

January 5, 2009

Mr. Jeffrey Bull
Manager Health, Safety, & Environment
Windsor Energy Resources, LLC
14301 Caliber Drive, Suite 300
Oklahoma City, OK 73134

RE: WDEQ Review of Amended Draft - *Report of Investigation and Remedial Alternatives Evaluation, October 14, 2008*
Crosby 25-3 Natural Gas Well Blowout; Clark, Wyoming

Dear Mr. Bull:

The Wyoming Department of Environmental Quality (WDEQ), Voluntary Remediation Program (VRP) has reviewed the Windsor Energy Group, LLC (Windsor) amended draft *Report of Investigation and Remedial Alternatives Evaluation, October 14, 2008* (ROI/RAE) for the Crosby 25-3 well blowout (site). The amended draft ROI/RAE incorporates some of the WDEQ's June 25, 2008, comments on the original draft; however, not all of the comments have been adequately addressed. In addition, the WDEQ received comments on the ROI/RAE from two interested parties (enclosed). Comments which are specifically from the Clark Resource Council (CRC) and which the WDEQ believes should be addressed are designated with a CRC after the comment.

Please address the attached comments and incorporate them into the version 2 amended draft ROI/RAE. Once the version 2 amended draft is completed, please forward to the WDEQ and to everyone on the interested parties mailing list who requests one for review. If you have any questions, please feel free to contact me at (307) 335-6949.

Sincerely,

Kathy Brown, P.G.
Voluntary Remediation Program
Solid and Hazardous Waste Division

ENC: Clark Resource Council, December 15, 2008 comments on ROI/RAE
Pam Murrell, December 15, 2008 comments on ROI/RAE

CC: Lander VRP File 58.093 (w/out attachment)
Carl Anderson, WDEQ/Cheyenne; VRP File 58.093 (w/out attachment)
Michael Bullock, Terracon, 2110 Overland Ave., Suite 124, Billings, MT 59102

**WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
SOLID AND HAZARDOUS WASTE DIVISION
VOLUNTARY REMEDIATION PROGRAM**

**REVIEW COMMENTS FOR
REPORT OF INVESTIGATION AND REMEDIAL ALTERNATIVES EVALUATION –
October 14, 2008 Amended DRAFT**

January 5, 2009
Windsor Energy Group, L.L.C.
Crosby 25-3 Natural Gas Well Release

1. Section 1.0, **EXECUTIVE SUMMARY** (page 2): The discussion on remedial alternatives needs to be revised to state that each alternative must meet all of the Remedial Action Objectives (RAOs), not just RAO #1. The WDEQ requests that additional active remedies, including pump and treat, be evaluated for the bedrock aquifer as discussed in item # 18 below. Remove the discussion on the “no action alternative” since it does not meet the RAOs and has been removed as an option from the report text.
2. Section 3.5, **Release History** (page 8): Provide an estimate for the volume of fluids released during the blowout. Include a structural cross section showing the dip of the beds based on field data and subsurface information, including any log or core information obtained during the drilling of the Crosby wells. **(CRC)**
3. Section 3.7, **Groundwater and Surface Water Rights Search** (page 9): This section discusses the data gathered from the Wyoming State Engineer’s Office (SEO) website for the Line Creek Wilderness Subdivision. The data is from Township 58 North, Range 103 West, Section 25; however, the Line Creek Subdivision is also located in Section 36 and in Township 58 North, Range 102 West, Sections 30 and 31. Include all applicable SEO groundwater and surface water data for the Line Creek Wilderness Subdivision. Include all available well logs from the private water wells in the subdivision.
4. Section 3.8, **Identification of Potentially Impacted Media** (page 10): This section should include a summary of past investigation activities and results. For soils, summarize or refer to Section 3.5 of the report. For groundwater, provide a brief discussion on the installation of the initial groundwater monitoring wells MW-1 through MW-10.
5. Section 3.8.2, **Groundwater** (pages 11-12): The field sampling data sheets should be included in either the groundwater monitoring reports or the ROI/RAE. **(CRC)**
6. Section 3.9.1, **Metals** (page 14): There is the possibility that the blowout has caused elevated or reduced pH conditions in groundwater. If this is the case, then there is the potential that naturally occurring metals have been mobilized by the pH conditions and are now present in groundwater. Provide either pH data for groundwater or other lines of evidence to show that this is not likely or metals data from groundwater. **(CRC)**

7. Section 3.11, **Nature and Distribution of Petroleum Impact in Soil/Bedrock** (pages 18-19): As requested in the first set of comments, include the numerical soil cleanup levels required by the Wyoming Oil and Gas Conservation Commission (WOGCC) and discuss if all impacted soils were cleaned up to that level. Identify on a map any areas where soils were not cleaned up to WOGCC requirements.
8. Section 3.12.3, **Characterization of the Lower Groundwater Zone** (page 27): Provide an explanation as to why bedrock well MW-4D produced sufficient water to conduct a pump test yet none of the other bedrock wells were able to produce enough water for a pump test (i.e. MW-4D is connected to alluvial aquifer, or completed in fracture system or more permeable zone, etc.). **(CRC)**

Provide a discussion on the impact that fractures could have on the current bedrock/deep zone plume maps (i.e. potential for an inaccurate representation of contaminants in the deep zone). Include a discussion on the potential for contamination to migrate through a fracture system not identified with the current bedrock groundwater monitoring network and what measures are in place to minimize exposure if contaminants are able to migrate through an unmapped fracture system to private drinking water wells. **(CRC)**

9. Section 3.12.4, **Regional Groundwater Flow** (pages 27-28):

Provide a thorough explanation of how the shape of the benzene plume in the bedrock aquifer, as shown in figures 18 and 19, “suggests a slow or non-moving emplacement of petroleum hydrocarbons”. **(CRC)**

This section estimates that there is approximately 0.9 to 1.2 acre-feet per day of water discharging within the project area to the surface and Line Creek (with some being transpired by vegetation). Although the water samples collected from Line Creek have been essentially non-detect for petroleum constituents of concern (COC), there is still a concern that appreciable contaminants are discharging into Line Creek and being diluted by the volume of creek water. This issue has also been brought up in our review of the Ecological Risk Assessment conducted by Windsor, and to date has not been resolved. Several methods acceptable to the WDEQ to address this issue include: a) conduct modeling of contaminant fate and transport from groundwater into the Line Creek to estimate concentrations entering the creek; b) conduct a bio-assay of the most sensitive species living in Line Creek to determine if they can be impacted by COCs; or, c) any other lines of evidence which demonstrates that COCs are not discharging into Line Creek at levels either above surface water quality standards or levels impacting flora/fauna. Prior to Windsor proceeding with a plan to address this issue, the WDEQ requests the opportunity to review the chosen method and details of the plan. **(CRC)**

This section also estimates that there is approximately 0.1 to 0.2 acre-feet per day of water flowing out of the project area and into the valley fill aquifer downstream of the monitoring network. It seems reasonable to include modeling to estimate the fate and transport of COC's moving down the valley in both the alluvial and bedrock aquifers and to provide projected worse-case plume size and concentration maps for both aquifers. Include the location of any private water wells screened in the applicable alluvial/bedrock plume map. This evaluation is necessary since there are no active groundwater remedial alternatives proposed for contaminants which have already migrated downgradient of the

interim AS/SVE system. (CRC)

Discuss Line Creek in terms of whether it is a gaining or losing stream and how it potentially changes with location and season. Discuss how this potentially influences groundwater migration. (CRC)

10. Section 3.12.5, **WDEQ Groundwater Classification** (page 28): Clarify that the aquifers at the site are a drinking water source and therefore the groundwater at the site, by default, is classified as Class I and is required to be cleaned up to drinking water standards. (CRC)
11. Section 3.13.6, **Indoor/Ambient Air Migration Evaluation** (page 31): The potential for indoor air impacts at the King residence should be evaluated using the vapor intrusion guidance per VRP Fact Sheet #25 (Using Fate and Transport Models to Evaluate Cleanup Levels).
12. Section 3.15.1, **Population Distribution** (page 32): Explain why it is believed that the contamination reported in the Bennett Well Pad water supply well is not related to the contamination from the blowout (i.e. contaminants different than blowout COCs indicating different source). Clarify that the VRP investigation and cleanup of the groundwater contamination in the Line Creek drainage is limited to contamination from the Crosby 25-3 well blowout. (CRC)
13. Section 3.15.3, **Surface Water Features** (page 33): Include the stream survey data, flow rates, and water level measurements for Line Creek. (CRC)
14. Section 3.19, **Monitoring Well Sampling** (pages 37-38): Clarify that the WDEQ has approved the Sampling and Analysis Plan (SAP) and include the date of the approved SAP.

This section would be clearer and more effective if the groundwater sampling program was discussed in a general sense (standard procedures, sampling events to date, problem wells, analytical trends, etc.) instead of discussing one sampling event and the results. This same comment applies to Section 3.20 (Private Drinking Water Well Sampling).

15. Section 3.21.1, **Sampling Frequency** (pages 39-42): Inset 2 states that the groundwater monitoring wells in bold will be sampled quarterly. The text following this discusses the rationale for sampling certain wells quarterly versus semiannually. Resolve the inconsistencies between the bolded wells and wells discussed in the text.

Update the information on proposed groundwater monitoring wells MW-45 and MW-46 to include actual drilling locations, rationale for choosing the locations, and all other pertinent geological/hydrological information.

16. Section 4.2, **Air Sparge/Soil Vapor Extraction System** (page 45): As requested in the previous comments, compare the effectiveness and estimated treatment timeframes of AS/SVE to ex-situ pump and treatment.
17. Section 5.1, **Remedial Action Objectives (RAOs)** (page 52): As requested in the previous comments, include the cleanup level for toluene in this section since concentrations exceed regulatory cleanup levels at the site. Revise the text on the DRO cleanup level to reflect that the 10,000 ug/L is only applicable when naphthalene and all

other COC's are below the MCL/DWEL and there is no free product present on the groundwater table.

18. Section 5.2, **General Response Actions** (page 52): The property owner (Crosby) would need to agree to and sign a deed restriction to prevent the installation of any new water supply wells. Provide information on the property owner's position on this action and a map of the proposed groundwater restriction area.
19. Section 5.3, **Screening of Remedial Action Alternatives** (pages 52-53): The WDEQ requests that several other active remedies be evaluated for source reduction in the bedrock aquifer. The WDEQ recommends evaluating all, or some combination of, pump and treat, dual phase extraction (temporary and/or permanent), and iSOC technology. There is currently only one remedial alternative proposed for the bedrock aquifer, and because of the high levels of benzene, the WDEQ believes that it would be prudent to evaluate additional active remedies for that zone.

The balancing criteria should be used to justify elimination of Pump and Treat as a potential remedy for the alluvial aquifer.

As requested in the previous comments, the remedial alternatives need to be evaluated using the balancing criteria established in W.S. 35-11-1605(b) and listed in VRP Fact Sheet #21 (question #15). This still has not been conducted for any of the proposed remedies. If you need additional assistance in this process, the WDEQ can provide examples of how this has been conducted at other sites.

20. Section 5.4, **Evaluation of Remedial Action Alternatives – Valley Fill Aquifer** (pages 53-58): The alternatives are numbered VF2 through VF5 and there is no VF1. It would be less confusing if the alternatives were numbered VF1 through VF4.
21. Section 5.4.2, **Alternative VF3 – Enhanced Aerobic Bioremediation Treatment Line** (pages 54-56): Include what the acronym iSOC stands for.

Because this is the recommended remedial alternative for the alluvial aquifer, provide a detailed pilot/feasibility work plan. Include how the zone of influence will be determined and what and how indicator parameters will be assessed. Provide ranges for the indicator parameters which would be conducive to using iSOC technology. Provide information on how well iSOC has worked in similar geological/hydrological settings with similar COCs. Include an estimated volume of water that can be treated by the proposed system. Provide any information from the existing AS/SVE system which indicates that an increase in the dissolved oxygen concentration in groundwater has enhanced aerobic degradation of the contaminants. **(CRC)**

Provide a second option for this remedial alternative which includes some type of active source treatment in addition to the iSOC technology proposed. **(CRC)**

22. Section 5.5, **Evaluation of Remedial Action Alternatives - Bedrock** (pages 58-59): As discussed in item #18 above, provide additional active remedial alternatives for the bedrock aquifer.

23. Section 5.5.2, **Alternative B2 – Chemical Oxidation** (page 59): The independent evaluation of the feasibility of fracturing is not provided in Table XIV as stated in the text.
24. Section 6.3, **Recommended Monitoring Schedule through 2010** (page 60): Include language that states that the monitoring program may be extended past 2010 based upon an evaluation of the data by the WDEQ. **(CRC)**