. Environment Canada guidance is cited stating that there should be no dust emissions on days with measurable precipitation and snow depth of 1 cm or greater; however, the Environment Canada suggestion is a very approximate, 1st order approach with high uncertainty, that should not be relied upon when reasonable field data are available. The field data indicate that a 90% assumption is unrealistic. Even the Environment Canada approach would show that 90% is not appropriate for the early winter (November) and late winter (March). The field data presented by CVRI in their response are consistent with other data for other locations, all suggesting that 90% control throughout the winter period is an extremely optimistic approach.

The Smoky River dustfall data indicated a reduction on the order of 43% for winter dustfall compared to summer. CVRI presents data from Grande Cache indicating that winter dustfall levels are anywhere from 5% to 43% lower than summer levels. After removing what they identify as outliers, they conclude that the winter levels are about 62% lower than summer. CVRI goes on to show data from Coal Valley and indicate that the data support a winter reduction in the range of 23% to 43% for the median values. All of these data sets present a consistent story, which is also consistent with other data that can be found in published research. CVRI then goes on to identify some factors that affect dustfall measurements; however, none of these support an assumption of 90% control rather than the observed 5% to 62% levels control. In the presence of uncertainties, the normal industry approach is to err on the high side to offset the uncertainties. CVRI also notes that the assumption of 90% has been used elsewhere, but nowhere has this assumption been backed up by field data. The available field data show something quite different.

a. Provide CALPUFF model sensitivity runs for the Robb Trend Project showing what results would look like if a reduction in the range of 40-60% was assumed (which is consistent with the available field data) rather than 90%.

4. Supplemental Information Request Responses, Question 36, Page 77

With respect to making an assumption for coarse coal rejects, CVRI does not adequately justify the assumption of 27% moisture in the calculation of emissions. Based on the description given of the rejects, the real moisture content of this material should be used.

a. Provide physical data on the coarse rejects to show that it compares well with fly ash, and confirm that it is handled in a high moisture form.

5. Supplemental Information Request Responses, Question 38, Page 79

The reported silt loading of 0.17 g/m^2 is extremely low for a paved road with access from unpaved areas and with significant heavy truck traffic. This silt loading value represents an annual average value for urban highways.

a. Provide the original data with details of where they were obtained.

b. Define 'typical' road surface material and how that relates to heavy truck using this road.

c. The single particle size analysis indicates 43% silt and 15% clay content. Using a hand calculation, indicate how these high values relate to the silt loading value of 0.17 g/m^2.

d. Provide a more extensive set of field data to justify this value.

e. Provide CALPUFF model sensitivity tests to show what the results would look like with a more realistic average silt loading value.

6. Supplemental Information Request Responses, Question 41, Page 83

a. Provide the moisture content and drop height values that were used in the calculations shown.

7. Supplemental Information Request Responses, Question 43, Page 88

The assumption of snow cover from November through March is not appropriate. Climate norms for Edson indicate that November has historically had only 18.9 days with snow depth greater than 1 cm and only 14.6 days with snow depth greater than 5 cm. Similarly, March has only 9 days with snow depth greater than 1 cm and only 6.5 days with snow depth greater than 5 cm. During November and March, therefore, there will be little or no snow cover most of the time. With global warming considerations and the recent update to climate norms, the days with snow cover during these months may be even fewer in future. It would be more realistic to assume that the snow covered period extends only from December through February.

Given that traffic areas may be cleared of snow, snow cover is not necessarily a good indicator of dust potential on those traffic areas. If using snow cover data, it would also be important to consider the statistic available in the Climate Norms indicating the mean number of days/month when the ground is relatively free of snow cover (e.g., days/month with less than 10 cm of snow). However, when field monitoring data are available to give an indication of natural dust control during winter, such as those from Smoky River, Grande Cache and Coal Valley, CVRI should rely on the field data, as they are a direct indicator.

a. Provide model sensitivity runs showing the implications of assuming a level of natural dust control consistent with the reported dustfall measurements.

8. Supplemental Information Request Responses, Question 45, Page 90

The AP-42 methods in Chapter 11.9 and 13.2.5 both may significantly underestimate wind erosion from coal piles. The method for AWMA (1992) will underestimate by significantly more. No substantive justification for use of AWMA (1992) has been provided. CVRI indicates that there are significant uncertainties and their only justification for AWMA (1992) is that it appears to be based on credible measurements and organizations. However, this is also true of AP-42, Ch. 13.2.5.

It is clear that quantification of wind erosion has large uncertainties and, under that circumstance, the appropriate approach is to err on the high side in an effort to offset the uncertainties.

a. Provide justification for use of AWMA (1992) which, based on the SIR response from CVRI, indicates the least conservative option for estimating dust emissions.

b. Provide CALPUFF model sensitivity runs showing how use of AP-42, Ch. 13.2.5 would affect the dispersion model results for the proposed project.

9. Supplemental Information Request Responses, Question 46, Page 96

Contrary to what is stated by CVRI, the papers cited do not support the claims of Pace. CALPUFF can inherently compute deposition processes as a function of the surface roughness, and therefore, already inherently estimates the effects of particle removal effects by the canopy. Applying a further reduction factor result in a double counting of deposition. The factor of 4 reduction mentioned in the context of CMAQ does not apply to dispersion models such as CALPUFF or ISC3 which compute deposition in an integrative fashion that is independent of receptor spacing, rather than explicitly on the grid as in the case of CMAQ, which tends to underestimate deposition when the grid is coarse.

Many published papers can be found that discuss the effect of vegetation on airborne emissions of particulate matter and other pollutants. When trees are sufficiently close to an emission source and are present in sufficient size and density, they can produce significant reductions in concentrations downwind of the trees; however, the magnitude of the effect is highly variable, being dependent on the type, size and density of the tree belt and on wind speed. In light of this variability and the high uncertainty, a blanket assumption of 75% reduction is not appropriate. In areas where the trees are relatively sparse or there is a large separation distance between the emission sources and the trees, the level of control will be much less. For a blanket approach, a much more moderate assumption should be adopted that errs on the safe side (e.g., 25%).

Dispersion models and, in particular CALPUFF, frequently underestimate downwind concentrations of particulate matter rather than overestimate. Therefore, no emphasis should be placed on the tendency of dispersion models to over predict. CALPUFF has inherent deposition and depletion calculations that at least partially account for the effect of trees. Before applying a further 75% reduction factor to account for trees, it is necessary to provide strong evidence that CALPUFF's deposition/depletion calculations

do not adequately represent the full effect of the trees. CVRI cites a paper by Malone (2004) that only considers the effects of trees, but does not delve into whether deposition algorithms within CALPUFF or other dispersion models account for it. The same is true for Zhu et al. (2012) and Cowherd et al. (2006). Also, all of these studies found reductions that were less than 75%.

CVRI reports one study of nighttime stable conditions and indicates that a Gaussian model (ISC3, not CALPUFF) overpredicted the transportable fraction of PM10. The study did not address daytime neutral or unstable conditions. There is also no indication of whether ISC3 was run with deposition and depletion and, if so, what parameters were used.

CVRI then goes on to identify various problems with dispersion models and, in particular, with modelling of dust from roads. The comments made here point to significant uncertainties in modelling of fugitive dust sources. This is true and, in fact, dispersion modelling for fugitive dust sources has often been found to underestimate actual measurements, even when no reduction factor is applied for the effect of trees.

a. Provide CALPUFF model sensitivity runs that show what the model results would look like with trees accounted for only by the deposition/depletion algorithms built into the model. In light of the significant uncertainties this would provide something closer to an upper bound estimate of what the actual concentrations and deposition rates might be like.

10. Supplemental Information Request Responses, Question 64, Page 125

The choice of TERRAD by CVRI is still of some concern. Model guidance is that TERRAD should be some multiple of the horizontal grid spacing. If TERRAD is the same size as the grid spacing, the effect is to minimize (if not remove) the terrain effect. In fact, with TERRAD = grid size, in computing HMAX for a given grid cell, the grid cells on the diagonal will be ignored as the centre to centre distance will be SQRT(2), and thus bigger than TERRAD. Only the cells immediately east-west or north-south will be considered as only they will lie within the TERRAD radius. To be physically meaningful, TERRAD should be at least big enough that all adjoining grid cells will be examined.

There is no physical reason to use 15 km, so comparison to a run using this value is of little value. As the response states, the terrain in the region suggest that TERRAD should be on the order of 5 km. This is consistent with a grid resolution of 1 km. A value of TERRAD consistent with the physical features in the domain should be the starting point and it can be adjusted accordingly, within the physical meaning of the parameter. As the response states, this is likely somewhere in the range of 3-6 km.

Also, because TERRAD determines the influence of terrain on the CALMET winds and, more specifically, the influence of spatial variation of terrain on the CALMET wind fields, it is important to examine the spatial wind patterns produced by CALMET throughout the domain, rather than at just a single point in space. The evaluation of the

representativeness of the CALMET fields should include snapshots of wind vectors that show influence (or lack) of terrain drive flows. Further, the response to this question contradicts the statement addressed in SIR# 62.

a. If data from Suncor Hanlan Robb Gas Plant are available for model evaluation, include these in a model run.

b. Provide results for values of TERRAD in the range of 3-6 km and show that they are similar to what was used in the modelling.

c. Provide spatial wind vector plots to demonstrate terrain influences.

3.3. Water

11. Supplemental Information Request Responses, Question 70, Page 131 and 132
Supplemental Information Request Responses, Question 71a, Page 132 - 133

In response to requests for a numerical groundwater models to illustrate baseline hydrogeological conditions and to provide site specific hydrogeological data and analysis, CVRI states *CVRI has chosen to use the substantial volume of hydrogeological information collected over the course of mining in the precisely similar hydrogeological regimes as evidence of the probability and nature of impact. This substantial body of knowledge is more valid as a predictor of future impacts in the Project than any computer model.*

The information does not provide site specific analysis or modelling scenarios for an area that is not necessarily of a precisely similar hydrogeological regime.

a. Provide site specific hydrogeological data and analysis, taking into account the variability in hydrogeological parameters to:
   i. quantify the amounts of water that are anticipated to be required to be removed during mining operations.
   ii. quantifying the drawdown of groundwater during mining operations at the site and in adjacent areas.

   For this assessment, use a numerical model to confirm the predicted amounts.

b. Provide an analysis of potential error in the prediction.

12. Supplemental Information Request Responses, Question 71b, Pages 132

In response to question 71b, CVRI used information observed in the area of the Mercoal West mine permit area and not data specific to the proposed Robb Trend Project. CVRI also state *As the impact is insignificant, no mitigation is required and the overall water balance/interaction between ground and surface water is unaffected*. This assertion is not based upon site specific data.

a. Based upon site specific information, provide a balanced water budget quantifying the groundwater contribution to streamflow in the pit footprint, and adjacent areas where groundwater drawdown is predicted.

b. Provide the balanced water budget for time periods prior to, during and after mining operations are completed.

c. Define the length of time from the end of active mining operations until static groundwater conditions are re-established.

13. Supplemental Information Request Responses, Question 71c-e, Page 133

In response to 71c, CVRI state *CR #3, Section 4 summarizes the known effects and necessary mitigation associated with the groundwater effects of the Project. Tables 4.2-1 and 4.3-1 of CR #3 outline that no significant impacts are predicted.* This information does not quantify the effects requested.

a. Quantify stream, wetland and peatland water levels during the time of reductions in groundwater levels in the mine pit footprint and adjacent areas where groundwater drawdown is predicted.

In response to 71 d. CVRI state *Section 4.2.6.1 of CR # 3 states clearly that with the return of pit water to adjacent watercourses there will be no reduction in flow*. However, Section 4.2.6.1 of CR # 3 states *When mine pits are adjacent to watercourses there will be a tendency for dewatering of the adjacent pit to draw water that would, for a portion of the year, have entered that water body*, thus indicating that impacts are anticipated.

b. Quantify the groundwater contributions to streamflow (before, during and after mining) for streams in the area where drawdown is predicted (and anticipated) due to dewatering of the mine pit footprint and adjacent affected areas.

c. Quantify the percent reductions in streamflows that will result from the reductions in groundwater levels.

d. Quantify the anticipated effects on streamflow associated with reduced groundwater recharges to the streams in the areas affected by the groundwater level declines.

14. Supplemental Information Request Responses, Question 72a to 72d, Pages 134-136

In Section 3.3 of CR # 3 (Page 24), CVRI indicate that groundwater is anticipated to be drawn down in the area of the abandoned Lakeside and Bryan underground mines. As a consequence, CVRI anticipates that groundwater levels will decline to 1,050 m on the southeast side of the Hamlet of Robb and to 1,040 m on the northwest side of the Hamlet of Robb.

CVRI was requested to provide site specific hydrogeological data and analysis, taking into account the variability in hydrogeological parameters, to quantify the drawdown of groundwater anticipated during these dewatering operations in the area of the abandoned Lakeside and Bryan underground mines and adjacent affected areas (SIR 72a). CVRI was requested to provide additional information related to the issue of groundwater level decline to 1,050 m on the southeast side of the Hamlet of Robb and to 1,040 m on the northwest side of the Hamlet of Robb (SIR 72b to 72d).

CVRI's response was a qualitative discussion acknowledging that drawdown would occur and that at a later time, the effects would be confirmed and a mitigation strategy would be developed. The discussion did not provide the quantitative analysis requested.

CVRI state "It is anticipated that water levels will recover approximately nine months after dewatering ceases" without providing any site specific quantitative analysis.

CVRI also state "Dentherm (1982) undertook a computer model of the drawdown adjacent to the dewatered Lakeside and Bryan Mines. The amount of drawdown of the water level in the workings was similar to that anticipated for this proposed Project – approximately 60 m. Section 3.4.8.3 (page 3.4-27-28) states as follows:

> *"Computer simulation of groundwater flow around the final pit was conducted using a transient finite element model.*
>
> *It is predicted that the pit will not affect bedrock flow systems beyond a distance of a few tens of metres from the pit walls due to the presence of low permeability and anisotropic rock formations."*

Considering the large scale of the proposed Robb Trend Project and associated possible significant impacts, it is considered necessary to conduct a new phase of computer modelling to assess effects and provide a mitigation strategy, rather than rely on modelling conducted 31 years ago.

CVRI also describe information provided in regards to drawdown observed in the area of the Mercoal West mine permit area which is not specific to the proposed Robb Trend Project. It is noted that the Mercoal West mine permit area is located 5-10 km west of the proposed Robb Trend Project.

a. Provide site specific hydrogeological data and analysis, taking into account the variability in hydrogeological parameters, to quantify the drawdown of groundwater anticipated during these dewatering operations in the area of the abandoned Lakeside and Bryan underground mines and adjacent affected areas.

b. Provide site specific hydrogeological data and analysis quantifying the lateral extent of the drawdowns of groundwater anticipated during these dewatering operations.

c. Provide a site specific quantitative analysis indicating how long it will take, following the completion of mining operations, for the water levels to recover to static levels observed before the beginning of mining operations. For this analysis, illustrate, for monthly time increments, the extent of the maximum drawdown, to full recovery, in the area of the abandoned Lakeside and Bryan underground mines and adjacent affected areas.

d. For a) to c) above, use the numerical model previously generated to confirm the predicted drawdowns and recovery times.

e. Provide an analysis of potential error in the predictions.

15. Supplemental Information Request Responses, Question 73a to 73c, Pages 136 and 137

CVRI states they have *proposed a plan of action with respect to the situation surrounding the mine plans and the underground mines*. CVRI also state *CVRI will commit at this time to transporting water diverted from watercourses through groundwater back to the adjacent watercourse. This will effectively mitigate the issues pointed out above*."
This does not answer the question presented to CVRI.

a. For streams in the affected areas, provide a balanced quantitative water budget that quantifies stream input and output parameters prior to, during and after mining operations. Provide this quantitative analysis for each stream that transects the mining footprint, and including adjacent affected areas.

b. Describe and quantify the groundwater contribution to the streams in the area where drawdown is anticipated in relation to the dewatering of the Lakeside and Bryan underground mines.

c. Quantify the anticipated declines in wetland and peatland water levels associated with reduced groundwater recharge in the areas affected by the groundwater level declines.

16. Supplemental Information Request Responses, Question 74a to 74c, Section 5.1, Pages 137 and 138

CVRI state they will *return groundwater that has entered mine pits from adjacent watercourse to those same watercourses. This process acknowledges that whatever the amount of water being diverted, it will be returned to the adjacent watercourse. Any impact is thus mitigated and thus becomes insignificant*.

CVRI have not addressed the question in relation to TOR 3.2.1 (A), in terms of defining baseline conditions, or quantifying water amounts that could be diverted away from the streams as a result of groundwater declines.

a. Provide a balanced quantitative water budget showing stream input and output parameters prior to, during and after mining operations in the pit footprint and outlying areas. Provide this quantitative analysis for each stream that transects the mining footprint.

b. Describe and quantify the groundwater contributions to the streams in the areas where drawdowns are predicted by dewatering the mine pit footprint and adjacent affected areas.

c. Quantify the anticipated declines in stream levels associated with the reduced groundwater recharge to the streams in the areas affected by the groundwater level declines.

17. Supplemental Information Request Responses, Question 75a, Page 138, and Figures 75a-1 and 75a-7; Supplemental Information Request Responses, Question 79a, Page 151 and Figure 79-1

CVRI was asked for a set of figures that show the anticipated final configuration of end pit lakes and channels. CVRI was also asked to assess whether adjacent lakes would hold water at the differential levels shown. The response to the second request stated that seepage is assumed to be an issue and will be controlled by placement of compacted glacial till where it is necessary to maintain differential elevations between adjacent lakes.

The analysis shown on Figure 79-1 indicates that no core is necessary or will be provided between adjacent Lakes 1 and 2, despite a proposed 15 m elevation difference, because they drain to the *same stream*. It follows that if seepage is as great as anticipated, these two lakes will normally fluctuate more or less together in a water level range controlled by the outlet elevation of the downstream lake. However, Figure 75a-1, which shows the final configuration of lakes and channels, has Lakes 1 and 2 with a 15 m water level difference which will support approximately 700 m of reclaimed connecting channel. There are similar inconsistencies between the anticipated seepage and final elevations of water levels at Lakes 12 and 10 which are shown to be joined by 1500 m of connecting channel (Figure 75a-7).

a. In light of the seepage assessment described in Response 79a, clarify whether Lake 1 is expected to hold water at a level 15 m higher than adjacent Lake 2, and whether Lake 12 is anticipated to hold water at a level 30 m higher than adjacent Lake 10.

b. Provide revised reclamation plan drawings that show the anticipated final water levels.

c. If functional connecting channels cannot be created between these lakes as shown on the reclamation plan drawings, explain what CVRI will do to mitigate the project impacts.

18. Supplemental Information Request Responses, Question 75b, Page 139 and Figures 75a-1 and 86-1

CVRI provided a summary of diversions to be completed over land bridge fills as a table in Response 75b. Figure 86-1 appears to show a diversion of Bryan Creek over the Myneer Pit which is not identified in the table of diversions over land fills

a. What methods will be used to divert Bryan Creek over the Myneer Pit as shown on Figure 86-1?

b. If a land bridge fill is proposed, expand Table 75-1 to include this diversion

19. Supplemental Information Request Responses, Question 75c, Pages 139 and 140

CVRI provided information to describe the amounts of settlement anticipated at land bridge fills where existing watercourses will be reinstated. Two reports respectively dated 1995 and 1965 were identified. The response includes the statement *The chart*

provided illustrates settlement rates for rockfilled dams but no chart was provided. CVRI states that the rock dumps at CVM are comprised of a wide size distribution of material ranging from boulders to silt.

a. Identify the location of, or provide the chart referred to in the response.

b. Do the previous studies address a wide size distribution of materials as is anticipated at CVM?

c. Outline previous studies or prior CVRI experience that addresses settlement of potentially steep embankments under possibly fully saturated conditions. Saturation will occur when end pit lakes are filled on one or both sides of the land bridges.

20. Supplemental Information Request Responses, Question 77a and 77b, Pages 142 and Appendix 86

CVRI was asked about changes in flow regime, including but not limited to changes caused by pump capacity limits. CVRI has responded with references to Appendix 86, titled *Water Management and Aquatic Discussion Paper*. Appendix 86 describes project operations with water management operations that are substantially different from the water management system that is proposed and described in the original project description. Furthermore, Appendix 86 suggests a number of presumably-viable project "alternatives" which would significantly reduce impacts to several of the watercourses. For example, one of the alternative drainage plans described for the Erith River (from Appendix 86 Section 4.1) would *eliminate the Mynheer Pit in the Erith River valley section altogether to leave most of the existing channel undisturbed*.

a. Provide clarification of what water management system is proposed for the project and what elements of the project description are superseded by the discussion paper in Appendix 86.

b. Provide clarification of the timeline and process that CVRI anticipates for deciding which, if any, of the project footprint and water management "alternatives" identified in Appendix 86 will be adopted as defining elements of the project description

21. Supplemental Information Request Responses, Question 77c, Page 144

CVRI provided an update to Volume 3, CR #6, Table 14, which quantifies residual impacts to 2-year, 5-year, and 100-year peak flows. The table indicates significant (around 50%) reductions in peak flows in Hay Creek and Bryan Creek. The initial analysis also indicated large flow reductions but did not specifically look effects on regime and flushing flows.

a. Describe predicted changes to regime flow in Hay and Bryan Creeks in relation to possible resulting impacts to fisheries and aquatic habitats in these streams

22. Supplemental Information Request Responses, Question 79a, Page 151 and Figure 79-1

CVRI acknowledges the potential for seepage through fill berms and *will commit to the placement of an engineered barrier of glacial till to reduce flow*. Figure 79-1 identifies

locations where barriers may be needed and provides a schematic of a dam core to illustrate how this could be done. The core is specified to be a minimum of 5 m wide, with depths up to 30 m based on incomplete data (missing digits) in the table which is part of Figure 79-1. The text suggests that in lieu of a dam core, the low permeability barrier *may be installed near the upstream sloping face of the backfill.* A surface barrier will not be as durable or as long-lived as a dam core installation.

a. Provide a revised version of Figure 79-1 which does not have missing characters in the table.

b. Is a sufficient volume of suitable low-permeability till expected to be available on site to construct all proposed dam cores? If not, where will this material be sourced?

23. Supplemental Information Request Responses, Question 86b & c, Pages 157-158.

CVRI states *CVRI has also initiated more detailed water management planning (with a key goal of avoiding critical habitats)….* They also state *The primary mitigative action employed by CVRI will be to develop mine plans that minimize direct disturbance to critical habitats* (in response to SIR 86.c.).

Athabasca rainbow trout spawning habitat maps provided in CR#2 (Figure 6, 8, 10, and 12) show no avoidance of critical rainbow trout spawning habitat.

a. Provide examples where CVRI has planned to avoid critical rainbow trout spawning habitats in the current mine plan.

24. Supplemental Information Request Responses, Question 86f, Page 160.

CVRI states *CVRI will consider installing barriers to limit fish access to lakes…* in response to concerns that end-pit lakes will have a high probability of being colonized by northern pike and essentially result in a significant shift in fish community.

a. Describe a barrier system that will enable rainbow trout, Arctic grayling, and bull trout bi-directional fish passage throughout the lake complex while preventing the colonization of northern pike.

25. Supplemental Information Request Responses, Question 185c, Page 336.

It has been suggested that impacts on water temperature regime are restricted to the area of stream directly below the pit lakes and that temperatures downstream of the pit lakes will be similar to that upstream of the lakes. Given that the end-pit lakes have a greater surface area and reduced flow, it is likely that summer water temperature regimes will be directly affected. Without some downstream cooling influence (e.g., groundwater inputs), reaches with increased summer water temperatures will not be able to reduce added heat during summer, but will continue warming according to natural stream processes. This heat loading has the potential to maintain downstream temperatures above the range that cold-water fish species such as Athabasca rainbow trout, bull trout, and Arctic grayling require.

a. Discuss the effect stream temperature heat loading will have on Rainbow trout, Bull trout, and Arctic grayling within the LSA and RSA.

b. Describe the water temperature monitoring program that CVRI will conduct to measure such an effect.

c. Discuss measures that can be implemented to mitigate a stream temperature heat loading effect. Include in the discussion the feasibility of CVRI utilizing the mitigation measures identified.

3.4. Terrestrial

26. Supplemental Information Request Responses, Question 106a & b, Page 188 ; Response 118a, Page 207; and Response 144a, Page 241

CVRI indicates in response 106a that *If there are insufficient volumes of soils available for salvage for the soil replacement demand of the reclamation program all the soils will have to be salvaged*. In Response 118a, when discussing the potential salvage of surface soil from Gleysolic and Fluvial landscapes, CVRI states that *If the potential shortfall turns out to be real, this would make up the difference*. In Response 144a, CVRI states that *most, if not all, of the B horizon material will be required* to meet the Approval Condition of 0.30 m of coversoil and that there is no excess salvaged surface soil. In Response 106b, CVRI states that *Soils from soil landscape units F1, F2, F3, and F4 will be salvaged,* but in Table 12, these units have been shaded, indicating that the available peat, A horizon, and B horizon volumes were excluded from the salvage volumes.

These various statements appear at odds with each other, and it is unclear exactly what volume of soil is available for salvage, how much will be salvaged, what horizons will be salvaged from each soil landscape unit, and if there is sufficient soil available to meet the overall coversoil requirements.

a. How will CVRI track the volumes of soil salvaged, and at what point will CVRI know whether sufficient material has been (or will be) salvaged to meet coversoil requirements?

b. Will CVRI know in time to make adjustments and salvage sufficient volumes to cover any projected shortfalls?

c. If the tracking indicates that insufficient volumes of soil have been salvaged (especially in the Robb West Pits and Haul Road area) and insufficient material remains available to be salvaged, how will CVRI make up the difference?

d. Provide a detailed description of the decision-making process that the soil salvage monitor will follow when deciding if part or all of the B horizon material will be salvaged in an area.

e. Confirm if the available peat, A horizon, and B horizon materials from soil landscape units F1, F2, F3, and F4 are required to meet the minimum coversoil of 0.30 m as specified in the Approval Condition.

f. Provide updates to the reclamation material balances in Table 12, Table 13, and Table 15 to clarify what materials will be salvaged from which soil landscape units and the coversoil material balance for the Robb Trend Project.

27. Supplemental Information Request Responses, Question 130, Pages 219-220

CVRI states *the west bank of the Pembina River is controlled by a 15-30 m bedrock embankment. The mine development will not extend past the embankment and therefore will not impact the river or the floodplain*. CVRI also states *For the purposes of this EIA, a vegetation buffer of 30m will be maintained along streams and rivers which are not being diverted. Disturbance, including space for clearing, mining, dumps, soil stockpile, or reclamation sloping of dumps will not enter into the Pembina River or its floodplain.* The majority of recent mine approvals in the province have included significantly larger vegetated buffers from the escarpment of watercourses.

a. Explain why a minimum setback of 30 m from the bank was selected. Discuss the factors included in the decision of 30 m. Provide references if available and include references to other mining projects with a similar watercourse setback.

b. Discuss the proposed footprint disturbance boundary with respect to escarpments (including the Pembina River) &/or upland riparian zones associated with all watercourses in the area. Does the disturbance boundary or lease boundary extend directly to the upland escarpments or riparian zones of all watercourses? Confirm the area of buffer that will be maintained from the project disturbance area to the proposed lease boundary and from this boundary to the escarpment/upland riparian zone of all watercourses (consider developing a figure that clearly shows the proposed disturbance boundary, proposed lease boundary and the vegetated buffer from all watercourse escarpments &/or upland riparian zones). What criteria will be used to determine the size of the buffers to be used between the disturbance, lease boundary and watercourse escarpments &/or upland riparian zones?

c. Discuss the minimum setback required to maintain the geotechnical stability of the Pembina River escarpment. Include discussion on any other watercourse escarpments or upland riparian zones.

d. What is meant by *For purposes of this EIA*? Is CVRI intending to maintain proposed buffers throughout the lifetime of the project?

e. Provide evidence (including scientific references) that supports that a 30 m vegetated buffer is adequate to support wildlife movement. Include discussion on the potential impacts to wildlife movement resulting from the 15-30 m Pembina River escarpment and associated upland and lowland habitat.

f. Discuss the baseline and operational monitoring planned to detect changes in wildlife movement through vegetated buffers (including upland and lowland habitat between along the lease boundary). Explain mitigations to be implemented if reductions in wildlife movement are identified.

g. Provide evidence (including scientific references) that support that a 30 m vegetated buffer is adequate to maintain watercourse health. Include a discussion on the feasibility of increasing the size of the buffer.

h. Discuss the monitoring planned to detect changes in watercourse health. Discuss if/how placement of monitoring sites will be related to buffer width.

28. Supplemental Information Request Responses, Question 131a, Page 221

CVRI was asked to discuss the methods or techniques that will be employed to ensure that any soil or groundwater resources left in place after the initial spill response and removal of spilled product have not been adversely affected by the spill. Information was provided on how the soil resources will be managed, but not the groundwater.

a. Discuss the methods or techniques CVRI will employ to ensure that groundwater resources have not been adversely affected by a spill.

29. Supplemental Information Request Responses, Question 132a, Page 223

CVRI states that a small buffer is included between most of the development features and the proposed disturbance boundary.

a. What are the minimum, maximum, and average buffer distances between the proposed disturbance and mine permit boundaries?

b. Identify those areas that will have no buffer.

30. Supplemental Information Request Responses, Question 135a & b, Pages 231& 232 ; and Question 69c, Page 94

CVRI was asked to discuss alternative uses for non-salvageable debris, including use of coarse woody debris (defined as logs, branches, and stumps) on coversoil stockpiles. In Response 135b, CVRI provided a brief discussion on firewood as a possible alternative, but did not address the use of placing coarse woody debris on the surface of coversoil stockpiles or reclaimed areas after coversoil placement. In Response 69c, CVRI states that *Logging residual placed on the reclaimed surface will function as downed wood in the future forest*.

a. Provide a definition for Logging residual, and compare that to coarse woody debris, commonly defined as logs, branches, and stumps.

b. Clarify if CVRI intends to place coarse woody debris on the coversoil stockpile and/or reclamation surface after coversoil placement, separately from the woody debris that may be retained in the salvaged soil.

c. If CVRI does intend to place coarse woody debris in the reclamation process, provide information on where this debris will come from, considering that CVRI has stated that their *Standard procedure has been to windrow the excess woody debris on the mine development area where it will be incorporated into the overburden mined from the pits and hauled to the rock dumps*.

31. Supplemental Information Request Responses, Question 137a, Page 233

In Response 137a, CVRI states that the drawdown of water levels adjacent to operating pits was found to be minimal, but in the EIA, CVRI stated that significant groundwater drawdown may extend up to 200 m from the pit.

a. Within the context of groundwater drawdown levels, define what is meant by 'significant' versus 'minimal'.

b. Quantify the predicted change in water levels over time in the peatlands and wetlands adjacent to the Robb Trend mine pits.

c. Discuss whether CVRI expects the predicted changes in water levels in the peatlands and wetlands adjacent to the project disturbance footprint to be significant or minimal.

d. Using the site specific groundwater drawdown levels quantified for the Robb Trend Project, discuss effects that the predicted groundwater drawdown is expected to have on the vegetation communities in the peatlands and wetlands adjacent to the mine pits.

32. Supplemental Information Request Responses, Question 145, Page 242

a. Assuming that the quoted mortality risk of 6.1 is pre-mining (Robb Trend) and that both the RSF values and road density will change on the RSA during the T10, T25 and T50 time frames, provide mortality risk calculations for the RSA at the T10, T25 and T50 periods in the context of foreseeable future cumulative developments including other coal mines.

b. Given that recent local research (Cristescu *et al* 2011) has suggested that large original forested patches are an important component of grizzly bear habitat on coal mines, provide details regarding original forest cover to be maintained on the mine during active mining:
   i. how much original forest cover will be maintained
   ii. in what configuration; and
   iii. the locations.

References:
Cristescu, B, G.B. Stenhouse, M. Symbaluk and M.S. Boyce. 2011. Land -use planning following resource extraction – lessons from grizzly bears at reclaimed and active open pit mines. Mine Closure 2011 — A.B. Fourie, M. Tibbett and A. Beersing (eds)

33. Supplemental Information Request Responses, Question 146, Page 243

a. Recognising that in the Banff example, focused crossing points are located in a protected area with few roads outside of Highway 1 and where no firearms are permitted, discuss, in the context of the end-pit lakes, how focused and predictable crossing points, with a significant road density (above the recommended maximum road density for core areas in the Grizzly Bear Recovery Plan) and permitted firearms, may affect mortality risk for grizzly bears, given that unusual terrain

conditions such as this are not a component of the FRI Mortality Model calculations (G. Stenhouse, pers com).

34. Supplemental Information Request Responses, Question 147, Page 249

CVRI indicates that High and Very High marten habitat suitability classes presently make up 56% of the RSA and that, in 50 years, 78% of that will be reduced to Moderate, Low or Very Low habitat suitability classes. Dumyahn *et al* (2007) has suggested that marten will not establish home ranges unless >70% of the area is suitable habitat and Hargis *et al* (1999) indicated that marten respond negatively to low levels of habitat fragmentation and are nearly absent when landscapes are comprised of >25% non-forest cover.

a. Given the loss of 78% of High and Very High marten habitat suitability classes, explain the regional habitat impact analysis that suggests marten populations will not decline or that effects on marten populations will be insignificant (CR#7, page 88).

References:
Dumyahn, J. B., P. A. Zollner, and J. H. Gilbert. 2007. Winter home-range characteristics of American marten in northern Wisconsin. American Midland Naturalist 158:382–394.

Hargis, C. D., J. A. Bissonette, and D. L. Turner. 1999. The influence of forest fragmentation and landscape pattern on American marten. Journal of Applied Ecology 36:157–172.

35. Supplemental Information Request Responses, Appendix 137, Section 3.2.1, Page 5

As part of the provided Wetland Monitoring Program Proposal, CVRI states that, as part of the proposed wetland selection process, *those wetlands that are most likely to be affected by reductions in water levels will be given priority*.

a. Confirm if CVRI intends to include all peatlands and wetlands that will be intersected by the mine pit or other disturbance associated with the mine.

b. If any peatlands and wetlands directly affected by the mine disturbance are not included, provide information on how CVRI will identify and mitigate any potential adverse effects to peatlands and wetlands not included in the monitoring program.

36. Supplemental Information Request Responses, Appendix 137, Section 2.1, Pages 3 and 4

As part of the provided Wetland Monitoring Program Proposal, CVRI discusses the water level and water chemistry results obtained as part of the current Wetland Monitoring Program for the "South Extension Wetlands". While CVRI states that *there were no issues with the lowering of groundwater levels as the drawdown of water levels adjacent to operating pits was minimal*, it is unclear on exactly how much the water levels have decreased over time. No discussion was provided on how the South Extension Wetland vegetation communities have been affected by pit development.

a. Quantify the changes in water levels over time in the South Extension Wetlands. What were the water levels before pit development, and how have those levels changed over time?

b. What effects on the South Extension Wetland vegetation communities has CVRI identified as part of the wetland monitoring program? Discuss whether CVRI considers these effects to be significant or not.

4. Federal

The responses to questions in this Approvals section will not be considered as part of the EIA completeness decision made by ESRD.

4.1. Environment Canada

37. Supplemental Information Request Responses, Response 189, Page 340.

In response to SIR # 189, CVRI stated that *[t]he current ESRD approval for the operation of the CVM specifies that surface water bodies will be monitored by grab sample once per year for "inorganic parameters" listed in "Canadian Water Quality Guidelines for the Protection of Aquatic Life 1999 (as amended). These parameters are listed in CR #3 Tables 3.4-2 and 3.4-3. This would therefore be the "acceptable quality (level)"*. However, not all of the inorganic parameters listed in CR #3 Tables 3.4-2 and 3.4-3 have levels listed in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life 1999.*

a. For those inorganic parameters listed in CR #3 Tables 3.4-2 and 3.4-3 which do not have acceptable levels as defined in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life 1999,* indicate how "acceptable quality" will be defined.

38. Supplemental Information Request Responses, Response 191, Page 341.

In response to SIR # 191, CVRI stated that *[t]he 'competent rock' will be taken from the proposed mine pits and hauled to provide 'common fill' for the haul road construction. Solid, unweathered rock is preferred for construction. Therefore, it is the same 'overburden rock' that has been tested for the mine. Overburden characteristics have been described in CR#10, Section 4.0.*

While the reference section does state that *A total of 128 overburden samples (mostly bedrock) from fourteen test holes (Figure 8) were collected by CVM and analysed for texture, carbonate content, detailed salinity and metals*, it does not include any information on testing for the potential for acid generation.

a. Clarify how the testing discussed in CR#10 will determine the suitability of overburden for the construction of haul roads, with respect to the potential for acid generation and metal leaching.

4.2. Natural Resources Canada

39. Supplemental Information Request Responses, Response 210, Page 363.

In their response to SIR 210, CVRI states that *climate change is indifferent to ecosystem makeup* and that *the minor spatial differences between Edmonton and Edson (CVM) are insignificant to climate change over the long term.*

a. Provide a justification and rationale for the applicability of the predictions generated by using the Edmonton data (e.g. explain how model results are representative of the Edson (CVM) area when existing differences between Edmonton and Edson make Edmonton a poor surrogate for Edson). Response should reference model prediction uncertainty.

40. Supplemental Information Request Responses, Response 211, Page 363.

In their response to SIR 211, CVRI states that with regards to 're-worked till', *[s]econdary deposits are those having undergone 'reworking' through actions such as fluvial transport or erosion.*

a. Explain why re-worked till is not classed as fluvial sediment.

b. Provide a description of the sedimentological and physical characteristics of the "reworked till" unit, and explain why it classifies as a 'till', whether it is a diamicton and whether it contains erratic clasts.

4.3. Health Canada

41. Supplemental Information Request Responses, Response 213, Page 365.

CVRI states that at some locations, for some compounds, air emission values are higher for Project Case 2 than for Project Case 1, even though Project Case 1 was used in the assessment as the worst-case air quality scenario.

a. Revise the assessment using Project Case 2 air emission values when they are higher than Project Case 1.

42. Supplemental Information Request Responses, Response 215, Page 367.

According to the National Pollutant Release Inventory, the benzo(e)pyrene, dibenz(a,h)acridine, phosphorus, and sulphuric acid are emitted by this industrial sector/facility and are not emitted from project fugitive sources or from diesel combustion.

a. Identify and describe the other project sources that emit benzo(e)pyrene, dibenz(a,h)acridine, phosphorus, and sulphuric acid.

43. Supplemental Information Request Responses, Response 216a, Page 368.

CVRI states that water trucks will be deployed on a continuous basis during peak traffic periods and warm weather conditions.

a. Provide specific details on the watering schedule including a discussion of:
   i. the application rate of water,
   ii. the time between applications,
   iii. traffic volume during the period and
   iv. the meteorological conditions during the period.

b. US EPA 1998b suggests that surface improvements and source extent reductions (if possible) can reduce the PM10, PM2.5 and TSP levels. Will CVRI be considering these mitigative measures?

44. Supplemental Information Request Responses, Response 217, Page 371.

CVRI states that they will *investigate the potential for low-emission practices*...

a. Provide more detail on when these practices will be investigated including what will trigger an investigation and; under what circumstances "low emission practices" will be put into place.

b. Clarify whether Tier 4 technology will be used when it becomes available.

c. Clarify whether CVRI will be implementing an air quality monitoring program to determine when additional operational controls should be applied to reduce air quality emissions.

45. Supplemental Information Request Responses, Response 224, Page 382.

Of the 18 discrete receptor locations (denoted as R1 to R18), 4 locations are not considered in the HHRA (R10, 11, 12, and 13).

a. Clarify why all four of these locations are not considered in Table 3-2, with specific attention to R11 (in Local Study Area) and R12 (identified as a campground).

5. Errata

46. Supplemental Information Request Responses, Response 53, Page 113

Some ambient measurements appear to be misinterpreted by CVRI and used in the creation of the box plot. Based on the spread of data at each hour and the strong autocorrelation from one hour to the next, the box plots for Hour 4 are statistically significantly different from all other hours. This is clearly caused by an error in reporting of calibration hours as measurements.

a. The box plots for Hour 4 should be removed from the two graphs.

47. Supplemental Information Request Responses, Response 65, Page 126

It makes no material difference to the study results, but the explanation of mixing height calculation provided by CVRI is misleading.

CALMET recalculates mixing height for every hour and every grid cell using the micrometeorological module of the CALMET model as described starting on page 2-23. This explanation does reference twice daily temperature profiles, which may be the source of the confusion. However, the model was run (correctly) with no upper air data using MM5 prognostic fields only. In this case, the model uses the temperature profile from MM5 to perform the mixing height calculation.

As the response states, it is true that upper air and surface observations are among of the sources of data that *may* be input to MM5. The data *may* be included in re-analysis fields to set initial and boundary conditions (if reanalysis fields are used in the MM5 model run) or *may* be used to nudge the 3-D wind and temperature fields (if nudging is used). If such data are used they will obviously influence the MM5 solution, but the text in the report read as though the mixing heights are directly determined from twice daily soundings.
However, in neither CALMET in no obs mode nor MM5 are twice daily profiles *directly* used to calculate mixing heights.

a. The reference to mixing height and twice daily soundings is confusing and should be removed.

48. Supplemental Information Request Responses, Response 66, Page 126

a. Text should be changed to remove the discussion of interpolation as response indicates none was used.

49. Supplemental Information Request Responses, Response 69, Page 130

The CALMET micrometeorological module calculates mixing heights for each hour for each grid cell. These are passed explicitly from the binary CALMET file to the CALPUFF model by this code in the rdmet subroutine:
c --- MIXING HEIGHT

```
 call rdr2d(io,itimes,htmix(1,1,kg),wrk1,mxnx,mxny,
&         nxm(kg),nym(kg),clabel,
&         ndathrb,nsecb,ndathre,nsece,ieof)
```

Which reads a 2-d array from the CALMET outputs and passes it to the HTMIX variable which is defined in the same subroutine as:

```
c       HTMIX(mxnx,mxny,mxmetdom) - real    - Mixing height (m)
```

The PRTMET utility only extracts and prints the value from what is held in a CALMET output file. It does no calculation and does not in any manner change the mixing height value to make it 'explicit'.

a. The original text is incorrect and should be changed.

50. Supplemental Information Request Responses, Question 75a, Page 138 and Figures 75a-1 to 75a-6

CVRI provided a set of figures that show the anticipated final configuration of end pit lakes and channels. Some information on these figures is missing and/or unclear.

a. On all figures, most of the "prime" symbol to orient sections is the plan view is shown as a blank box in the section view. In the figure legend(s) a blank box is also shown in as the symbol for water. All legends need to be expanded to explain what is shown in green in the plan views. Provide corrected versions of all figures.

b. On Figure 75a-2, the plan view horizontal scale of 1:12500 is different from the section view horizontal scale of 1:20000, which makes interpretation of the figure extremely difficult. Provide a revised figure that uses the same horizontal scale for the plan and section views.

c. On Figure 75a-3, the plan view horizontal scale of 1:25000 is different from the section view horizontal scale of 1:20000, which makes interpretation of the figure extremely difficult. Also, the legend uses non-unique blank boxes to identify pit bottom and final grade. One of the water level lines on the section view is identified with as a Lake blank box, and another line is identified as a non-specific lake. Provide a revised figure that uses the same horizontal scale for the plan and section views and correct the other omissions and errors.

d. On Figure 75a-4, the plan view horizontal scale of 1:12500 is different from the section view horizontal scale of 1:20000, which makes interpretation of the figure extremely difficult. Section B-B' shows a sloping channel through a reach that is shown as a lake in the plan view. Section C-C' shows a diversion bridge which is not shown in the plan view. Provide a revised figure that uses the same horizontal scale for the plan and section views, eliminates the discrepancy about whether B-B' is through a lake, and which and shows the Section C-C' diversion bridge location in the plan view. The legend needs to identify the meaning of the dashed line shown in plan view for a portion of Bacon Creek.

e. On Figure 75a-5, there is a diversion bridge shown on Section A-A' which is not shown in the plan view. Provide a revised figure that shows the diversion bridge in the plan view.

f. On Figure 75a-6, the plan view horizontal scale of 1:12500 is different from the section view horizontal scale of 1:20000, which makes interpretation of the figure extremely difficult. There are two diversion bridges shown in the sections, neither of which is shown in plan view. Characters are missing from the section view water level labels. Provide a revised figure that uses the same horizontal scale for the plan and section views, and which shows the diversions bridge locations in the plan view, and corrects other errors.

g. On Figure 75a-6, the orientation of Section A'-A in the plan view is reversed from the A-A' orientation in the section view, which complicates the interpretation of the figure. Provide a revised figure which uses a consistent orientation, preferably left-to-right

51. Supplemental Information Request Responses, Response 132c, Page 224

In the last sentence on page 224, CVRI states *Bi-directional surface runoff from the reclaimed area will be added to the non-disturbed organic soil in continued support of pre-disturbance conditions so that adverse effect is expected in the long term.*

a. Confirm if this sentence should read "… so that no adverse effect is expected in the long term".