

## 4.0 MITIGATION MEASURES

This ROD includes mitigation measures applicable to both on-site and off-site actions. On-site administrative requirements, COAs, and mitigation requirements are used to prevent certain impacts to resources and guide field development activities to compensate for, resolve, minimize, or avoid impacts to resources. Appendix A presents administrative requirements and potential mitigation to be applied when supported by site-specific environmental review. Key mitigation measures have been identified here. Additional mitigation measures may be imposed through the adaptive management process.

Mitigation and monitoring implemented under the 2000 PAPA ROD will be continued subject to adaptive management. This mitigation and monitoring includes, but is not limited to monitoring raptors, bald eagle winter roosts, mapping prairie dog colonies, surface- and ground-water monitoring, and historic trail monitoring and mitigation. The current Lander Trail Programmatic Agreement (PA) (signed 2004) will need to be amended. Most of the parameters of the PA have been met and further development issues will be addressed.

### 4.1 AIR QUALITY

---

#### 4.1.1 Visibility

The final goal of the air quality mitigation for visibility is to ensure that emissions from the PAPA result in zero days of visibility impairment over 1 deciview (dv) at the Bridger Wilderness Area.

There are three milestones in meeting this goal:

1. Within 12 months after signing of this ROD modeled project related visibility impacts will be no greater than 40 days of visibility impairment over 1 dv at the Bridger Wilderness Area.
2. Within 42 months after signing of this ROD modeled project related visibility impacts will be no greater than 10 days of visibility impairment over 1 dv at the Bridger Wilderness Area.
3. Within 78 months after signing of this ROD modeled project related visibility impacts will be no greater than 0 days of visibility impairment over 1 dv at the Bridger Wilderness Area. Unless BLM, WDEQ-AQD, and the Operators have reached an alternative approach to achieve the goal of zero days of visibility impairment, BLM may reduce the pace of development to achieve this goal.

Demonstrations of progress in meeting these milestones will be provided annually by the Operators. This information will be provided to the PAPO and will be made publicly available.

BLM is committed to assuring that any mitigation necessary to achieve the goal of zero days of modeled visibility impairment will be implemented. BLM, WDEQ-AQD, and the Operators will work together to evaluate impacts and, if needed, sequentially review and employ the most effective technologies available to address impacts to visibility. Absent an effective technology to achieve further reductions beyond 10 days of visibility impairment at the Bridger Wilderness Area, adjustments in the pace of development may be utilized to achieve zero days of modeled visibility impairment. Mitigation could include, but will not be limited to:

- Replacing diesel-fired drilling rig engines with natural gas-fired drilling rig engines,
- Using fuel additives,
- Using gas turbines rather than internal combustion engines for compressors,

- Reducing the number of drilling rigs,
- Requiring Tier 2 equivalent (or better) emissions on drilling rig engines,
- Installing selective catalytic reduction on drilling rig engines,
- Using electric drilling rigs,
- Implementing electric compression,
- Requiring centralization of production facilities to reduce truck traffic,
- Adopting cleaner technologies on completion activities, and other ancillary sources;
- Implementing advancements in drilling technology; and
- Reducing the pace of development.

**Implementation.** The following measures will be implemented to ensure that air quality impacts are mitigated:

1. To provide more predictability during the development phase, Operators will annually develop a 10-year rolling forecast or development plan for submission to the BLM and WDEQ-AQD. The forecast or development plan will report the anticipated activity levels and projected air emissions from all project related sources in the PAPA as identified by WDEQ-AQD. The annual forecast will continue through the development period. Operators will meet annually with the BLM and WDEQ-AQD and in consultation with EPA to review the annual forecast and monitoring data and evaluate alternate ways to achieve the visibility impact reduction goal specified in paragraph #4 (below), beyond the 80 percent drilling rig engine NO<sub>x</sub> emission reductions specified in paragraph #3 (below). Upon consideration of the annual forecast, the BLM and WDEQ-AQD in consultation with EPA will determine any necessary air dispersion modeling to be run by the Operators for the coming year. Modeling will be performed using protocols approved by BLM and WDEQ-AQD in consultation with EPA. Any modeling will be summarized and submitted to the BLM and WDEQ-AQD no later than the 11<sup>th</sup> month following the annual planning meeting.
2. No later than 1 year after signing of this ROD, Operators will adopt air emission control strategies which reduce predicted visibility impacts to levels predicted for 2009 Alternative B emissions mitigated to 2005 actual emissions levels described above (i.e., which are modeled to result in no more than 40 days greater than 1.0 dv of visibility impairment). This will provide an almost immediate reduction of visibility impacts from current development.
3. All Operators will accelerate the use of advanced technologies to reduce NO<sub>x</sub> emissions to reduce predicted visibility impacts to the 80 percent drilling rig engine NO<sub>x</sub> emissions reduction scenario, which is modeled to result in no more than 10 days greater than 1.0 dv of visibility impairment. The 80% minimum reduction must occur no later than 42 months following signing of this ROD. To ensure that any drilling rig NO<sub>x</sub> emission reductions are enforceable, WDEQ-AQD, a cooperating agency, is administrating an interim permit policy to reduce VOC and NO<sub>x</sub> emissions, effective July 21, 2008. This policy will require the Operators to demonstrate that proposed facilities will not prevent attainment or maintenance of an air quality standard.
4. During the annual planning meeting, as specified in paragraph #1 in this section, Operators, WDEQ-AQD, and the BLM in consultation with EPA will collaboratively identify methods to reduce air emissions beyond the 80 percent drilling rig engine NO<sub>x</sub> emissions goal. No later than the fifth annual planning session following signing of this

ROD, Operators will submit to the collaborative group an evaluation of alternatives, and recommend a plan that addresses all sources from project activities, and of which the aim is to meet a predicted visibility impact objective of no more than zero days greater than 1.0 dv of visibility impairment. The Operators' evaluation will include modeling of the expected reduction in predicted visibility impairment which can be achieved by each alternative as well as an implementation schedule. All visibility modeling shall be performed using protocols approved by WDEQ-AQD and BLM in consultation with EPA. BLM is committed to assuring that any mitigation necessary to achieve the goal of zero days of modeled visibility impairment will be implemented. BLM, WDEQ, and the Operators will work together to evaluate impacts, and if needed, sequentially review and employ the most effective technologies available to address impacts to visibility. Absent an effective technology to achieve further reductions beyond the 80 percent described in the Final SEIS, adjustments in the pace of development may be utilized to achieve zero days of modeled visibility impairment. The collaborative group will also specify a schedule for completely implementing the plan.

5. All Operators will comply with WDEQ-AQD permitting regulations to establish emission limitations for production equipment and compression facilities and will voluntarily institute any other emission reduction measures that have been proposed as part of the alternate method selected by the collaborative group.
6. The Monitoring and Mitigation Fund will be used to pay for the following activities, to be carried out by WDEQ-AQD:
  - a. Supplement WDEQ-AQD's existing field inspection staff by adding an inspector dedicated to monitoring compliance in PAPA for a period of 5 years at a cost not to exceed \$400,000 for the 5-year period. Thereafter, if continued compliance monitoring in the PAPA is determined to be needed it will be paid out of the Monitoring and Mitigation Fund.
  - b. WDEQ-AQD will conduct a formal evaluation of the existing ambient monitoring network in Southwest Wyoming. Based on the results of the evaluation, the Monitoring and Mitigation Fund will provide a funding contribution to WDEQ-AQD not to exceed \$1,250,000 over a 5-year period to establish and/or operate monitors recommended by the "network assessment" for pollutants of interest from the PAPA. WDEQ-AQD will, to the extent practicable, use monitor data collected by any new, and all existing local monitors, in performing future air quality modeling. WDEQ-AQD and the Operators will cooperate to collect ambient ammonia data for use in modeling, including modeling to evaluate the adequacy of alternate emission reduction options required under paragraph #4, above.
  - c. Supplement WDEQ-AQD's existing capability to analyze and report on ambient monitoring data, by funding an analyst (1) in WDEQ-AQD's monitoring group for a period of 2 years, at a cost not to exceed \$160,000 for the two-year period, and (2) providing \$200,000 as a contribution to the expected costs of \$400,000 to allow WDEQ-AQD to upgrade its ambient air quality data management systems. WDEQ-AQD will agree to use such staff and funds to improve its ability to analyze data to more effectively disseminate those data to the general public and to use ambient monitor data in future air quality modeling associated with the project.

#### 4.1.2 Ozone

To ensure that this project will result in the continued attainment of the Wyoming Ambient Air Quality Standards (WAAQS), within one year of the signing of this ROD, and as needed thereafter, BLM, WDEQ-AQD, and the Operators, with input from EPA, will refine the NO<sub>x</sub> and VOC emissions inventory. BLM, in consultation with WDEQ-AQD and EPA, will ensure that new modeling conducted and funded by the Operators, includes all WDEQ BACT requirements and a sensitivity analysis to determine appropriate reductions in ozone precursor emissions. BLM, WDEQ-AQD, in consultation with EPA and the Operators, will evaluate the modeling results.

As soon as possible following evaluation of the modeling results and if needed, the BLM and WDEQ-AQD, in consultation with EPA, will use their respective authorities to implement emission control strategies and/or operating limitations necessary to ensure compliance with applicable ambient air quality standards for ozone. Absent an effective technology to implement, reductions in the pace of development may be utilized to ensure ambient air quality standards are met.

Potential mitigation measures include but are not limited to:

- natural gas-fired drilling rig engines;
- fuel additives;
- gas turbines rather than internal combustion engines for compressors;
- reduction in the number of storage tanks containing VOCs;
- reduction in the number of drilling rigs;
- Tier 2 (or better) equivalent emissions drilling rig engines;
- selective catalytic reduction on drilling rig engines;
- electric drilling rigs;
- electric compression;
- centralization of gathering facilities to reduce truck traffic, including the liquids gathering system;
- cleaner technologies on completion activities, and other ancillary sources;
- advancements in drilling technology; and
- reduction in the pace of development.

Within 2 years of the signing of this ROD, Ultra, Shell, and Questar will install a liquids gathering system to all existing wells. After this 2 year period, all producing wells must be connected to the liquids gathering system prior to production unless waived by the BLM AO.

Within 1 year of the signing of this ROD or at such time as production occurs, all other PAPA operators will be required to demonstrate, and within a subsequent one year period implement, a reduction in VOCs comparable to that obtained by the liquids gathering system as approved by the BLM AO. Installation of a liquids gathering system will meet this requirement. Operators not installing a liquids gathering system must demonstrate a comparable reduction in VOCs.

Within 90 days of the signing of this ROD, and on an annual basis thereafter, until such time as BLM and WDEQ deem it is no longer necessary, individual contingency plans will be developed by the Operators with WDEQ-AQD and BLM to address avoidance of wintertime ozone exceedances. Failure to comply by any individual company will result in BLM withholding approvals for that company and/or reducing the pace of development and/or production.

## 4.2 GROUNDWATER RESOURCES

---

Sublette County Conservation district is currently conducting a groundwater monitoring program, funded by the Operators. It is anticipated that this program will continue and may be augmented by results obtained from the activities described below.

The BLM's Regional Framework for Water Resources Monitoring Related to Energy Exploration and Development (Framework) will guide the groundwater monitoring and subsequent identification and implementation of mitigation. The Framework consists of three steps; 1) compilation of existing information, 2) characterization of the groundwater system; and 3) modification of the monitoring plan.

**Step 1.** Step 1, compilation of existing information, was completed in the *Final Hydrogeological Conceptual Model*, March 2008.

**Step 2.** Within 3 months of the signing of this ROD, the BLM, the Operators, WDEQ-Water Quality Division (WQD), and EPA, will develop an Interim Groundwater/Aquifer Pollution Prevention, Mitigation and Monitoring Plan and funding strategy to initiate groundwater characterization efforts and augment existing monitoring programs as necessary. This plan will identify mitigation for all potential sources of contamination until a potential source is determined not to be contributing to contamination.

Anticipated costs, to be funded outside of the Monitoring and Mitigation Fund, are shown in Table 1:

**Table 1**  
**Anticipated Groundwater Monitoring Costs**

<b>Task</b>	<b>Amount</b>
Data Acquisition & Monitoring Network Design	\$250,000
Monitoring Network Installation and Initial Sampling	\$500,000
Groundwater Monitoring and Reporting	\$750,000

A cooperative effort will be initiated which includes technical specialists from BLM and Regulatory Agencies who will work with the Operators to develop the Groundwater Characterization. This will fulfill step 2 of the Framework.

**Step 3.** Within 6 months of completion of the Groundwater Characterization, technical specialists from BLM and Regulatory Agencies will update the Interim Groundwater/Aquifer Pollution Prevention, Mitigation and Monitoring Plan. The implementation of this plan will be funded by the Operators outside of the Monitoring and Mitigation Fund. Finalization of the Groundwater/Aquifer Pollution Prevention, Mitigation and Monitoring Plan, will complete the third step of the Framework.

Detection of hydrocarbons in industrial water wells is a concern. Potential causes have been identified and mitigation measures have been suggested. BLM will continue to work with the regulatory agencies and the Operators to identify and mitigate potential mechanisms for contamination of water with hydrocarbons. Mitigation, which can be modified through adaptive management will include:

- Operators will provide certification to the BLM, within 6 months of signing of this ROD that back flow prevention devices have been installed on all water supply wells and locked to prevent unauthorized use or access.

- No BLM rights-of-way or other approvals for new industrial water supply wells will be allowed in the PAPA until the Groundwater Characterization is completed and the causes of the hydrocarbon detections have been determined and effectively mitigated.

#### **4.3 GRAZING RESOURCES**

---

Operators have developed a Letter of Commitment that will be followed with a Memorandum of Agreement to address livestock death and injuries, and other projects not funded by the Fund.

#### **4.4 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES**

---

The USFWS has determined the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker are harmed from the water depletions resulting from implementation of this ROD. The USFWS has established a Recovery Program to mitigate specific project effects on these species. Harm has been specifically identified as: 1) individuals using habitats diminished by the proposed water depletions could be more susceptible to predation and competition from nonnative fish; 2) habitat conditions may be rendered unsuitable for breeding because of reduced flows would impact habitat formulation and maintenance (USFWS, 2008). The USFWS has determined that the depletion impacts resulting from an annual average removal of 479.58 acre-feet per year for activities outlined in this ROD, including well development and pipeline construction, can be offset by: 1) a one-time contribution to the Recovery Program; 2) appropriate legal protection of instream flows pursuant to State law; and 3) accomplishment of activities necessary to recover the endangered fish as specified under the Recovery Implementation Program Recovery Action Plan (USFWS, 1993). Therefore, the Operators are required to make a payment to the Recovery Program of \$8,531.73.

The BLM has determined and the USFWS concurred that activities within the PAPA are not likely to adversely affect Ute ladies'-tresses or black-footed ferrets. Continuation of surveys, where appropriate, and identification of any mitigation measures will continue to ensure that the activities within the PAPA are not likely to adversely affect these species.

Based upon the absence of suitable habitat for Canada lynx and Kendall Warm Springs dace, the BLM made a "no effect" determination for these species.

Raptor anti-perching devices within 0.25 mile of prairie dog towns will be installed on all aboveground facilities. Powerlines should be buried near prairie dog towns and placement of power poles within prairie dog towns will be avoided.

#### **4.5 WILDLIFE AND AQUATIC RESOURCES**

---

Extensive measures for the mitigation of impacts to wildlife resources have been included in this ROD through constraints on development and delineation and the liquids gathering system to reduce production-related impacts. For example, the Core Area for DA-5 has been drawn to avoid five key leks as shown on Map 6. A wildlife monitoring plan will be developed by the BLM, WGFD, and the Operators and will be approved by the BLM AO before April 1, 2009.

#### **4.6 OFF-SITE MITIGATION**

---

BLM has determined that some impacts to resources from implementing this ROD (for example, wildlife habitat and vegetation resources) are not likely to be adequately mitigated on site.

Accordingly, the decisions in this ROD are based in part on the commitments of the Operators to fund off-site mitigation.

#### **4.6.1 Monitoring and Mitigation Fund**

Recognizing not all impacts can be adequately mitigated on-site, Ultra, Shell, and Questar committed to establish the Pinedale Anticline Operators' Monitoring and Mitigation Fund. Ultra, Shell, and Questar will provide an initial contribution of at least \$4.2 million and will make future annual contributions to this Fund of \$7,500 per well spud each year on their respective leaseholds. Ultra, Shell and Questar may make advanced contributions to the Fund to implement projects. Such contributions will be credited toward the end of development contributions.

#### **4.6.2 Pinedale Anticline Project Office**

In addition to collecting and maintaining monitoring information and analyzing mitigation projects, the PAPO will also serve to coordinate mitigation projects, in a cooperative effort with Wyoming Landscape Conservation Initiative (WLCI) and JIO.