

SECTION 3

Groundwater Pollution Prevention Program



GROUNDWATER POLLUTION PREVENTION, MONITORING AND RESPONSE ACTION PLAN

Pinedale Anticline Project Area
Sublette County, Wyoming



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3.0 POLLUTION PREVENTION PROGRAM

The goal of the Pollution Prevention Program is to reduce the potential for groundwater impacts from oil and gas exploration and production (E&P) activities in the Pinedale Anticline Project Area (PAPA). Operators were employing best management practices (BMPs) for the prevention of groundwater pollution during the period when technical groundwater studies (AMEC 2012, 2013a, 2013b) were completed as required by Step 2 of the groundwater resources section of the Bureau of Land Management's (BLM) 2008 Record of Decision (ROD). Based on the Low-Level Petroleum Hydrocarbon Compounds (LLPHC) study (AMEC 2013b), no additional measures were found (beyond those already being employed) to be necessary to mitigate low-level volatile or semivolatile organic constituents detected in water wells in the PAPA.

This section presents BMPs applicable to prevent or minimize the potential for future groundwater impacts in the PAPA from five distinct phases of E&P activities as required by Objective O1.1 of this Groundwater Pollution Prevention, Monitoring and Response Plan (Plan) (**Section 2.1**):

- Planning;
- Construction;
- Drilling;
- Production; and
- Closure.

BMPs for this Pollution Prevention Program were developed to be inclusive of all measures that directly or indirectly contribute to groundwater protection in the PAPA. Some practices, while not directly linked to a groundwater protection measure, contribute to overall groundwater protection when considered as a whole. For example, conducting the pre-application review and on-site inspection described in **Section 3.3** does not literally "protect groundwater." However, during the course of completing the pre-application review and on-site inspection, specialists from regulatory agencies and Operators can collectively identify site-specific and project-specific measures that could possibly contribute to groundwater protection.

3.1 BACKGROUND

Operators inventoried and recorded standard E&P operating procedures and practices that were being used in the PAPA during 2010, and improved upon their work in 2011 (AMEC Geomatrix 2011). They developed a list of Operator practice mitigation matrices (e.g., BMPs) which were organized into the five project phases mentioned above. After evaluating the matrices, representatives of agencies and Operators at that time: 1) determined that additional regulatory references for the practice mitigation matrices were necessary; 2) determined that the organization of matrices could be improved; and, 3) decided to postpone finalizing the matrices until after the LLPHC study results were accepted by BLM. The Operators, however, continued to employ both required and voluntary BMPs for their activities to minimize the potential for groundwater impacts.

3.2 DEVELOPMENT OF CURRENT BMPs

BLM's Authorized Officer (AO) for the Pinedale Field Office made the determination that Step 2 (groundwater characterization) of BLM's 2008 ROD was complete in November 2013 (BLM 2013). The Operators retained AECOM, an environmental consulting firm, in May 2014 to finalize the comprehensive listing of BMPs for the five E&P project phases. AECOM prepared a memorandum describing its methodology to finalize the BMP matrix (i.e., Pollution Prevention Matrix) which is contained in **Appendix 3-A**. The following text summarizes the steps AECOM followed to produce the Pollution Prevention Matrix found in **Appendix 3-B**. Note that the Pollution Prevention Matrix has been referred to under a variety of monikers, including the Operator Practice Mitigation Matrices, Best Practice Matrices, Pollution Prevention Matrices, and BMP Matrices; hereafter it will be referred to as the "P2 Matrix."

AECOM followed a sequential methodology to complete the comprehensive list of groundwater pollution prevention BMPs (i.e., P2 Matrix), beginning with a set of five tables (each representing a different E&P project phase) provided by BLM, dated March 2014. These five tables were based on the 2011 version of the matrices (AMEC Geomatrix 2011) and had been modified by BLM staff in 2011 to add additional regulatory references for BMPs. Following an initial review, AECOM reduced duplicate and redundant information entries, reorganized the tables into a more "user friendly" format, and combined the tables into a single table (or matrix).

An objective held by AECOM was to ensure that the BMPs listed in the table reflected current field conditions and infrastructure improvements (e.g., liquids gathering system), and were at least as protective as those employed during the period of time when groundwater characterization studies were completed between 2009 and 2013 (AMEC 2012, 2013a, 2013b). AECOM then proceeded to conduct a detailed review of the table that included: quality assurance and quality control checks; consultation with a variety of documents published by the American Petroleum Institute and BLM; incorporation of additional BMP references; and confirmation that pollution prevention practices listed in the table were germane to operations in the PAPA. The Operator Team then reviewed AECOM's preliminary work product for accuracy and consistency, and following revisions, provided a draft version of the P2 Matrix to BLM's Project Lead for distribution to the Review Team (see **Section 1.5**).

The Operators and BLM organized a field tour of the PAPA on September 24, 2014 for the Regulatory Team (see **Section 1.5**) to observe the various groundwater pollution prevention practices being employed for the five E&P project phases. During a full-day meeting on September 25, 2014 at BLM's Pinedale Field Office, the entire Review Team systematically discussed the draft P2 Matrix. Review Team members then individually provided comments to the draft matrix during October 2014. The final step in developing the P2 Matrix contained in **Appendix 3-B** was addressing Review Team comments to the draft matrix. The Operators and AECOM worked together to provide responses to each comment and finalized the P2 Matrix. Operator/AECOM responses to the various comments regarding the draft P2 Matrix were then provided to BLM's Project Lead, who in turn distributed the document to the Review Team on December 9, 2014.

Although the P2 Matrix is a single document with more than 110 pollution prevention practices, it is organized according to the five E&P project phases. The only addition to the P2 Matrix made by NewFields in **Appendix 3-B** is a column providing a sequential identification number for each distinct practice for each project phase.

1 The following five sections provide brief descriptions of the activities associated with each E&P project
2 phase, and provide several examples of potential sources for groundwater impacts. An additional
3 explanation of potential point and non-point sources of groundwater impacts related to E&P activities in
4 the PAPA is found in Section 4.0 of AMEC (2013b). **Tables 3-1** through **3-5** provided at the end of
5 **Section 3.0** were adapted from the P2 Matrix (**Appendix 3-B**) to form abridged versions of the P2
6 Matrix; these five tables include the following information:

- 7 • Project Phase;
- 8 • Activity;
- 9 • Source of Potential Groundwater Contamination;
- 10 • Practice Identification;
- 11 • Operator Practice (e.g., BMP); and
- 12 • Operator Mitigation Measure.

13 **3.3 PLANNING**

14 Planning is the initial E&P activity, whereby the entire operation is deliberately designed to minimize the
15 potential for groundwater impacts during all subsequent E&P phases. Both Operator and regulatory
16 specialists participate in the Planning phase to ensure appropriate safeguards are considered and
17 included in the pad design, including infrastructure for pad access, liquid storage, and pipelines. **Table**
18 **3-1** summarizes BMPs used during the Planning phase; complete regulatory citations for these BMPs are
19 provided in **Appendix 3-B**.

20 Operators follow six steps during the Planning phase:

21 **Step 1: Prepare Preliminary Pad, Road and Pipeline Drawings**

22
23 Operator specialists, including environmental (physical and biological sciences) and engineering
24 professionals, work together to design the locations proposed for E&P activities. They prepare
25 preliminary engineering drawings that show the pad layout, road system, and pipeline network for a
26 proposed location. In doing so, available existing information germane to the environment and
27 existing infrastructure is reviewed. Many factors are considered in the location design, including:

- 28 • Known sensitive and critical environmental and cultural issues (to be avoided);
- 29 • Surface waters, floodplains, wetlands, and riparian areas (to be avoided);
- 30 • Steep slopes (i.e., >25 percent), drainages, and highly erosive soils (to be avoided);
- 31 • Optimum locations to place topsoil stockpiles, production facilities, and storage/containment
32 areas;
- 33 • Reclamation potential for the site;
- 34 • Locations for culverts, road crossings, and stream crossings based on BLM guidance documents;
35 and

- Locations of stream crossings to avoid spring runoff conditions.

Step 2: Conduct On-Site Inspection

Once preliminary drawings are completed, an on-site inspection is scheduled for those locations on BLM-managed land and/or where federal minerals are involved. The on-site inspection is attended by Operator and BLM specialists. This is an interactive engagement with all specialists working together to design the pad to minimize potential impacts. Any suggested or required modifications to the preliminary design are noted and the pad design is adjusted based upon the on-site inspection. A final set of drawings is prepared and Operators submit the design to BLM for review and approval prior to any construction.

Step 3: Prepare Erosion Control, Re-vegetation and Restoration Plan

Prior to any disturbance of a location, the eventual reclamation of the site is considered in the Planning phase. An Erosion Control, Re-vegetation and Restoration Plan (ERRP) is prepared to achieve reclamation goals established for the PAPA in BLM's ROD (BLM 2008). To prepare the ERRP, the pre-disturbance condition of the location is documented, including: soil types, ecological site type, riparian areas, saline areas, existing drainage patterns, trails/two-tracks, and vegetation composition. Site reclamation is considered during the Planning phase and the ERRP describes the general process for site reclamation. The ERRP is provided to BLM for its records.

Step 4: Prepare Storm Water Pollution Prevention Plan

Operators develop a Storm Water Pollution Prevention Plan (SWPPP) in the Planning phase to describe how they will manage their activities to minimize the potential of impacts from storm water runoff and sediment loss in accordance with DEQ rules (DEQ 2004). Slopes, nearby drainages, and vegetative cover are documented and evaluated with respect to potential erosive impacts from storm water. Given the particular setting of the pad, "structural BMPs" to prevent storm water pollution are specified in the SWPPP which may include: diversions, pad berms, silt fences, straw wattles, and gravel surfacing of the pad. The SWPPP also specifies "operational BMPs" to be enacted once the pad is constructed. These may include identifying locations and management of waste receptacles, types and methods of secondary containment, and regular inspections and maintenance of BMPs used to prevent storm water pollution. The SWPPP is then provided to BLM for its records.

Step 5: Prepare Spill Prevention, Control and Countermeasure Plan and Spill Response Plan

Fluid storage and handling are active components of E&P operations. A Spill Prevention, Control and Countermeasure (SPCC) Plan and Spill Response Plan (SRP) are prepared in the Planning stage to document how Operators will manage their activities to minimize the potential impact of a leak or spill. These plans include:

- Specifying the proper design and operation of storage systems to minimize spills;
- Describing how spills would be prevented and controlled during operations;
- Proper training of spill response team members on how to safely and properly respond to spills;

- 1 • Staging appropriate spill response equipment at optimum locations for availability; and
- 2 • Conducting routine inspections of facilities to ensure integrity of spill prevention features and
- 3 countermeasure equipment.

4 Operator staff are trained on the SPCC Plan and SRP when newly hired and thereafter on an annual
5 basis. These plans are both field-wide and tailored to address site-specific conditions on individual
6 well pad locations. Plans are available to BLM or any other agency upon request.

7 **Step 6: Develop Housekeeping Procedures**

8 Housekeeping procedures are also established during the Planning phase of a new E&P location.
9 Operators describe how their locations are to be kept clean and how they will be maintained to
10 minimize the potential for impacts to water resources. They develop procedures on how to:
11 manage, recycle and dispose of unused or excess materials; specify routine inspections to document
12 good housekeeping practices; and establish a response process to resolve any evidence of poor
13 housekeeping.

14 **3.4 CONSTRUCTION**

15 Construction related to E&P activities in the PAPA consists mainly of building multi-well pads, access
16 roads, pipelines, and water supply wells. Lengths of access roads and pipelines vary; a typical pad size is
17 between 10-15 acres with up to 20 acres required for a large multi-well pad. Construction typically
18 consists of using earth moving equipment, such as bulldozers, motor graders, haul trucks, and personal
19 vehicles such as pickup trucks. **Table 3-2** summarizes BMPs to be used during the Construction phase,
20 and **Appendix 3-B** provides further details including applicable rules and regulations pertaining to
21 construction of BMPs.

22 Construction starts with clearing vegetation and grading the site. Topsoil is salvaged for reclamation
23 purposes and set aside in a topsoil stockpile at a previously designated location. The pad is then
24 flattened (graded) to allow for an adequate surface and size for drilling operations. Civil engineers
25 typically design the pads so that cut and fill are balanced to the best extent possible, and that the site is
26 as flat as possible with only a slight grade to provide for directed storm water drainage. If the existing
27 grade does not allow for the site to have an earthwork balance, excess soil material is stored in a
28 stockpile on the side of the site. Storm water BMPs are put in place during the grading process and
29 typically include an earthen berm surrounding the site to prevent off-site runoff (e.g., run-on) from
30 entering the site. Other storm water controls include drainage channels to route off-site storm water
31 around the site, and on-site controls such as straw wattles, silt fence, or additional grading measures. If
32 pits are used for drill cuttings storage, they are excavated in cut areas and lined with HDPE liners. Pits
33 are built to engineering standards of the WOGCC and BLM, which are considered to be protective of
34 the environment and ensure the integrity of liner materials.

35 Access roads are typically crowned in the center to promote positive drainage and covered with gravel
36 to ensure their integrity. Water sprays are used to abate dust during construction. Storm water BMPs
37 are used for access roads, with rip rap and other storm water BMPs used around culvert inlets, outfalls
38 and in roadside ditches, as appropriate. Access road grades are limited to between 8 and 9 percent or

1 less to reduce sediment discharge from roads. Side slopes on the edges of access roads and multi-well
2 pads are kept to a grade of 3:1, where possible, as an additional measure to prevent erosion.

3 Pipelines are buried in trenches using standard engineering practices. Typical earthwork and trenching
4 equipment are used during pipeline installation. Scalping is employed during construction to ensure that
5 soils along the pipeline right-of-way remain intact. River and stream crossings for pipelines are
6 constructed during dry or low runoff conditions. Operators can shut-down pipeline construction at
7 stream crossings in the event of a spill to minimize potential impacts. At pipeline maintenance stations
8 (e.g., pipeline pig receiver stations), Operators stage spill cleanup kits for use in the event of a spill.

9 Industrial water supply wells needed to support natural gas well drilling and completion operations are
10 placed at reasonable distances from potential sources of contamination. Since BLM issued its ROD in
11 2008, no new water supply wells have been allowed in the PAPA (BLM 2008). Water supply wells
12 drilled prior to 2008 were drilled and constructed using standard industry practices in accordance with
13 water well construction standards set forth by the Wyoming State Engineer's Office (SEO). Any future
14 industrial water supply well in the PAPA would be drilled and constructed according to SEO's current
15 minimum water well construction standards (SEO 2011). Since at least 2008 and as required by BLM's
16 2008 ROD, backflow prevention devices have been employed at water wells. Each well is also secured
17 with a locking well cap to prevent vandalism or operator error.

18 After water supply wells are constructed, Operators conduct initial water quality sampling and then
19 annual sampling after dedicated pumps are installed in conformance with BLM's 2000 ROD (BLM 2000).
20 Beginning with the acceptance of this Plan by BLM and WOGCC (see **Section 1.1**), all future
21 groundwater sampling and analysis from water supply wells will be conducted in accordance with the
22 GMP presented in **Section 4.0** of this Plan. In addition, all equipment installed down-hole in water
23 wells (e.g., drilling rods/bits, submersible pumps, tubing, and sampling equipment) will be steam-cleaned
24 prior to being used to avoid introducing contaminants into a water well (see **Table 3-2**).

25 **3.5 DRILLING**

26 Natural gas production wells are drilled, constructed and completed to standards set by the state and
27 federal government, and every well in the PAPA has been approved by one or both of those entities.
28 Specific BMPs employed by Operators during the Drilling phase are listed on **Table 3-3**; a detailed
29 presentation of the BMPs, including regulatory references, is contained in **Appendix 3-B**.

30 AMEC (2013b) provides a detailed description of E&P activities associated with the Drilling phase
31 including: drilling natural gas production wells; muds used when drilling boreholes; well casing and
32 cementing programs employed during installation of natural gas production wells; procedures and testing
33 protocols used to assess the integrity of the well casing and cemented intervals; and well completion
34 procedures. The text below is taken from AMEC (2013b) and was slightly adapted to fit this Plan. It
35 summarizes key procedures in the Drilling phase and identifies several BMPs used to protect
36 groundwater from impacts (also see **Table 3-3**).

37 **3.5.1 Drilling Muds**

38 Multiple natural gas production wells are generally installed on each pad using directional drilling
39 technologies to minimize surface disturbance. Two types of drilling muds are commonly used to drill

1 boreholes using a semi-closed or fully-closed loop mud system: water-based and oil-based. The mud
2 systems minimize the potential for leakage of drilling fluids. Vacuum systems on drill rigs are used to
3 collect any drilling mud spilled on the rig floor and return it to the mud system.

4 Fresh water-based mud is used for drilling and setting the surface casing. Water-based mud may also be
5 used to drill the borehole for the subsequent intermediate casing string. The depth where water-based
6 mud is used corresponds to depths where groundwater may be encountered that meets the WOGCC
7 definition of “Fresh Water” and “Potable Water” or BLM’s definition of “Usable Water.” WOGCC
8 defines Fresh and Potable Water as “water currently being used as a drinking water source or having a
9 total dissolved solids (TDS) concentration of less than 10,000 milligrams per liter (mg/L) and which can
10 reasonably be expected to be used for domestic, agricultural, or livestock use” (WOGCC Rules and
11 Regulations, Chapter 1, Section 2). Current BLM regulations require operators to “isolate fresh water-
12 bearing and other usable water containing 5,000 ppm (parts per million) or less of dissolved solids and
13 other mineral-bearing formations and protect them from contamination” (43 CFR 3162.5-2(d); October
14 1, 2012).

15 Beneath the depth where usable water can reasonably be expected, oil-based mud is generally used to
16 drill wells. Operators use a closed-looped mud system to minimize the potential for releases. Oil-based
17 mud is usually not used until reaching depths of around 7,000 feet below ground surface. In some cases,
18 companies transition from water-based mud to oil-based mud at a depth shallower than 7,000 feet, but
19 only if surface casing has been installed and cemented to a depth of at least 2,500 feet true vertical depth
20 (PAPA Operators 2013). In addition, pressure integrity testing of casing is conducted prior to changing
21 over to oil-based mud, thereby providing confirmation that oil-based mud used in drilling is isolated
22 from sources of usable or potable water.

23 **3.5.2 Well Casing and Cementing Program**

24 Natural gas wells in the PAPA are constructed using continuous steel surface casing cemented into the
25 borehole from ground surface to a depth below the interval of fresh groundwater. When used (i.e.,
26 below the depth of surface casing), oil-based muds would not be in contact with fresh groundwater.
27 Cement design is part of the approved permit to drill a natural gas production well. The cement slurry is
28 designed to emplace a permanent bond between the borehole and the steel casings, and the bonds are
29 evaluated before well completion with a cement bond log (sonic tool run on wireline).

30 Well bore construction entails installation of three to four cemented and pressure-tested steel casings.
31 Casing pressure testing is performed after each casing schedule is cemented into the borehole prior to
32 drilling the next casing schedule. The casing is pressure-tested to 10,000 pounds per square inch (psi),
33 the maximum stimulation pressure used during hydraulic fracturing, and the pressure is held for 15-30
34 minutes to confirm integrity. The data from casing pressure testing are recorded and reported to the
35 WOGCC and BLM. A typical natural gas production well in the PAPA is constructed using the following
36 casing schedules and testing protocols implemented to assess the integrity of well casings:

- 37 • “Surface” casing is set to protect all known or reasonably estimated utilizable groundwater and
38 to prevent blowouts or uncontrolled flows (WOGCC Rules and Regulations, Chapter 3, Section
39 22). PAPA operators generally set surface casing to a depth ranging between approximately 800
40 and 4,900 feet below ground surface (PAPA Operators 2013). The steel surface casing is
41 typically 9-5/8 inches in diameter and is cemented into the borehole from the base of the casing

1 to ground surface. Pressure testing is then performed to assess integrity of the casing and the
2 cement bonded to the borehole wall and casing wall.

- 3 • “Intermediate” steel casing is typically 7 inches in diameter and is installed in an 8½-inch
4 diameter borehole to a depth of about 8,500 feet. After setting the casing, cement is added at
5 the base of the casing and forced up the outside of the casing wall to seal it into the borehole.
6 Pressure testing is then performed as described above.
- 7 • Steel “production” casing, which is usually 4½ inches in diameter, is then installed into a 6-inch
8 diameter borehole drilled to a permitted depth in the natural gas reservoir (i.e., Lance Pool).
9 The steel production casing is also cemented into the borehole from the base of the casing up
10 to at least 1,000 feet inside the intermediate casing. Cement bond logs are then typically
11 performed to verify the top of the cement and to assess the cement bond. The production
12 casing is then pressure-tested to the maximum stimulation pressure used during hydraulic
13 fracturing.

14 The annulus between the surface casing and the borehole is sealed by circulating cement slurry from the
15 bottom to ground surface in order to seal the casing into the borehole. The remainder of the well is
16 installed using subsequently smaller and overlapping casings that are cemented into the boreholes.
17 Operators monitor the volume of cement slurry added for each cemented interval, and add extra
18 volume of slurry to adequately seal the casing to the borehole.

19 Operators commonly run cement bonding logs on all production casing strings, and cement bonding logs
20 may be run after other casing installations for quality control purposes (i.e., to verify that no gaps are
21 present). If gaps are found, that section of the casing is perforated, and additional cement slurry is
22 squeezed through the perforations into the annulus. The adequacy of the repair is typically checked with
23 another cement bonding log, and the process is repeated, if necessary. According to PAPA Operators,
24 only 1-2 percent of gas production wells field-wide need cement repairs prior to the initial completion.
25 As part of the well completion report issued to the appropriate regulatory agency, the post-cement top-
26 of-cement elevation is reported. All well boring logs are also submitted to the appropriate regulatory
27 agency. An additional check on the cement bond is made during hydraulic fracturing operations.
28 Backside pressure is continuously monitored by Operators during hydraulic fracturing operations to
29 detect any communication through the cement as described below.

30 **3.5.3 Well Completions**

31 Well completion involves a number of steps to test the integrity and use of the well for natural gas
32 production. Throughout the PAPA, hydraulic fracturing techniques are used to increase rates of gas
33 production. Hydraulic fracturing, also referred to as well stimulation, involves pumping large quantities
34 of fluids at high pressure down a well bore to fracture the targeted rock formation, thereby stimulating
35 the flow of natural gas or oil. These fluids are referred to as both hydraulic fracturing fluids and well
36 completion(s) fluids. Hydraulic fracturing of a natural gas well occurs in the producing zone of the well,
37 which is approximately 8,000 to 14,000 feet below ground surface in the PAPA. Natural gas wells are
38 typically fractured in 15 to 30 stages.

39 Typical hydraulic fracturing pressures range from 6,000 to 10,000 psi, depending on the stage and depth
40 of the producing zone. Pressures over 10,000 psi may occur, but are usually instantaneous or of limited
41 duration, and occur only in the lower stages (e.g., depths in the range of approximately 14,000 feet). The

1 duration of hydraulic fracturing for each stage in a well ranges from approximately 35 to 60 minutes.
2 During each hydraulic fracturing operation, backside pressures are continuously monitored. Following
3 the operation, hydraulic fracturing pressures are monitored for 5-15 minutes, and annulus and casing
4 pressure may also be monitored. These monitoring data are used by the Operators to confirm each
5 hydraulic fracturing operation was performed as designed.

6 The Operators are confident that materials from hydraulic fracturing are contained within the natural
7 gas reservoir (i.e., Lance Pool), based on well design, monitoring results, hydraulic fracture modeling,
8 and geologic logs (PAPA Operators 2013). The surface casing intervals for all natural gas and oil wells
9 are cemented in the outer annulus up to the surface, and well casing integrity is scrutinized through
10 pressure testing and verified with cement bond logs where necessary. These testing and verification
11 procedures are conducted prior to any completion activities to confirm the interior of the production
12 casing is isolated from the annulus.

13 During hydraulic fracturing operations, annulus pressure is continually monitored and recorded. The
14 dimensions of hydraulic fracturing are controlled by rock properties and stresses. The 7,000 feet of
15 overlying rock (1.3 miles – the vertical distance between the Lance pool and groundwater resources)
16 and overburden stress provide a barrier between the zone of hydraulic fracturing and fresh water.
17 According to PAPA Operators, monitoring and modeling analyses have shown that this barrier has not
18 been compromised (PAPA Operators 2013). Operators' practices and well designs meet or exceed all
19 regulatory requirements, including BLM's Onshore Order No. 2 (BLM 1988) and WOGCC Rules and
20 Regulations (Chapter 3). In addition, all pipe specifications and cement designs are included in the
21 application for permit to drill (APD) submittal to WOGCC (for permits on federal lands, BLM also
22 receives the APD submittal).

23 Hydraulic fracturing fluids, or completions fluids, contain a variety of specialty chemicals and are often
24 classified into water-based fluids, oil-based fluids, alcohol-based fluids, emulsion fluids, and foam-based
25 fluids (Fink 2003 *in* AMEC 2013b). A typical formulation of modern completions fluids contains greater
26 than 99.5 percent by volume water, sand, and inert solids. Further details of completion fluids are found
27 in AMEC (2013b).

28 After hydraulic fracturing ceases, the completions fluids are allowed to "flow back" up the well under
29 natural pressures within the Lance Pool. The completions fluids ultimately flow back to the surface,
30 where they are recovered. The resulting liquid is known as flowback fluid. The flowback fluid consists of
31 both completions fluids and naturally occurring fluids present in the Lance Pool. These fluids may be
32 treated and reused, or disposed in permitted deep injection wells (see **Section 3.6**).

33 Well completion activities are regulated by the WOGCC and BLM. Many required and voluntary steps
34 are taken during these activities to verify that the well bore construction provides an adequate barrier
35 between fracturing fluids, produced fluids, and fresh groundwater to protect fresh groundwater
36 resources. Completion activities (i.e., hydraulic fracturing operations) are not initiated until each well is
37 confirmed to meet requirements for hydraulic fracturing based on pressure testing of the well casing, as
38 described above.

39 Some of the important types of monitoring performed by the Operators that occur throughout each
40 hydraulic fracturing operation to verify that hydraulic fracturing fluids are being placed in the target zone
41 are summarized below:

- 1 • Surface casing is visually monitored to assess if excess pressure is present.
- 2 • Annulus pressure of the production casing is monitored and recorded continually at the well
- 3 head during all completion activities to assess whether the fluid is being delivered to the
- 4 targeted zone. Annulus pressure is monitored to confirm whether or not communication occurs
- 5 with the backside, or on the outside, of the production casing. Only one target zone (e.g., stage)
- 6 is completed at a time. If only limited changes in pressure (increase from heating or decrease
- 7 from cooling) occur on the production casing annulus or surface casing, then it can be concluded
- 8 that all pressure and fluid are delivered to the single open target zone.
- 9 • Surface treating pressures are monitored and recorded continually during all completion
- 10 activities. Changes in friction pressure and hydrostatic pressure will cause variations in surface
- 11 treating pressures during hydraulic fracturing operations. These pressure variations, together
- 12 with known volumes of fluid that were pumped, help establish if the hydraulic fracturing fluids
- 13 are being placed in the target zone.

14 3.6 PRODUCTION

15 Potential sources of groundwater impacts during the Production phase include produced water and
16 condensate and chemicals stored on site, such as triethylene glycol, methanol, and corrosion inhibitors.
17 BMPs for the Production phase are contained in **Appendix 3-B** and summarized in **Table 3-4**.

18 The majority of liquid management concerns associated with natural gas production are minimized
19 through the use of a liquids gathering system. AMEC (2013b) presents a short discussion of the history
20 of liquids gathering systems in the PAPA. The liquids gathering system transports condensate and
21 produced water from the wells via underground pipelines to centralized gathering facilities. This
22 minimizes the need for storage tanks located on producing well pad sites. The only large storage tanks
23 at well pads connected to the liquid gathering system are blowdown tanks which are used when fluids in
24 natural gas wells are released (e.g., blown) as a safety precaution during well maintenance activities.
25 Blowdown tanks are placed in secondary containment structures as described below.

26 Where tank batteries and liquids storage are necessary on well pad sites (including blowdown tanks),
27 internal and routine external tank inspections are conducted to observe tank integrity. Tanks are also
28 equipped with spill containment structures or devices. Truck load-out facilities connected to tank
29 batteries are equipped with drip containment buckets to minimize the potential for releases during liquid
30 transfer to trucks.

31 Produced water generated during natural gas production is either treated and reused, or disposed in
32 deep waste water injection wells. These disposal wells are permitted through the WOGCC and
33 regulated by both the WOGCC and BLM.

34 The liquids gathering system is inspected and tested for integrity in accordance with state and federal
35 regulations. In addition, the pipeline system is monitored using a remote sensing system that allows the
36 pipelines to be shut-in automatically (closed with flow reversed back to nearest collection point) if a leak
37 is detected.

1 Spills to the ground surface are prevented from the production equipment on well pad sites using drip
2 storage devices. Tanks associated with production equipment are placed in lined secondary
3 containment berms and are inspected on a routine basis for leaks. Chemicals stored on well pad sites
4 typically consist of triethylene glycol, methanol, and corrosion inhibitors. These chemicals, although
5 kept at the site temporarily, are stored in secondary containment and routinely inspected for leaks.

6 Additional BMPs related to the Production phase include: use of closed tank storage systems in areas
7 where shallow groundwater is present; reuse of produced water with low total dissolved solids on
8 access roads for dust suppression; and use of drip buckets on tank load-out lines throughout the PAPA.
9 Although a liquids gathering system is used to collect and transport liquids in the PAPA, a small number
10 of natural gas wells are not connected to the system. These wells are primarily located in the southern-
11 most portion of the PAPA. In these areas, trucks are occasionally used to haul liquids from the sites and
12 from the blowdown tanks to centralized gathering facilities. For any trucking of liquids, Operators verify
13 proper transporter training with trucking companies they contract for liquids transport.

14 **3.7 CLOSURE**

15 Closure and reclamation of natural gas well sites in the PAPA consist of: plugging and abandoning the gas
16 well; pit closure (if pits were used on site); reclamation of well pads; pipeline abandonment and closure;
17 and water well plugging and abandonment. If deemed appropriate, access roads will also be reclaimed
18 by stripping any gravel, recontouring, and stabilizing cut/fill slopes, drainage channels, and other
19 disturbed areas. To the extent possible, all disturbed surfaces, whether for a well pad or access road,
20 will be returned to their original contours, shape, function and configuration that existed before
21 construction. These original physical features are documented during the Planning phase.

22 Following drilling of natural gas wells, interim reclamation occurs on all areas of the pad not needed to
23 safely and efficiently produce the well, which reduces the size of surface disturbance. Areas of the pad
24 not needed for production operations will be recontoured. This allows for grade control, re-vegetation,
25 site stabilization, and long-term topsoil viability. Interim reclamation provides erosion control and site
26 stabilization prior to final reclamation.

27 Pit closure (if pits are used) is completed after natural gas wells are drilled, and is conducted by a
28 WOGCC-certified oilfield waste management consultant who performs the cement-based
29 solidification/stabilization process in-situ. Pits used in the PAPA are typically lined with HDPE liners, and
30 the materials in the pits are relatively dry and may contain only small amounts of oil-based drilling mud
31 that is tied to the cuttings. Due to this practice, materials in the pit are stabilized and tested for
32 hydraulic conductivity to ensure that no liquids will pass through the material. Once the pit materials
33 are stabilized, they are buried in place on the site. Soil is backfilled over the processed material and the
34 pit area is returned to the existing grade bordering the pit.

35 If spilled materials are encountered during operation or prior to reclamation, soil sampling is conducted
36 in accordance with state and federal standards. If contaminants are present in soil above state
37 standards, impacted soils are removed and properly disposed. Some impacted soil may be remediated
38 on-site by tilling and aeration. After treatment, confirmation sampling is conducted to ensure that all
39 contaminated material has been remediated to below state standards prior to re-grading and seeding.

1 Natural gas well plugging and abandonment is conducted in accordance with WOGCC and BLM rules
2 and regulations (**Appendix 3-B**). Closure typically consists of a concrete plug placed 50 feet below and
3 up to 50 feet above any zone encountered that contains fluid or gas with a potential to migrate.
4 Additional cement plugs are placed uphole in the wellbore in accordance with WOGCC rules and
5 regulations, as necessary, to ensure protection of groundwater and other potential mineral resources in
6 the area. Intervals between cement plugs are filled with mud of sufficient density to exert pressure
7 exceeding the greatest formation pressure encountered while drilling. A surface cap is then installed
8 and a metal plate is used to mark the well location on the surface.

9 Any water supply well at the well pad site is also plugged and abandoned in accordance with SEO,
10 WOGCC, and BLM rules and regulations. Pipelines are abandoned by emptying the contents, plugging
11 both ends of lines which are left in place, and burying the sealed pipeline ends beneath the surface.

12 Upon final natural gas and water well abandonment, the well pad is re-contoured to as close to existing
13 contours as possible using stockpiled material at the site. Following re-contouring of the site, topsoil is
14 placed across the site and the area is seeded with seed mixes approved by BLM. Additional erosion
15 control is provided until the site is re-vegetated and vegetation is established to ensure storm water
16 runoff is free of sediment and other potential contaminants. Sediment loss is managed throughout the
17 reclamation process, during all stages of interim or final reclamation.

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TABLES



TABLE 3-1

Planning - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Siting / Surface Use	General	1.1	Adjust/move locations to avoid wetlands, riparian areas, floodplains, and other sensitive areas, where possible.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.
		1.2	Conduct on-site determination for presence of wetlands, riparian areas, floodplains, and other sensitive areas.	Minimize construction on areas with highly erosive soils/slopes.
		1.4	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as erosion prone areas and steep slopes.	Minimize disturbance of wetlands, riparian areas, floodplains, and other sensitive areas.
		1.6	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as surface waters, riparian areas, wetlands, or floodplains.	Minimize construction on areas with highly erosive soils/slopes.
		1.5	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as when shallow groundwater is close to the surface and permeability is high.	Minimize disturbance of wetlands, riparian areas, floodplains, and other sensitive areas.
		1.3	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues.	Consider modification of design on site-specific basis to address wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues or implement other Best Management Practices as appropriate.
		1.11	Coordinate disturbance of wetlands, riparian areas, floodplains, and other sensitive areas with the COE and secure 404 permits.	Minimize disturbance of wetlands, riparian areas, floodplains, and other sensitive areas.
	Erosion and Sediment Loss	1.12	Design pads with erosion control features which minimize/contain runoff.	Minimize or avoid construction on areas with highly erosive soils/slopes.
	Pipelines and Roads	1.25	Where practicable, avoid surface disturbances on slopes steeper than 25%.	Minimize surface disturbance.
		1.16	Plan and design drainage culverts to be installed at appropriate locations.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.
		1.17	Plan and design pipeline installation in central corridors.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.
		1.18	Plan and design pipelines to be installed across wetlands during dry conditions.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.

TABLE 3-1

Planning - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Siting / Surface Use (cont.)	Pipelines and Roads (cont.)	1.23	Restrict road and utility line construction at river crossings to normal flow conditions.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.
		1.24	Work with gas gathering companies to ensure safe practices such as the use of block valves at river crossings and monitoring of line pressure via SCADA. Should an anomaly be detected in the line pressure, field staff would be deployed to manually close block valves.	Minimize/avoid surface disturbance and impacts to riparian habitats.
	Wells, Well Pads, and Pits	1.13	Design pits with appropriate liner materials.	Minimize impact to wetlands, riparian areas, floodplains, and other sensitive areas.
		1.25	Where practicable, avoid surface disturbances on slopes steeper than 25%.	Reduce footprint and surface disturbance (i.e., fewer pads/roads).
Operations and Maintenance	Fluids Storage and Handling	1.14	Design storage systems to prevent spills.	Actively manage activities to minimize potential for impacts from leaks or spills.
		1.19	Maintain complete copy of SPCC Plans	Actively manage activities to minimize potential for impacts from leaks or spills.
		1.7	Plan to conduct routine inspections as required for integrity of spill prevention features and countermeasures equipment.	Actively manage activities to minimize potential for impacts from leaks or spills.
		1.9	Plan to conduct spill response drills in PAPA as applicable.	Actively plan and prepare for spill response.
		1.10	Plan to conduct training of first responders and/or designated spill team members.	Actively plan and prepare for spill response.
		1.20	Prepare and maintain up to date Spill Prevention Control and Countermeasure (SPCC) Plans for all applicable locations.	Actively manage activities to minimize potential for impacts from leaks or spills.
		1.21	Stage spill response equipment per plan specifications as applicable.	Actively plan and prepare for spill response.
	Stormwater	1.8	Plan to conduct routine inspections for integrity of control features.	Actively manage activities to minimize potential for impacts from stormwater runoff/sediment loss.
		1.22	Prepare and maintain up to date Stormwater Pollution Prevention Plans (SWPPP) for all applicable locations.	Actively manage activities to minimize potential for impacts from stormwater runoff/sediment loss.
	Waste Management	1.15	Plan to implement waste minimization and proper waste management and handling practices in accordance with state and federal regulations.	Reduce amount of wastes generated, stored, and disposed within PAPA.

Note:

Definitions for acronyms used in this table are presented in **Appendix 3-A**.

This table is an abridged version of the Pollution Prevention (P2) Matrix contained in **Appendix 3-B**.

Practice Identification numbers are not sequential relative to the P2 Matrix because the order of presentation was modified to better reflect the order of Activity in the Project Phase.

TABLE 3-2

Construction - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Construct Access Roads	Sediments	2.5	Construct diversion ditches on top of slope to manage/reroute stormwater runoff.	Control and reduce sediment discharge from roads.
		2.6	Crown roads, add gravel as necessary. Repair headcuts that affect groundwater.	Control and reduce sediment discharge from roads.
		2.7	Implement dust abatement measures during construction (e.g., water construction areas).	Control and reduce sediment discharge from roads.
		2.11	Install check dams, gravel bars, rip-rap, and/or waddles to capture/reduce sediment loss.	Control and reduce sediment discharge from roads.
		2.12	Install culverts at streams/channels crossed by roads.	Control and reduce sediment discharge from roads. Minimize impacts to riparian environments.
		2.20	Restrict grades 8-9%.	Control and reduce sediment discharge from roads.
		2.21	Restrict slopes to 3:1 instead of 2:1 even for non-erosive soils.	Control and reduce sediment discharge from roads.
Construct Pads	Sediments, petroleum hydro-carbons	2.3	Construct berms/diversion ditches to direct potential stormwater run-on around pads. Repair headcuts that affect groundwater.	Reduce erosion and sedimentation.
		2.18	Manage hazardous materials during construction in conformance with applicable rules and regulations.	Minimize potential for release of hydrocarbons to soil.
Construct Pits	Release of Pit Fluids	2.13	Install high-density polyethylene (HDPE) liners in reserve pits.	Reduce risk of release of pit fluids to subsurface.
		2.14	Install pits with appropriate liner materials.	Reduce risk of release of pit fluids to subsurface.
Construction and Operation of Water Wells	Water Supply Wells	2.19	P&A existing water wells which are improperly constructed or out-of-service due to location.	Eliminate potential future conduit for contaminants entering subsurface.
		2.28	Use non-toxic, hydrocarbon-free pipe thread compound.	Avoid introducing contaminants during water well installation/use.
		2.1	Conduct baseline water quality sampling.	Provide basis for continued water quality.
		2.2	Conduct sampling after pump installation and well development.	Ensure water quality good for intended purpose.
		2.25	Construct water wells to SEO minimum standards or better	Avoid introducing contaminants during water well installation/use.
		2.8	Include siphon breaks (air gap) between discharge line and tank in accordance with state and federal regulations.	Prevent backflow of lower-quality water into freshwater zone.
		2.9	Install backflow prevention (double check valve).	Prevent backflow of lower-quality water into freshwater zone.
		2.10	Install locked metal well caps.	Minimize unauthorized access to well.
		2.24	Locate water wells away from potential sources of contamination with consideration to geology and location on well pad with relation to gas wells as well as any setback distances as stated in the WSEO minimum standards.	Avoid introducing contaminants during water well installation/use.
2.23	Steam-clean all water well construction equipment prior to use in well.	Avoid introducing contaminants during water well installation/use.		

TABLE 3-2**Construction - Summary of Best Management Practices**

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Construction and Operation of Water Wells (cont.)	Water Supply Wells (cont.)	2.26	Use approved sampling protocols and use discrete zone sampling bailer to collect groundwater sample from screened interval.	Avoid introducing contaminants during water well installation/use.
		2.27	Use EPA Method 8260B for analysis of BTEX.	Ensure water quality good for intended purpose.
Pipelines	Surface water runoff, sediments, release of produced fluids	2.4	Construct crossing/install bore only during dry conditions.	Minimize impacts to environments.
		2.15	Install pipelines across wetlands during dry conditions	Minimize impacts to riparian environments.
		2.16	Install spill containment structures at pig receiver stations.	Minimize risk of operational spills.
		2.17	Keep soil intact during pipeline construction.	Minimize impacts to riparian environments.
		2.22	Restrict stream crossings until after spring runoff.	Minimize impacts to riparian environments.

Note:Definitions for acronyms used in this table are presented in **Appendix 3-A**.This table is an abridged version of the Pollution Prevention (P2) Matrix contained in **Appendix 3-B**.

Practice Identification numbers are not sequential relative to the P2 Matrix because the order of presentation was modified to better reflect the order of Activity in the Project Phase.

TABLE 3-3

Drilling - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
O&G Well Design and Construction	Blowouts	3.10	Install and maintain blow-out preventers on wellheads.	Minimize potential for blow out.
		3.11	Install and maintain well control.	Minimize potential for blow out.
		3.16	Perform real-time monitoring during drilling with means for emergency shutdown of drilling.	Prevent release of fluids from the well bore.
	Casing Design	3.3	Case and cement all wells in alignment with approved 8-point drilling plan.	Ensure that strength and integrity of materials used are protective of groundwater.
	Completion and Produced Fluids	3.4	Case and cement all wells in alignment with approved 8-point drilling plan.	Ensure well integrity.
	Mud program	3.5	Comply with mud program requirements per OO#2.	Ensure integrity of geologic formations during drilling.
		3.8	Evaluate top of cement for integrity using standard geological techniques.	Prevent migration of fluids from producing zones into freshwater zones.
3.9		Evaluate top of cement for integrity using state of the art technology (e.g., circulation volumes, temperature surveys, acoustic integrity surveys).	Prevent migration of fluids from producing zones into freshwater zones.	
O&G Well Drilling	Diesel Fuel Tanks	3.18	Stage tanks on area lined with HDPE liner.	Provides secondary containment for incidental leak or spill from fuel tank.
	Diesel Fuel Tanks for Drill Rig	3.7	Ensure fuel tanks used for drilling have secondary containment.	Provides both secondary containment for incidental leak or spill from fuel tank.
	Drill Rig	3.25	Utilize vacuum system on rig to collect drilling mud spilled on rig floor and return to mud system.	Control minor drilling mud spills during drilling.
	Drilling fluids	3.2	Avoid discharge of oil-based drilling mud into reserve pit and handle such occurrences appropriately.	Minimize/avoid on-site storage of oil-based drilling mud.
		3.15	Minimize potential for discharging oil based mud into reserve pit.	Minimize leakage or potential for migration of constituents from drilling fluids into subsurface.
		3.22	Utilize HDPE liner in reserve pits.	Prevent leakage or potential for migration of constituents from drilling fluids into subsurface.
		3.24	Utilize semi-closed or fully-closed loop mud system.	Minimize leakage or potential for migration of constituents from drilling fluids into subsurface. Minimize/avoid on-site storage of oil-based drilling mud.
	Miscellaneous Leaks and Spills	3.23	Utilize HDPE liner over areas for staging tanks and pumps used for drilling.	Limit potential for leaks and spills to enter subsurface.
	Mousehole	3.13	Install steel casing with concrete plug in bottom.	Minimize risk of fluids released to shallow subsurface during drilling.
3.17		Remove oil-based fluids with vacuum truck.	Minimize risk of fluids released to shallow subsurface during drilling.	

TABLE 3-3

Drilling - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
O&G Well Drilling (cont.)	Surface Casing	3.1	All water used must be permitted by the State Engineer's Office.	Ensure water quality good for intended purpose.
		3.21	Use freshwater for drilling that meets applicable water quality standards. Use recycled water for drilling in place of fresh water where it is available and of adequate quality.	Ensure water quality good for intended purpose.
	Wellhead Cellar	3.12	Install one foot of concrete in bottom of concrete vault or corrugated steel cellar.	Contain spills at wellhead.
Completions Gas Wells	Frac Fluids	3.19	Treat/discharge or dispose via underground injection spent frac fluids.	Limit potential for frac fluids to impact groundwater via improper disposal.
	Hydraulic Fracturing	3.14	Install/utilize instrumentation that provides real-time monitoring of fracturing to help ensure proper pressures maintained.	Ensure fracture/stimulation integrity.
		3.20	Use fracture geometry models and real-time monitoring (casing pressure, annulus pressure, flow rate and fluid densities) to evaluate/ minimize potential for fracture extension out of target zone.	Ensure fracture/stimulation integrity.
Pit Closure	Spent drilling and completions fluids	3.6	Conduct sampling and field documentation during closure.	Document chemicals of concern will not result in groundwater impacts.

Note:

Definitions for acronyms used in this table are presented in **Appendix 3-A**.

This table is an abridged version of the Pollution Prevention (P2) Matrix contained in **Appendix 3-B**.

Practice Identification numbers are not sequential relative to the P2 Matrix because the order of presentation was modified to better reflect the order of Activity in the Project Phase.

TABLE 3-4

Production - Summary of Best Management Practices

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Fluids Handling	Liquids Gathering System – Produced water/ condensate	4.4	Conduct quality control testing, including hydrotesting, during installation.	Minimize potential for installation-related leaks (e.g., welds).
		4.6	Install pipeline shutoff valves at New Fork River pipeline crossings (manual or MOV).	Provide means of stopping flow in event of release from pipeline in or near river.
		4.5	Install, monitor, and maintain SCADA system on 24/7 basis.	24/7 monitoring of LGS allows shut-in of system if problems encountered.
		4.22	Where appropriate, construct with poly-pipe instead of steel. If steel is used, integrity management should be employed.	Eliminate potential for corrosion induced leaks.
	Load Outs – Produced water/ condensate	4.13	Install and maintain drip buckets.	Minimize potential for releases during transfer to trucks.
		4.18	Reduce truck loading/unloading through LGS.	Eliminate potential source of releases.
		4.19	Verify transporter training.	Minimize potential for releases during transfer to trucks.
	Produced Water	4.14	Apply produced water with appropriate TDS levels and no hazardous materials to roads in accordance with BLM authorization.	Eliminate storage and treatment of produced water on surface.
		4.3/4.17	Dispose of produced water according to OO #7 using permitted facilities.	Eliminate storage, treatment and disposal of produced water on surface, except at permitted disposal facilities.
		4.15	Produced water will be disposed of in closed storage system where ground water is close to surface.	Eliminate storage and treatment of produced water on surface.
		4.16	Properly dispose of all water.	Eliminate storage and treatment of produced water on surface.
	Tank Batteries – Produced water/ condensate	4.1	Conduct internal tank inspections.	Maintain tank integrity standards.
		4.2	Conduct routine external inspections.	Maintain tank integrity standards.
		4.10	Install/construct containment structures or devices.	Minimize potential for releases entering groundwater. Minimize potential for releases entering surface or groundwater.
		4.11	Institute integrity management/corrosion prevention practices.	Minimize potential for leaks.
		4.12	Minimize on-site tank storage and replace with LGS.	Consolidate fluids handling and reduce number of potential point sources.
4.20		Use sound tanks that are in good working condition.	Maintain tank integrity standards.	
4.21		Where possible, locate Enardo valves (end-of-line vent valves) to interior of tank battery containment/pad.	Minimize potential impacts from releases from Enardo valves (end-of-line vent valves) during upsets.	
Gas/Fluids Treatment	Production Equipment – Produced water/ condensate	4.7	Install and maintain impervious drip storage devices such as: --Drum storage; --Drum storage with secondary containment; or --Blow down piping directly to tank.	Minimize potential for releases to impact soil/enter Vadose zone.
		4.8	Install and maintain production packs with one or more containment features.	Minimize potential for releases to impact soil/enter subsurface.

TABLE 3-4**Production - Summary of Best Management Practices**

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Gas/Fluids Treatment (cont.)	Treatment Chemical Storage (e.g., TEG)	4.9	Install and maintain secondary containment structures such as: -- Poly drums with containment troughs; or -- Steel drums with containment troughs	Minimize potential for releases to impact soil/enter Vadose zone.
Well Treatment	Treatment Chemical Storage (e.g., methanol; corrosion inhibitors)	4.9	Install and maintain secondary containment structures such as: -- Poly drums with containment troughs; or -- Steel drums with containment troughs	Minimize potential for releases to impact soil/enter Vadose zone.

Note:Definitions for acronyms used in this table are presented in **Appendix 3-A**.This table is an abridged version of the Pollution Prevention (P2) Matrix contained in **Appendix 3-B**.

Practice Identification numbers are not sequential relative to the P2 Matrix because the order of presentation was modified to better reflect the order of Activity in the Project Phase.

TABLE 3-5**Closure - Summary of Best Management Practices**

Pollution Prevention Program, Pinedale Anticline Project Area, Sublette County, Wyoming

Activity	Source (of Potential Contamination)	Practice Identification	Operator Practice	Operator Mitigation Measure
Interim and Final Reclamation	Sediment loss	5.1	Apply appropriate erosion control measures.	Control and reduce sediment discharge from reclaimed areas.
		5.5	Manage disturbed areas to minimize runoff.	Control and reduce sediment discharge from reclaimed areas.
		5.6	Reclaim slopes to approximate original contours.	Minimize footprint of disturbed area subject to erosion forces.
		5.8	Revegetate disturbed areas.	Minimize footprint of disturbed area subject to erosion forces.
O&G Well Plugging and Abandonment	Cased hole	5.4	Comply with WOGCC requirements for plugging and abandonment.	Eliminate potential conduits for migration of contaminants into/through subsurface.
	Open Hole			
	Subsurface or subsurface releases			
Pad Decommissioning	Historical leaks and spills	5.7	Remediate/remove soil or fill material impacted above state standards.	Remove potential source areas post-closure.
	Pit closure	5.2	Comply with SEO requirements for plugging and abandoning water wells prior to pit closure.	Remove potential source areas.
Pipeline Decommissioning	In-Situ	5.9	Seal ends of pipeline or remove pipeline.	Ensure decommissioned lines will not impact groundwater.
Pit Closure	Spent drilling mud and cuttings, spent completions fluids	5.3	Comply with WOGCC requirements for pit closures.	Minimize potential for chemicals of concern in residual material from impacting subsurface post-closure.

Note:Definitions for acronyms used in this table are presented in **Appendix 3-A**.This table is an abridged version of the Pollution Prevention (P2) Matrix contained in **Appendix 3-B**.

Practice Identification numbers are not sequential relative to the P2 Matrix because the order of presentation was modified to better reflect the order of Activity in the Project Phase.

APPENDIX 3-A



SUMMARY OF AECOM'S METHODOLOGY TO REVISE THE POLLUTION PREVENTION MATRICES



Memorandum

To Kelly Bott, Ultra Petroleum Page 1

CC

Subject Summary of AECOM's Methodology to Revise the Pollution Prevention Matrices
Pinedale Anticline Project Area, Wyoming

From Bill Bock, AECOM

Date December 8, 2014

This memo summarizes the approach for revision of the Pollution Prevention Matrices (P2 Matrices) for the Pinedale Anticline Project Area (PAPA), Wyoming. Ultra Petroleum (Ultra), Shell Exploration & Production Company (Shell) and QEP Resources (QEP) (referred to as the Operators), voluntarily contracted with AECOM in May 2014 to review and revise the P2 Matrices in order to make them more user-friendly so that they can be incorporated into the Final Groundwater/Aquifer Pollution Prevention, Mitigation and Monitoring Plan (FGMP). At the end of September 2014, the divestment of Shell's PAPA assets to Ultra was completed and Shell no longer participates in the P2 Matrices revision process. As a result, Ultra and QEP (collectively UQ) have contracted directly with AECOM to continue and complete the P2 Matrices revision process.

AECOM implemented a systematic methodology to the review and reorganization of the five Bureau of Land Management (BLM) reformatted Mitigation Matrices tables dated March 2014 (i.e., 1-Planning, 2-Construction, 3-Drilling, 4-Production and 5-Closure). After an initial review, AECOM concluded that the best approach to maintaining relevant information while reducing duplicated/redundant entries and allowing for a more 'user friendly' reorganization would be to:

1. Represent each original entry as an individual line item by unmerging all cells and inserting text within cells (i.e., Activity, Source, Operator Practice, Mitigation Measure, etc.) as needed.
2. Combine the five tables into one table.

After completing this task, AECOM began its review, data QA/QC and information entry into the draft table. A number of reference documents were consulted and reviewed for applicability:

Reference Documents:

API 51R	<i>API 51 R</i> – API, 2009. Environmental Protection for Onshore Oil and Gas Production Operations and Leases. API Recommended Practice 51R, First Edition, July.
API RP 52	<i>API 52</i> – American Petroleum Institute (API), 1995. Land Drilling Practices for Protection of the Environment. API Recommended Practice 52, Second Edition, July 1.

BLM 2009	<i>BLM, 2009</i> – U.S. Department of Interior, Bureau of Land Management (BLM), 2009. Pinedale Anticline Project Area – Monitoring for Reclamation Success. BLM Pinedale Field Office. 35 pp.
BLM Gold Book	<i>BLM Gold Book</i> – U.S. Department of Interior/U.S. Department of Agriculture (USDI/USDA), 2007. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. BLM/WO/ST-06/021+3071/REV 07. BLM. Denver, CO. 84 pp.
BLM Road Manual	<i>BLM Road Manual</i> - U.S. Department of Interior, Bureau of Land Management, 1985. BLM Manual Handbook 9113Roads. 33pp.
OO#2	<i>Onshore Oil and Gas Order No. 2</i> – U.S. Department of Interior, Bureau of Land Management/U.S. Department of Agriculture, Forest Service (BLM/FS), 1988. Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases; Drilling Operations. 40 CFR 3160.
ROD	<i>ROD</i> – U.S. Department of Interior, Bureau of Land Management (BLM), 2000. Record of Decision for Pinedale Anticline Natural Gas Exploration & Development Project, Environmental Impact Statement. BEIS/FEIS-00-018.
ROD FSEIS	<i>ROD FSEIS</i> – U.S. Department of Interior, Bureau of Land Management (BLM), 2008. Record of Decision: Final Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming. BLM/WY/PL-08/022+1310.
RMP	<i>RMP</i> – U.S. Department of Interior, Bureau of Land Management (BLM), 2008. Record of Decision and Approved Pinedale Resource Management Plan, Pinedale, Wyoming. BLM/WY/PL-09/014+1610.

Once the reference documents were reviewed and incorporated into the P2 Matrices, the Operators conducted a detailed review and recommended a number of changes. The review objective was to remove redundancy and ensure that listed operator practices accurately reflected current field conditions and improvements, such as the liquids gathering system. During the Groundwater Characterization Study, conclusions were based on a specified set of field conditions and operating practices. Therefore, it was important that the final P2 Matrices reflected practices that are at least as protective as those in place during the Groundwater Characterization Study.

In addition, it was noted during the Operators' review that there were a number of instances where certain listed practices did not conform to other practices in the P2 Matrices. In those circumstances, each practice was evaluated for a regulatory basis, as well as degree of environmental protection with an aim toward keeping the more protective practice. There were also several practices determined to be not applicable to the operations in the Pinedale Anticline, and those were also removed.

Upon receipt of the Operators' comments, AECOM incorporated the recommended changes and reformatted the P2 Matrices for ease of review by grouping and sorting the operator practices. This revised P2 Matrices was then presented, reviewed and discussed at the PAPA FGMP Meeting held at the BLM Pinedale Field Office, Pinedale, Wyoming on September 25, 2014. Participants at this meeting included representatives from Ultra, QEP, NewFields Companies LLC, BLM, U.S. Environmental Protection Agency Region 8, Wyoming Department of Environmental Quality, Wyoming Oil and Gas Conservation Commission, and Wyoming State Engineer's Office.

Subsequent to the PAPA FGMP meeting, agency representatives who were in attendance, provided via email to Kelly Bott (Ultra), comments on the P2 Matrices for consideration. AECOM consolidated all agency comments into one table and then addressed each comment with a response, and in some cases, a text or format revision. Requests for specific comment clarification were submitted to the agencies, where necessary. AECOM's recommended responses to the

agencies' comments and revisions were submitted as a draft to UQ. UQ conducted a detailed review and provided comments to AECOM which were incorporated into the final P2 Matrices.

List of Acronyms in the P2 Matrices:

APD	Application for Permit to Drill
API	American Petroleum Institute
BLM	Bureau of Land Management
BMP	Best Management Practice
BOPE	Blowout Prevention Equipment
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CFR	Code of Federal Regulations
COA	Condition of Approval
COE	Army Corps of Engineers
DP	Development Plan
ECM	Environmental Compliance Manual
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FSEIS	Final Supplemental Environmental Impact Statement
HDPE	High-Density Polyethylene
LGS	Liquids Gathering System
MOV	Motor Operated Valve
NPDES	National Pollutant Discharge Elimination System
O&G	Oil and Gas
OO	Onshore Oil and Gas Order
PAPA	Pinedale Anticline Project Area
PVT	Pit Volume Totalizer
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
SDS	Safety Data Sheets
SPCC	Spill Prevention, Control and Countermeasure
SRP	Spill Response Plan
SUP	Surface Use Plan
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
TEG	Triethylene glycol
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission
WSEO	Wyoming State Engineer's Office

Sincerely yours,



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APPENDIX 3-B



POLLUTION PREVENTION (P2) MATRIX



POLLUTION PREVENTION MATRICES
PINEDALE ANTICLINE PROJECT AREA

Project Phase	Activity	Source (of Potential Contamination)	Practic ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
1 - Planning	Siting / Surface Use	General	1.1	Adjust/move locations to avoid wetlands, riparian areas, floodplains, and other sensitive areas, where possible.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.	ROD FSEIS		A.5 Production Facilities: Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, as well as locating staging areas for storage of equipment away from drainages will prevent potential contaminants from entering surface waters.	WOGCC Rule: Chapter 4, Section 4	WOGCC Chapter 4, Section 4 Workmanlike Operations. Page 4-16.	WOGCC: (a)(vii) Maintain tanks in a workmanlike manner which will preclude seepage from their confines and provide for all applicable safety measures. Owners or Operators should be aware of their responsibility to comply with Spill Prevention Control and Countermeasures Plan (SPCC, 40 CFR 112) requirements that regulate the prevention and containment of crude oil spills. SPCC regulations and guidelines specify that applicable facilities construct appropriate containment or diversionary structures or equipment to prevent discharged oil from reaching waters of the United States.	Required	SUP / SPCC Plan
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: Treaters, dehydrators, and other production facilities installed on location, that have the potential to leak or spill oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety, will be placed on or within appropriate containment and/or diversionary structure to prevent spilled or leaking fluid from reaching ground, surface, or navigable waters.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b),The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank, will not escape the containment system before cleanup occurs. At a minimum, you must use one of the following prevention systems or its equivalent: (1) For onshore facilities: (i) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (ii) Curbing or drip pans; (iii) Sumps and collection systems; (iv) Culverting, gutters, or other drainage systems; (v) Weirs, booms, or other barriers; (vi) Spill diversion ponds; (vii) Retention ponds; or (viii) Sorbent materials.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Flood Plains: All surface disturbance, permanent facilities, etc., shall remain a minimum of 500 feet away from the edge of surface waters, riparian areas, wetlands, and 100-year floodplains unless it is determined through site specific analysis, approved in writing by the BLM AO, that there is no practicable alternative to the proposed action. A.8 Wetlands, Riparian Areas, and Flood Plains: If such a circumstance exists, then all practicable measures to mitigate possible harm to these areas must be employed. These mitigating measures will be determined case by case and may include, but are not limited to, diking, lining, screening, mulching, terracing, and diversions.	Executive Order 11990 - Protection of Wetlands (Note: BLM 500-foot buffer policy established to comply with EO 11990, per ROD DEIS)	EO 11990 - Protection of Wetlands	EO 11990: ...in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Section 2(a).each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.	Required	SUP
1 - Planning							43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands. The operator also must take measures to minimize or prevent erosion and sediment production. Such measures may include, but are not limited to: • Avoiding steep slopes and excessive land clearing when siting structures, facilities, and other improvements.	Required	SUP		
1 - Planning							Executive Order 11988 - Floodplain Management	EO 11988 - Floodplain Management	EO 11988: Section 2.a.(2). If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.	Required	SUP		

POLLUTION PREVENTION MATRICES
 PINEDALE ANTICLINE PROJECT AREA

Project Phase	Activity	Source (of Potential Contamination)	Practic ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
1 - Planning	Siting / Surface Use	General	1.1	Adjust/move locations to avoid wetlands, riparian areas, floodplains, and other sensitive areas, where possible.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Floodplains: Floodplain Executive Order 11988 (Section 3), in reference to federal real property and facilities states that agencies will, if facilities are to be located in a floodplain (i.e., no practicable alternative), apply flood protection measures to new construction or rehabilitate existing structures, elevate structures rather than fill the land, provide flood height potential markings on facilities to be used by the public, and when the property is proposed for lease, easement, right of way, or disposal, the agency has to attach restriction on uses in the conveyance, etc., or withhold from such conveyance.	Executive Order 11988 - Floodplain Management	EO 11988 - Floodplain Management	EO 11988: Section 3. If, after compliance with the requirements of this Order, new construction of structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protection, agencies shall, wherever practicable, elevate structures above the base flood level rather than filling in land. If property used by the general public has suffered flood damage or is located in an identified flood hazard area, the responsible agency shall provide on structures, and other places where appropriate, conspicuous delineation of past and probable flood height in order to enhance public awareness of a knowledge about flood hazards. When property in floodplains is proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties, the Federal agency shall (1) reference in the conveyance those uses that are restricted under identified Federal, State or local floodplain regulations; and (2) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successors, except where prohibited by law; or (3) withhold such properties from conveyance.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Floodplains: Therefore, federally-managed 100-year floodplains will have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where floodplain construction is approved, additional constraints could be applied.	24 CFR 55: Floodplain Management and Protection of Wetlands	24 CFR 55 - Floodplain Management and Protection of Wetlands	24 CFR 55.20: Decision making process. (g) Step 7. (1) If the reevaluation results in a determination that there is no practicable alternative to locating the proposal in the 100-year floodplain (or the 500-year floodplain for a Critical Action) or the wetland, (<i>the Responsible entity will</i>) publish a final notice that includes: (i) The reasons why the proposal must be located in the floodplain or wetland; (ii) A list of the alternatives considered in accordance with paragraphs(c)(1) and (c)(2) of this section; and (iii) All mitigation measures to be taken to minimize adverse impacts and to restore and preserve natural and beneficial functions and values.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: These plans will show the drill location layout over the existing topography, dimension of the location, volumes and cross sections of cut and fill, location and dimensions of reserve pits, existing drainage patterns, and access road egress and ingress. Plans will be submitted and approved prior to initiation of construction.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44, Section III Application for Permit to Drill (APD); D. Components of a Complete APD Package; 4. Surface Use Plan of Operations. Page 10332.	OO#1: i. Well Site Layout: A diagram of the well site layout must have an arrow indicating the north direction. Diagrams with cuts and fills must be surveyed, designed, drawn, digitized, and certified by licensed professional surveyors or engineers. The operator must submit a plat of a scale of not less than 1 inch = 50 feet showing the location and orientation of: • The proposed drill pad; • Reserve pit/blooiie line/flare pit location; • Access road entry points and their approximate location with respect to topographic features and with cross section diagrams of the drill pad; and • The reserve pit showing all cuts and fills and the relation to topography. The plat must also include the approximate proposed location and orientation of the: • Drilling rig; • Dikes and ditches to be constructed; and • Topsoil and/or spoil material stockpiles.	Required	SUP
1 - Planning							Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 14	6.1.7 Stormwater Runoff: Natural drainage patterns of the area should be considered in the location of equipment, pads, and pits so that stormwater runoff does not create an environmental hazard by erosion of base material, which could lead to equipment instability, or by flooding of pits, which could cause a discharge of oil or other fluids into the local surface waters.				Voluntary	---
1 - Planning							Section 8 Production and Water Handling Facilities - 8.2 Site Selection Considerations page 24	8.2.1 Land Use: Topographic, population, environmental hazard, zoning, and other maps should be consulted, where applicable, to locate sensitive or high exposure areas [such as churches, schools, hospitals, residential areas, surface waters, freshwater wells, flood zones, active fault areas, threatened and endangered plants and animals (including habitat), migratory bird habitat, wetlands, archeological, recreational, biological, or scenic areas]. Where feasible, the site should be located away from these sensitive areas. The potential impact from upset conditions, such as oil or produced water spills and leaks, should be considered.	API 51R			Voluntary	---

POLLUTION PREVENTION MATRICES
 PINEDALE ANTICLINE PROJECT AREA

Project Phase	Activity	Source (of Potential Contamination)	Practic ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
1 - Planning	Siting / Surface Use	General	1.1	Adjust/move locations to avoid wetlands, riparian areas, floodplains, and other sensitive areas, where possible.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.	API 51R	Section 8 Production and Water Handling Facilities - 8.1 Requirement Determination (Preplanning Considerations) page 23	8.1 Requirement Determination (Preplanning Considerations): The overall basis for siting, designing, constructing, and operating oil, gas, and water production, handling, and disposal/injection facilities should be to minimize adverse effects on the environment, consistent with providing an economical means of accumulating well, lease, or unit production from primary, secondary, or tertiary recovery methods and producing the ultimate recoverable reserves. Impacts on local population, land, surface and subsurface waters, air quality, and animal and plant species, including habitat, should be considered.	WOGCC Rule: Chapter 3, Section 22	WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-32.	WOGCC: (b) Before drilling commences, approval to construct proper and adequate reserve pits for the reception and confinement of mud and cuttings and to facilitate the drilling operation shall be applied for and received in accordance with Chapter 4, Section 1 of these rules. Special precautions including, but not limited to, an impermeable liner and/or membrane, monitoring systems, or closed systems, shall be taken, if necessary, to prevent contamination of streams and potable water and to provide additional protection to human health and safety in instances where drilling operations are conducted in close proximity to water supplies, residences, schools, hospitals, or other structures where people are known to congregate. Pits, wellheads, pumping units, tanks, and treaters shall be located no closer than three hundred fifty feet (350') from any of the aforementioned items. The Supervisor may impose greater distances for good cause and likewise grant exceptions to the 350-foot rule.	Voluntary	---
1 - Planning						API RP 52	Section 4 Planning - 4.2 Site Assessment and Construction Planning page 6	The drilling site and rights-of-way should be selected to minimize environmental impacts while allowing economical attainment of the geological objectives. An early visit to the site may make the planning process more efficient and identify areas of concern. Additional procedures may be required by regulatory agencies or landowners when construction could impact environmentally sensitive areas.			Voluntary	---	
1 - Planning						BLM Gold Book	Chapter 4 Construction and Maintenance - Well Sites page 15	Site Selection and Design: [Well] Locations on steep slopes that require deep, nearly vertical cuts and steep fill slopes should be avoided where possible or appropriately mitigated. Operations should also be avoided or properly mitigated in riparian areas, floodplains, playas, lakeshores, wetlands, and areas subject to severe erosion and mass soil movement.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands. The operator also must take measures to minimize or prevent erosion and sediment production. Such measures may include, but are not limited to: • Avoiding steep slopes and excessive land clearing when siting structures, facilities, and other improvements; and • Temporarily suspending operations when frozen ground, thawing, or other weather-related conditions would cause otherwise avoidable or excessive impacts.	Required	SUP
1 - Planning						Appendix A BLM's Practices and Restrictions for the PAPA page A-5 - A-6	A.3 Soil, Erosion, and Sediment Control: Projects requiring soil interpretations include: construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads and associated disturbances; and reclamation projects.			Required	SUP		
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.1 General Requirements: Unnecessary topographic alterations will be mitigated by avoiding, where possible, steep slopes, rugged topography, and perennial and ephemeral/intermittent drainages, and by minimizing the area disturbed. Alternative methods of construction in order to minimize environmental impacts may also be used.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands. The operator also must take measures to minimize or prevent erosion and sediment production. Such measures may include, but are not limited to: • Avoiding steep slopes and excessive land clearing when siting structures, facilities, and other improvements; and • Temporarily suspending operations when frozen ground, thawing, or other weather-related conditions would cause otherwise avoidable or excessive impacts.	Required	SUP
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Flood Plains: All surface disturbance, permanent facilities, etc., shall remain a minimum of 500 feet away from the edge of surface waters, riparian areas, wetlands, and 100-year floodplains unless it is determined through site specific analysis, approved in writing by the BLM AO, that there is no practicable alternative to the proposed action. A.8 Wetlands, Riparian Areas, and Flood Plains: If such a circumstance exists, then all practicable measures to mitigate possible harm to these areas must be employed. These mitigating measures will be determined case by case and may include, but are not limited to, diking, lining, screening, mulching, terracing, and diversions.	Executive Order 11990 - Protection of Wetlands (Note: BLM 500-foot buffer policy established to comply with EO 11990, per ROD DEIS)	EO 11990 - Protection of Wetlands	EO 11990: ...in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Section 2(a).shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.	Required	SUP
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: On producing locations, Operators will be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes will be backfilled and blended into the surrounding terrain, reseeded, and erosion control measures installed. Erosion control measures will be required after slope reduction. Facilities will be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands. The operator also must take measures to minimize or prevent erosion and sediment production. Such measures may include, but are not limited to: • Avoiding steep slopes and excessive land clearing when siting structures, facilities, and other improvements.	Required	SUP

POLLUTION PREVENTION MATRICES
PINEDALE ANTICLINE PROJECT AREA

Project Phase	Activity	Source (of Potential Contamination)	Practic ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
1 - Planning	Siting / Surface Use	General	1.3	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues.	Minimize disturbance of wetlands, riparian areas, floodplains, other sensitive areas, and buried utilities.	BLM Gold Book	Chapter 1 Introduction - Onsite Inspection page 2	Onsite Inspection: Before approval of the APD, an onsite inspection will be conducted with the operator to further identify site-specific resource protection concerns and requirements. Prior to, or in conjunction with, the onsite inspection, the surface management agency will advise the operator if any special inventories or studies are required, such as for cultural resources or threatened and endangered species.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). C. Notice of Staking Option. Page 10330. OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package; 7. Onsite Inspection. Page 10333.	OO#1: C. Notice of Staking Option. On non-NFS lands, the BLM will invite the Surface Managing Agency and private surface owner, if applicable, to participate in the onsite inspection. If the surface is privately owned, the operator must furnish to the BLM the name, address, and telephone number of the surface owner if known. All parties who attend the onsite inspection will jointly develop a list of resource concerns that the operator must address in the APD. The operator will be provided a list of these concerns either during the onsite inspection or within 7 days of the onsite inspection. D. Components of a Complete APD Package. 7. Onsite Inspection. The onsite inspection must be conducted before the APD will be considered complete.	Required	---
1 - Planning							Section 4 Planning - 4.1 Interactive Communications and Planning page 5	4.1.1 Communications Between Operator and Surface Owner or Tenant: The site inspection should include a discussion with the land owner or tenant regarding the existence of such items as underground pipelines, buried utilities (electrical or telephone cables or sewer or water lines), old mine shafts, archaeological sites, cemeteries, areas of potential flooding, known endangered animals or plants, or the presence of wetlands that can impact planning and site construction. Special requirements by the surface owner or tenant should be reviewed and considered for incorporation into the drilling plan.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). C. Notice of Staking Option. Page 10330.	OO#1: C. Notice of Staking Option. On non-NFS lands, the BLM will invite the Surface Managing Agency and private surface owner, if applicable, to participate in the onsite inspection. If the surface is privately owned, the operator must furnish to the BLM the name, address, and telephone number of the surface owner if known. All parties who attend the onsite inspection will jointly develop a list of resource concerns that the operator must address in the APD. The operator will be provided a list of these concerns either during the onsite inspection or within 7 days of the onsite inspection.	Required	---
1 - Planning			1.4	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as erosion prone areas and steep slopes.	Minimize construction on areas with highly erosive soils/slopes.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-5 - A-6	A.3 Soil, Erosion, and Sediment Control: Projects requiring soil interpretations include: construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads and associated disturbances; and reclamation projects.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands. The operator also must take measures to minimize or prevent erosion and sediment production. Such measures may include, but are not limited to: • Avoiding steep slopes and excessive land clearing when siting structures, facilities, and other improvements; and • Temporarily suspending operations when frozen ground, thawing, or other weather-related conditions would cause otherwise avoidable or excessive impacts.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.1 General Requirements: Unnecessary topographic alterations will be mitigated by avoiding, where possible, steep slopes, rugged topography, and perennial and ephemeral/intermittent drainages, and by minimizing the area disturbed. Alternative methods of construction in order to minimize environmental impacts may also be used.				Required	SUP
1 - Planning			1.5	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as when shallow groundwater is close to the surface and permeability is high.	Consider modification of design on site-specific basis to address wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues or implement other Best Management Practices as appropriate.	API RP 52	Section 4 Planning - 4.2 Site Assessment and Construction Planning page 6	The drilling site and rights-of-way should be selected to minimize environmental impacts while allowing economical attainment of the geological objectives. An early visit to the site may make the planning process more efficient and identify areas of concern. The following (4.2.1 to 4.2.18) represent some of the criteria that may be considered as part of the site assessment, selection. 4.2.6 Groundwater The location and usability of all aquifers should be determined so that positive protective measures may be taken. Excavations such as the conductor, rathole, mousehole, cellar, and the reserve pit may require special planning.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). C. Notice of Staking Option. Page 10330. OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit To Drill (APD). D. Components of a Complete APD Package. Page 10331.	OO#1: C. Notice of Staking Option. On non-NFS lands, the BLM will invite the Surface Managing Agency and private surface owner, if applicable, to participate in the onsite inspection. If the surface is privately owned, the operator must furnish to the BLM the name, address, and telephone number of the surface owner if known. All parties who attend the onsite inspection will jointly develop a list of resource concerns that the operator must address in the APD. The operator will be provided a list of these concerns either during the onsite inspection or within 7 days of the onsite inspection. 4. Surface Use Plan of Operations The Surface Use Plan of Operations must: Provide for safe operations, adequate protection of surface resources, groundwater, and other environmental components.	Required	SUP

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1 - Planning	Siting / Surface Use	General	1.5	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as when shallow groundwater is close to the surface and permeability is high.	Consider modification of design on site-specific basis to address wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues or implement other Best Management Practices as appropriate.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Floodplains: Therefore, federally-managed 100-year floodplains will have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where floodplain construction is approved, additional constraints could be applied.	24 CFR 55: Floodplain Management and Protection of Wetlands	24 CFR 55 - Floodplain Management and Protection of Wetlands	24 CFR 55.20: Decision making process. (g) Step 7. (1) If the reevaluation results in a determination that there is no practicable alternative to locating the proposal in the 100-year floodplain (or the 500-year floodplain for a Critical Action) or the wetland, (<i>the Responsible entity will</i>) publish a final notice that includes: (i) The reasons why the proposal must be located in the floodplain or wetland; (ii) A list of the alternatives considered in accordance with paragraphs(c)(1) and (c)(2) of this section; and (iii) All mitigation measures to be taken to minimize adverse impacts and to restore and preserve natural and beneficial functions and values.	Required	SUP
1 - Planning						API 51R	Section 8 Production and Water Handling Facilities - 8.2 Site Selection Considerations page 24	8.2.1 Land Use: Topographic, population, environmental hazard, zoning, and other maps should be consulted, where applicable, to locate sensitive or high exposure areas [such as churches, schools, hospitals, residential areas, surface waters, freshwater wells, flood zones, active fault areas, threatened and endangered plants and animals (including habitat), migratory bird habitat, wetlands, archeological, recreational, biological, or scenic areas]. Where feasible, the site should be located away from these sensitive areas. The potential impact from upset conditions, such as oil or produced water spills and leaks, should be considered.		Voluntary	SUP		
1 - Planning	Siting / Surface Use	General	1.6	Conduct pre-application review and site walk to identify wetlands, riparian areas, floodplains, other sensitive areas, and critical location issues such as surface waters, riparian areas, wetlands, or floodplains.	Minimize disturbance of wetlands, riparian areas, floodplains, and other sensitive areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Flood Plains: All surface disturbance, permanent facilities, etc., shall remain a minimum of 500 feet away from the edge of surface waters, riparian areas, wetlands, and 100-year floodplains unless it is determined through site specific analysis, approved in writing by the BLM AO, that there is no practicable alternative to the proposed action. A.8 Wetlands, Riparian Areas, and Flood Plains: If such a circumstance exists, then all practicable measures to mitigate possible harm to these areas must be employed. These mitigating measures will be determined case by case and may include, but are not limited to, diking, lining, screening, mulching, terracing, and diversions.	Executive Order 11990 - Protection of Wetlands (Note: BLM 500-foot buffer policy established to comply with EO 11990, per ROD DEIS)	EO 11990 - Protection of Wetlands	EO 11990: ...in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Section 2(a).shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.	Required	SUP
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: On producing locations, Operators will be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes will be backfilled and blended into the surrounding terrain, reseeded, and erosion control measures installed. Erosion control measures will be required after slope reduction. Facilities will be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.		Required	SUP		
1 - Planning	Operations and Maintenance	Fluids Storage and Handling	1.7	Plan to conduct routine inspections as required for integrity of spill prevention features and countermeasures equipment.	Actively manage activities to minimize potential for impacts from leaks or spills.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.2 Well Operations page 15	6.2.1 Equipment Operation and Maintenance: Drip pans should be provided under equipment and storage containers potentially subject to minor leaks. These drip pans should be monitored on a routine basis to recover and recycle or dispose of accumulated oil and other liquids.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b),The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank, will not escape the containment system before cleanup occurs. At a minimum, you must use one of the following prevention systems or its equivalent: (1) For onshore facilities: (i) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (ii) Curbing or drip pans; (iii) Sumps and collection systems; (iv) Culverting, gutters, or other drainage systems; (v) Weirs, booms, or other barriers; (vi) Spill diversion ponds; (vii) Retention ponds; or (viii) Sorbent materials.	Voluntary	SPCC Plan

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1 - Planning	Operations and Maintenance	Fluids Storage and Handling	1.7	Plan to conduct routine inspections as required for integrity of spill prevention features and countermeasures equipment.	Actively manage activities to minimize potential for impacts from leaks or spills.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.2 Well Operations page 15	6.2.2 Metallurgy and Corrosion: Equipment operating in known corrosive conditions should be inspected on a routine basis for signs of corrosion, with corrective action taken, as needed, to assure the equipment continues to operate in an environmentally acceptable manner.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (e) Inspections, tests, and records. Conduct inspections and tests required by this part in accordance with written procedures that you or the certifying engineer develop for the facility. You must keep these written procedures and a record of the inspections and tests, signed by the appropriate supervisor or inspector, with the SPCC Plan for a period of three years. Records of inspections and tests kept under usual and customary business practices will suffice for purposes of this paragraph.	Required	SPCC Plan
1 - Planning							Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (a)(3) Routinely scheduled tests and inspections of lines, vessels, dump valves, hoses, and other pollution prevention equipment where failure(s) and/or malfunction(s) could result in a potential spill incident. These tests and inspections should be commensurate with the complexity, conditions, and circumstances of the facility.				Required	SPCC Plan
1 - Planning		Stormwater	1.8	Plan to conduct routine inspections for integrity of control features.	Actively manage activities to minimize potential for impacts from stormwater runoff/sediment loss.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 14	6.1.7 Stormwater Runoff: Construction designs should include installation of erosion and sedimentation control systems. Site construction should be inspected routinely and after each significant storm event.			Required	SWPPP/ DEQ	
1 - Planning		Fluids Storage and Handling	1.9	Plan to conduct spill response drills in PAPA as applicable.	Actively plan and prepare for spill response.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 37	8.7.4 Spill Contingency Plan: In the event a spill occurs, it is extremely important for all responsible operating personnel to know how to respond quickly and effectively to control, contain, and clean up the spill. To ensure this capacity exists, a contingency plan should be prepared for inland areas as well as for areas near water. The plans should provide utilization of capabilities of oil spill cooperatives, whenever advantageous.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (f) Personnel, training, and discharge prevention procedures. (3) Schedule and conduct discharge prevention briefings for your oil-handling personnel at least once a year to assure adequate understanding of the SPCC Plan for that facility. Such briefings must highlight and describe known discharges as described in §112.1(b) or failures, malfunctioning components, and any recently developed precautionary measures.	Voluntary	SPCC Plan
1 - Planning							1.10	Plan to conduct training of first responders and/or designated spill team members.				ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-16
1 - Planning	Siting / Surface Use	General	1.11	Coordinate disturbance of wetlands, riparian areas, floodplains, and other sensitive areas with the COE and secure 404 permits.	Minimize disturbance of wetlands, riparian areas, floodplains, and other sensitive areas.	BLM Gold Book	Chapter 4 Construction and Maintenance - Drainage and Drainage Structures page 35	Wetlands are especially sensitive areas and should be avoided, if possible. Generally, these areas require crossings that prevent unnatural fluctuations in water level. Marshy and swampy terrain may contain bodies of water with no discernible current. The design of culverts for roads crossing these locations requires unique considerations. Construction of some wetland crossings may require a Section 404 Corps of Engineers permit in addition to the approval of the surface management agency.	43 CFR 3160 - Onshore Order #1 COE: 33 CFR 320: General Regulatory Policies 33 CFR 323: Permits for Discharges of Dredged or Fill Material into Waters of the United States	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: Except as otherwise provided in an approved Surface Use Plan of Operations, the operator must not conduct operations in areas subject to mass soil movement, riparian areas, floodplains, lakeshores, and/or wetlands.	Required	---
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-12	A.8 Wetlands, Riparian Areas, and Floodplains: Operators will evaluate all project facility sites for occurrence of waters of the U.S., special aquatic sites, and wetlands, per COE requirements. All project activities will be located outside of these sensitive areas, where practical.	EPA: 40 CFR 230: Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	Required	SUP		
1 - Planning						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-4	A.8 Wetlands, Riparian Areas, and Floodplains: Any disturbances to wetlands and/or waters of the U.S. will be coordinated with the COE, and 404 permits will be secured as necessary prior to disturbance.		Required	SUP		
1 - Planning	Erosion and Sediment Loss	1.12	Design pads with erosion control features which minimize/contain runoff.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-4	A.3 Soil, Erosion, and Sediment Control: Prudent use of erosion control measures, including diversion terraces, riprap, matting, temporary sediment traps, and water bars, will be employed as necessary. These erosion control measures will be used as appropriate to control surface runoff generated at well locations. The type and location of sediment control structure, including construction methods, will be described in APD and ROW plans.				Required	SUP	
1 - Planning						Appendix A BLM's Practices and Restrictions for the PAPA page A-5	A.3 Soil, Erosion, and Sediment Control: Best Management Practices (BMP's) will be required to control sediment from all construction sites. Because of concerns regarding potential sediment impacts to the New Fork and Green rivers, BLM will require Operators to provide more detailed plans, with their APD and/or right-of-way application, for erosion control, revegetation, and restoration on sites within 1 mile of the Green and New Fork rivers. These plans will be required prior to initiating any construction activities.			Required	SUP		

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1 - Planning		Erosion and Sediment Loss	1.12	Design pads with erosion control features which minimize/contain runoff.	Consider modification of design on site-specific basis to address sensitive/critical area issues or implement other Best Management Practices as appropriate.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 14	6.1.7 Stormwater Runoff: Natural drainage patterns of the area should be considered in the location of equipment, pads, and pits so that stormwater runoff does not create an environmental hazard by erosion of base material, which could lead to equipment instability, or by flooding of pits, which could cause a discharge of oil or other fluids into the local surface waters.				Voluntary	---
1 - Planning							Section 8 Production and Water Handling Facilities - 8.2 Site Selection Considerations page 24	8.2.2 Erosion and Drainage: A site should be selected that minimizes the amount of surface terrain alteration to reduce environmental and aesthetic damages. Cuts and fills which pose possible landslide or slump problems should be avoided. Consideration should be given to stock piling topsoil, if feasible. The natural drainage patterns of the land should be considered in selecting the site. Adequate culverts and drainage ditches should be provided, as required by the terrain. Soil stabilization, such as sod or grass seeding, should be provided to prevent erosion. Unnecessary removal of trees or alteration of other natural features should be avoided.			Voluntary	---	
1 - Planning							Section 4 Planning - 4.2 Site Assessment and Construction Planning page 6	4.2.4 Soil: Areas that will support equipment and traffic with the least alteration should be used. Hydric soils (wetlands) and areas of instability or potential erosion should be avoided. Plans should be made to stockpile topsoil for site reclamation whenever possible. The type of soil, bedrock, and groundwater depth can have a profound effect on the waste handling plan.			Voluntary	---	
1 - Planning	Siting / Surface Use	Wells, Well Pads, and Pits	1.13	Design pits with appropriate liner materials.	Minimize impact to wetlands, riparian areas, floodplains, and other sensitive areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: Reserve pits will not be located in areas where groundwater is less than 50 feet from the surface. A closed system will be required if water shows in the rat or mouse hole.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7	WOGCC: (u) Location. In areas where ground water is less than twenty feet (20') below the surface, a closed system must be utilized for well drilling operations.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Due to the location of the PAPA within the Colorado River Basin, all reserve pits must be lined. Reserve pit liners must have a mullen burst strength that is equal to or exceeds 300 pounds, a puncture strength that is equal to or exceeds 160 pounds, and grab tensile strengths that are equal to or exceeds 150 pounds. There will be verified test results conducted according to ASTM test standards. The liner must be totally resistant to deterioration by hydrocarbons.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7	WOGCC: (w) Construction. (ii) Liners constructed of synthetic materials must meet the following specifications: a 9 to 12 mil thickness, greater than 20% elongation at failure, puncture strength of 60 pounds, tear strength of 50 pounds, and permeability less than 10 ⁻⁷ cm/sec. Joints must be overlapped a minimum of 2 inches and seams sealed as recommended by the manufacturer.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt, or bentonite is suggested.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-8	WOGCC: (w) Construction. (v) Manufactured liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt or bentonite are suggested.	Required	SUP
1 - Planning							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Reserve pit slope will not exceed 1:1.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7	WOGCC: (w) Construction. (iii) Slopes for manufactured liners shall not exceed 1:1.	Required	SUP

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1 - Planning	Operations and Maintenance	Fluids Storage and Handling	1.14	Design storage systems to prevent spills.	Actively manage activities to minimize potential for impacts from leaks or spills.	API 51R	Section 8 Production and Water Handling Facilities - 8.3 Facility Design page 29	8.3.1 Equipment Sizing, Specifications, and Design: Consideration should be given to the following items in designing and constructing production facilities. I) Safety systems for protecting the environment should be considered as follows. 1) Installation of safety equipment and systems should be considered, i.e. emergency shutdown (ESD) systems which have the ability to shut wells in, shut down compressors or other engines, or divert production during malfunctions or accidental releases. Where appropriate, alarm systems should be installed to notify the public or company officials of equipment failure or accidental releases.				Required	---	
1 - Planning	Operations and Maintenance	Waste Management	1.15	Plan to implement waste minimization and proper waste management and handling practices in accordance with state and federal regulations.	Reduce amount of wastes generated, stored, and disposed within PAPA.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 12	6.1.1 Planning: For both new and existing well sites, a waste management plan for handling and storing all waste materials generated during completion and workover activities should be developed. The waste management plan should address the specific wastes which are expected to be produced by the particular operations being performed, as well as provide guidelines concerning the actions to be taken in the event that unexpected waste materials, including hazardous materials, are encountered during the operations. In addition to safe handling and storage of waste materials on the well site, provisions should also be made for each type of waste to be disposed of.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD); D. Components of a Complete APD Package; 4. Surface Use Plan of Operations. Page 10332.	OO#1: g. Methods for Handling Waste: The Surface Use Plan of Operations must contain a written description of the methods and locations proposed for safe containment and disposal of each type of waste material (e.g., cuttings, garbage, salts, chemicals, sewage, etc.) that results from drilling the proposed well. The narrative must include plans for the eventual disposal of drilling fluids and any produced oil or water recovered during testing operations.	Required	SUP	
1 - Planning							Section 8 Production and Water Handling Facilities - 8.4 Construction Considerations page 32	8.4.7 Site Cleanup: Unused and excess construction materials should be properly stored or removed from the site upon completion. During construction, the site should be kept as clean and free of debris as possible. Where feasible, unused material should be removed from the construction site as it is determined to be surplus. Where applicable, construction waste should be recycled.			Required	SUP		
1 - Planning							Section 8 Production and Water Handling Facilities - 8.5 Operation and Maintenance page 33	8.5.5 Housekeeping: a) The facilities should be kept clean, maintained, and operated in a safe and environmentally sound manner.			Voluntary	SUP		
1 - Planning							Section 8 Production and Water Handling Facilities - 8.6 Waste and Residual Management page 34	8.6.1 General: A waste or residual management plan should utilize one or all of the options listed below, in order of preference, to protect human health and the environment. a) Source Reduction—Minimize or eliminate the volume and/or toxicity of the waste generated. b) Recycling—Reclaim or reuse the maximum amount of waste possible. c) Treatment—Utilize techniques to minimize the amount and the toxicity of waste after it is generated, thereby minimizing the amount that has to be disposed. d) Disposal—Employ environmentally sound and approved methods to properly dispose of generated wastes.			Required	SUP		
1 - Planning							Section 4 Planning - 4.3 Drilling Fluids and Solids Control Planning page 7	In planning the drilling fluid system, consideration should be given to pit design, solids removal equipment, and drilling fluid additives with the goal of minimizing and managing waste volumes and the use of toxic additives, taking into account the economic considerations that are involved.			Required	SUP		
1 - Planning							Section 4 Planning - 4.5 Waste Management Planning page 8	Waste lubricants, solvents, used oil filters, rig refuse, batteries, and other wastes from drilling and completion operations may be classified as hazardous waste and require special manifesting, collection, recycling, and disposal practices. The list of approved waste sites and handlers should be determined.			Required	SUP		
1 - Planning	Siting / Surface Use	Pipelines and Roads	1.16	Plan and design drainage culverts to be installed at appropriate locations.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.6 Pipelines: Streams/channels crossed by roads will have culverts installed at all appropriate locations as specified in the BLM Manual 9112-Bridges and Major Culverts (BLM 1990) and Manual 9113-Roads (BLM 1985).	BLM manual 9112 - Bridges and Culverts (Note: not available via BLM website) BLM Handbook 9113-1 - Road Design	BLM H-9113-1 - 12 Design Guidelines, Section H. Drainage Elements. Pages 11 - 12.	BLM H-9113-1: 2. Drainage Culverts. e. Culverts carrying runoff from one side of the road to the other between natural drainages are spaced as shown in Illustration 10 – Spacing for Drainage Laterals, unless local experience dictates otherwise.	Required	SUP	
1 - Planning			1.17	Plan and design pipeline installation in central corridors.		BLM Gold Book	Chapter 4 Construction and Maintenance - Pipelines and Flowlines page 36	Construction: Flowline routes should take advantage of road corridors wherever possible to minimize surface disturbance and provide better leak detection and access for installation and repair operations.					Required	SUP
1 - Planning			1.18	Plan and design pipelines to be installed across wetlands during dry conditions.		ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-9	A.6 Pipelines: Wetland areas will be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities will occur only prior to soil freezing or after soils have thawed.						Required

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1 - Planning	Operations and Maintenance	Fluids Storage and Handling	1.19	Maintain complete copy of SPCC Plans	Actively manage activities to minimize potential for impacts from leaks or spills.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-15	A.14 Hazardous Waste Disposal: Owners or operators of a facility for which an SPCC Plan is required shall maintain a complete copy of the Plan at such facility if the facility is normally attended at least 8 hours per day, or at the nearest field office if the facility is not so attended (40 CFR 112.3 (e)).	40 CFR 112: Oil Pollution Prevention	40 CFR 112.3 - Requirement to prepare and implement a Spill Prevention, Control, and Countermeasure Plan.	40 CFR 112.3: (e) If you are the owner or operator of a facility for which a Plan is required under this section, you must: (1) Maintain a complete copy of the Plan at the facility if the facility is normally attended at least four hours per day, or at the nearest field office if the facility is not so attended, and (2) Have the Plan available to the Regional Administrator for on-site review during normal working hours. NOTE: The federal regulation minimum time limit has been amended from eight hours per day to 'four hours per day' subsequent to the ROD FSEIS publication.	Required	SUP / SPCC Plan
1.20			Prepare and maintain up to date Spill Prevention Control and Countermeasure (SPCC) Plans for all applicable locations.	A.14 Hazardous Waste Disposal: Owners or operators of onshore facilities (any facility of any kind, or drilling or workover rigs) due to their location, could reasonably be expected to discharge oil in harmful quantities (as defined in 40 CFR part 110 & 112.3), into or upon navigable waters of the United States or adjoining shorelines, shall prepare a Spill Prevention Control and Countermeasure Plan (SPCC Plan) in accordance with 40 CFR 112.7. Owners or operators of drilling or workover rigs need not prepare a new SPCC Plan each time the facility is moved to a new site. The SPCC Plan may be a general plan, using good engineering practice (40 CFR 112.3 (a), (b), and (c)).				40 CFR 112.1 - General applicability. 40 CFR 112.7 - General requirements for Spill Prevention, Control, and Countermeasure Plans.		40 CFR 112.1: (b) Except as provided in paragraph (d) of this section, this part applies to any owner or operator of a non-transportation-related onshore or offshore facility engaged in drilling, producing, gathering, storing, processing, refining, transferring, distributing, using, or consuming oil and oil products, which due to its location, could reasonably be expected to discharge oil in quantities that may be harmful, as described in part 110 of this chapter, into or upon the navigable waters of the United States or adjoining shorelines, or into or upon the waters of the contiguous zone,...	40 CFR 112.7: If you are the owner or operator of a facility subject to this part you must prepare a Plan in accordance with good engineering practices. The Plan must have the full approval of management at a level of authority to commit the necessary resources to fully implement the Plan. You must prepare the Plan in writing.	Required	SPCC Plan
1.21		Stage spill response equipment per plan specifications as applicable.	Actively plan and prepare for spill response.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 38	8.7.5 Control and Containment: the contingency plan should list where (spill) emergency equipment is located.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 General requirements for Spill Prevention, Control, and Countermeasure Plans	40 CFR 112.7: (a)(3)...You must also address in your Plan: (iv) Countermeasures for discharge discovery, response, and cleanup (both the facility's capability and those that might be required of a contractor); (d)...provide in your Plan the following: (2) A written commitment of manpower, equipment, and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful.	Required	SUP / SPCC Plan		
1.22		Prepare and maintain up to date Stormwater Pollution Prevention Plans (SWPPP) for all applicable locations.	Actively manage activities to minimize potential for impacts from stormwater runoff/sediment loss.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-13	A.12 Groundwater and Surface Water: Operators will prepare Stormwater Pollution Prevention Plans (SWPPPs) for their respective areas of field development as required by WDEQ National Pollution Discharge Eliminations System (NPDES) permit requirements.	WDEQ Rule: Water Quality, Chapter 2	WDEQ - Chapter 2 Permit Regulations for Discharges to Wyoming Surface Waters, Section 6. Storm Water Discharges. (k) Qualifying programs. Page 2-72.	WDEQ: (i) For storm water discharges associated with small construction activity identified in Section 6 (f) (ii) (A), the administrator may include permit conditions that incorporate qualifying state or local erosion and sediment control program requirements by reference. A qualifying state or local erosion and sediment control program is one that includes: (C) Requirements for construction site operators to develop and implement a storm water pollution prevention plan. (A storm water pollution prevention plan includes site descriptions, descriptions of appropriate control measures, copies of approved local requirements, maintenance procedures, inspection procedures, and identification of non-storm water discharges)	Required	SWPPP		
1.23		Restrict road and utility line construction at river crossings to normal flow conditions.	Minimize/avoid surface disturbance and impacts to wetlands, riparian areas, floodplains, and other sensitive areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.6 Pipelines: Crossings of ephemeral, intermittent, and perennial streams associated with road and utility line construction will generally be restricted until after spring runoff and normal flows are established.					Required	SUP	

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1 - Planning	Siting / Surface Use	Pipelines and Roads	1.24	Work with gas gathering companies to ensure safe practices such as the use of block valves at river crossings and monitoring of line pressure via SCADA. Should an anomaly be detected in the line pressure, field staff would be deployed to manually close block valves.	Minimize/avoid surface disturbance and impacts to riparian habitats.	API 51R	Section 7 Lease Gathering and System Lines - 7.1 Introduction page 19 Section 7 Lease Gathering and System Lines - 7.3 Design pages 20-21	7.1 Introduction: In planning lease gathering and system lines, including electrical distribution systems, it is important to consider the impact that construction operations and maintenance activities will have on people, animals, plants, and the land itself, both surface and shallow subsurface. The impact on current use, as well as possible future uses, should be evaluated along with potential future facilities expansion. Because pipelines can be buried, and the surface reclaimed, long-term surface disturbance associated with pipelines can be avoided. The placement of pipelines should avoid steep hillsides and watercourses where feasible. Also, where feasible, pipeline routes should take advantage of road corridors to minimize surface disturbance. 7.3 Design: 7.3.2 Lease gathering and system line design should consider the following. e) Consequences of possible line failure. Release of oil, water, or gas should be qualitatively evaluated. Consideration should be given to installing block valves to isolate line segments located in or near environmentally sensitive areas (such as wetlands), on either side of stream crossings, and in close proximity to areas occupied by the public. Consideration should also be given to sleeving lines or using heavier walled pipe in these areas.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD); D. Components of a Complete APD Package; 4. Surface Use Plan of Operations. Page 10332.	OO#1: b. New or Reconstructed Access Roads: The operator must identify on a map all permanent and temporary access roads that it plans to construct or reconstruct in connection with the drilling of the proposed well. Locations of all existing and proposed road structures (culverts, bridges, low water crossings, etc.) must be shown. The proposed route to the proposed drill site must be shown, including distances from the point where the access route exits established roads. All permanent and temporary access roads must be located and designed to meet the applicable standards of the appropriate Surface Managing Agency, and be consistent with the needs of the operator. The operator should consider using Best Management Practices in designing and constructing roads.	Required	---
1 - Planning		Erosion and Sediment Loss	1.25	Where practicable, avoid surface disturbances on slopes steeper than 25%.	Minimize or avoid construction on areas with highly erosive soils/slopes.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-5	A.3 Soil, Erosion, and Sediment Control: Critical erosion condition areas will continue to be identified during soil surveys, monitoring, site specific project analysis, and activity plan development for the purpose of avoidance and special management.				Required	SUP
1 - Planning					Minimize surface disturbance.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.1 General Requirements: No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans will be required in these areas.					Required
1 - Planning		Wells, Well Pads, and Pits	1.25	Where practicable, avoid surface disturbances on slopes steeper than 25%.	Reduce footprint and surface disturbance (i.e., fewer pads/roads).	API RP 52	Section 4 Planning - 4.2 Site Assessment and Construction Planning page 6	4.2.2 Size: The disturbed area should be minimized to the extent possible while still providing an adequate work area for all operations. Flexibility in site shape and size may be necessary in environmentally sensitive areas.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section IV General Operating Requirements. c. Surface Protection. Page 10335.	OO#1: The operator must conduct operations to minimize adverse effects to surface and subsurface resources, prevent unnecessary surface disturbance, and conform with currently available technology and practice.	Required	---
2 - Construction	Construction and Operations of Water Wells	Water Supply Wells	2.1	Conduct baseline water quality sampling.	Provide basis for continued water quality.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.				Required	---
2 - Construction						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-14	A.12 Groundwater and Surface Water: All fresh water used for the drilling of the surface casing must comply with all requirements concerning water quality as set forth by the WOGCC Regulations.			Required	---	
2 - Construction						API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.			Required	---	
2 - Construction	Construct Pads	Sediments, petroleum hydrocarbons	2.3	Construct berms/diversion ditches to direct potential stormwater run-on around pads. Repair headcuts that affect groundwater.	Reduce erosion and sedimentation.	BLM Gold Book	Chapter 4 Construction and Maintenance - Construction page 16	Construction: To reduce erosion and soil loss, it may be appropriate to divert storm water away from the well location with ditches, berms, or waterbars above the cut slopes and to trap well location runoff and sediments on or near the location through the use of sediment fences or water retention ponds.				Required	---
2 - Construction						API RP 52	Section 4 Planning - 4.4 Water Management Planning page 8	4.4.2 Storm Water: The immediate area around the rig structure can be isolated by a berm from the rest of the location. The location perimeter may need to be ditched and/or bermed to prevent rain draining onto the location.			Voluntary	---	
2 - Construction	Pipelines	Surface water runoff, sediments, release of produced fluids	2.4	Construct crossing/install bore only during dry conditions.	Minimize impacts to environments.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-9	A.6 Pipelines: Wetland areas will be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities will occur only prior to soil freezing or after soils have thawed.				Required	---

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2 - Construction	Construct Access Roads	Sediments	2.5	Construct diversion ditches on top of slope to manage/reroute stormwater runoff.	Control and reduce sediment discharge from roads.	BLM Gold Book	Chapter 4 Construction and Maintenance - Road Design and Construction page 25	Page 25: Drainage control must be ensured over the entire road through the use of drainage dips, insloping, natural rolling topography, ditch turnouts, ditches, or culverts.	BLM Handbook 9113-1 - Road Design			Required	---			
2 - Construction			2.6	Crown roads, add gravel as necessary. Repair headcuts that affect groundwater.		ROD FSEIS	ROD FSEIS Appendix A BLM's Practices and Restrictions for the PAPA page A-7	ROD FSEIS: A.4 Roads Main artery roads, regardless of primary user, will be crowned, ditched, drained, and, if deemed appropriate by the BLM AO, surfaced with gravel to reduce sediment, salt, and phosphate loading to the Green and/or New Fork Rivers.				BLM Handbook 9113-1 - Road Design			Required	SUP/ COAs/ Road Engineering Plan
2 - Construction			2.7	Implement dust abatement measures during construction (e.g., water construction areas).		RMP	RMP Appendix 3 Mitigation Guidelines and Operating Standards Applied to Surface Disturbing and Disruptive Activities page A3-7	RMP: Mitigations: Roads and Transportation - If necessary, roads will be treated to suppress dust. Treatment could include gravel, mag-water, or in rare cases, paving of roads.							API RP 52	API RP 52 Section 4 Planning - 4.2 Site Assessment and Construction Planning page 7
2 - Construction	Construction and Operations of Water Wells	Water Supply Wells	2.8	Include siphon breaks (air gap) between discharge line and tank in accordance with state and federal regulations.	Prevent backflow of lower-quality water into freshwater zone.	RMP	Appendix 3 Mitigation Guidelines and Operating Standards Applied to Surface Disturbing and Disruptive Activities page A3-19	Mitigation - Watershed and Water: All water wells must be constructed and operated according to all requirements of the Wyoming State Engineer's Office and shall be equipped with measures and equipment to prevent backflow and /or siphoning into the well.	WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 3: Water Well Equipping. Page 3-10.	WSEO: (f) For irrigation wells with in-line chemical injection systems or for other wells that are cross-connected with potential contaminant sources or water source(s) of lesser quality, a backflow prevention device (reduced pressure assembly, single/double check valve, etc., with vacuum relief) shall be installed to protect the wellhead from backpressure or back siphonage.	Required	---			
2 - Construction			2.9	Install backflow prevention (double check valve).		RMP	Appendix 3 Mitigation Guidelines and Operating Standards Applied to Surface Disturbing and Disruptive Activities page A3-19	Mitigation - Watershed and Water: All water wells must be constructed and operated according to all requirements of the Wyoming State Engineer's Office and shall be equipped with measures and equipment to prevent backflow and /or siphoning into the well.				WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 3: Water Well Equipping. Page 3-10.	WSEO: (f) For irrigation wells with in-line chemical injection systems or for other wells that are cross-connected with potential contaminant sources or water source(s) of lesser quality, a backflow prevention device (reduced pressure assembly, single/double check valve, etc., with vacuum relief) shall be installed to protect the wellhead from backpressure or back siphonage.	Required	---
2 - Construction			2.10	Install locked metal well caps.		RMP	Appendix 3 Mitigation Guidelines and Operating Standards Applied to Surface Disturbing and Disruptive Activities page A3-19	Mitigation - Watershed and Water: All water wells must be constructed and operated according to all requirements of the Wyoming State Engineer's Office and shall be equipped with measures and equipment to prevent backflow and /or siphoning into the well.				WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 3: Water Well Equipping. Page 3-9.	WSEO: (a) All new and old wells (including hand-dug) shall be capped or sealed so that they do not present a hazard and to prevent the unintended entry of contaminant matter, surface water, animals, or foreign objects, by utilizing either a welded plate or a sanitary well cap.	Required	---
2 - Construction	Construct Access Roads	Sediments	2.11	Install check dams, gravel bars, rip-rap, and/or waddles to capture/reduce sediment loss.	Control and reduce sediment discharge from roads.	BLM Gold Book	Chapter 4 Construction and Maintenance - Road Design and Construction page 25	Page 25: Drainage control must be ensured over the entire road through the use of drainage dips, insloping, natural rolling topography, ditch turnouts, ditches, or culverts.	BLM Handbook 9113-1 - Road Design			Required	---			

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2 - Construction	Construct Access Roads	Sediments	2.12	Install culverts at streams/channels crossed by roads.	Control and reduce sediment discharge from roads.	ROD FSEIS	ROD FSEIS Appendix A BLM's Practices and Restrictions for the PAPA page A-7	ROD FSEIS: A.4 Roads: New main artery roads will be designed to reduce sediment, salt, and phosphate loading to the Green and New Fork rivers.	BLM manual 9112 - Bridges and Culverts (Note: not available via BLM website) BLM Handbook 9113-1 - Road Design	BLM H-9113-1 - .12 Design Guidelines, Section H. Drainage Elements. Pages 11 - 12.	BLM H-9113-1: 2. Drainage Culverts. e. Culverts carrying runoff from one side of the road to the other between natural drainages are spaced as shown in Illustration 10 – Spacing for Drainage Laterals, unless local experience dictates otherwise.	Required	---
2 - Construction						BLM Gold Book	Chapter 4 Construction and Maintenance - Drainage and Drainage Structures page 32	BLM Gold Book: Culverts: Culverts are used in two applications: in streams and gullies to allow normal drainage to flow under the travelway and to drain inside road ditches. It may be necessary to install rip-rap or other energy dissipation devices at the outlet end of the culvert to prevent soil erosion				Required	---
2 - Construction						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-9	A.6 Pipelines: Streams/channels crossed by roads will have culverts installed at all appropriate locations as specified in the BLM Manual 9112-Bridges and Major Culverts (BLM 1990) and Manual 9113-Roads (BLM 1985).				Required	SUP
2 - Construction	Construct Pits	Release of Pit Fluids	2.13	Install high-density polyethylene (HDPE) liners in reserve pits.	Reduce risk of release of pit fluids to subsurface.	BLM Gold Book	Chapter 4 Construction and Maintenance - Reserve Pits page 17	To prevent contamination of ground water and soils...., it is recommended that operators use a closed-loop drilling system or line reserve pits with an impermeable liner.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-1, 4-7 and 4-8.	WOGCC: (a) These rules are intended to protect human health and the environment by avoiding contamination of the soils and underground and surface waters at drilling or producing locations. Applications to construct pits, provided for in these rules, shall be approved if the pit will not cause the contamination of surface or underground water, and endanger human health or wildlife. Approval by the Commission of applications for permits for reserve or produced water pits does not relieve the Owner or Operator of the obligation to comply with the applicable federal, local, or other state permits or regulatory requirements. (w) Construction. Lining of pits with reinforced oilfield grade material, compatible with the waste to be received, will be required by the Supervisor or Commission under certain circumstances including, but not limited to, pits proposed to be constructed in areas defined as critical as well as on sites with sandy soils, shallow groundwater, in groundwater recharge areas, or sites immediately adjacent to the Green River or the Colorado River drainage and other sensitive environments or circumstances identified by the Commission. (w)(vii) Monitoring systems may be required for pits constructed in sensitive areas. Such pits must be operated in a manner that avoids damage to liner integrity. Periodic inspections, weekly at a minimum, of pits must be made by the Owner or Operator and documentation of such inspections may be required to be submitted to the Supervisor at his request.	Required	SUP
2 - Construction						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Due to the location of the PAPA within the Colorado River Basin, all reserve pits must be lined. Reserve pit liners must have a mullen burst strength that is equal to or exceeds 300 pounds, a puncture strength that is equal to or exceeds 160 pounds, and grab tensile strengths that are equal to or exceeds 150 pounds. There will be verified test results conducted according to ASTM test standards. The liner must be totally resistant to deterioration by hydrocarbons.				Required	SUP
2 - Construction	Construct Pits	Release of Pit Fluids	2.14	Install pits with appropriate liner materials.	Reduce risk of release of pit fluids to subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt, or bentonite is suggested.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-8.	WOGCC: (w) Construction. (v) Manufactured liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt or bentonite are suggested.	Required	SUP
2 - Construction							Appendix A BLM's Practices and Restrictions for the PAPA page A-2	A.2 Project Siting and Operation: Reserve pit slope will not exceed 1:1.		WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7.	WOGCC: (w) Construction. (iii) Slopes for manufactured liners shall not exceed 1:1.	Required	SUP
2 - Construction	Pipelines	Surface water runoff, sediments, release of produced fluids	2.15	Install pipelines across wetlands during dry conditions	Minimize impacts to riparian environments.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-9	A.6 Pipelines: Wetland areas will be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities will occur only prior to soil freezing or after soils have thawed.				Required	---
2 - Construction			2.16	Install spill containment structures at pig receiver stations.	Minimize risk of operational spills.							Required	ROW Grant

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2 - Construction	Pipelines	Surface water runoff, sediments, release of produced fluids	2.17	Keep soil intact during pipeline construction.	Minimize impacts to riparian environments.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-5	A.3 Soil, Erosion, and Sediment Control: Operators will avoid adverse impacts to soils by: leaving the soil intact (scalping only) during pipeline construction, where possible.				Required	---
2 - Construction	Construct Pads	Sediments, petroleum hydrocarbons	2.18	Manage hazardous materials during construction in conformance with applicable rules and regulations.	Minimize potential for release of hydrocarbons to soil.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (f): Chemical, fuel, lubricant, and waste storage areas should be constructed to prevent contamination of soil or groundwater. Ditching for these areas; should be separate from that around other rig equipment and should not drain into the cellar or reserve pit. A covered area or covered container should be provided for storage of hazardous wastes.				Required	SPCC Plan
2 - Construction	Construction and Operation of Water Wells	Water Supply Wells	2.19	P&A existing water wells which are improperly constructed or out-of-service due to location.	Eliminate potential future conduit for contaminants entering subsurface.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.4 Plugging and Abandonment - 6.4.2 Subsurface page 17	6.4.2.2 Plugging Purpose: Generally, contamination by an improperly plugged and abandoned well can occur in two ways: a) the abandoned well can act as a conduit for fluid flow between penetrated strata, into USDW, or to the surface; b) contaminated water can enter the abandoned wellbore at the surface and migrate into USDW. Such contamination is prevented when a well is properly plugged. Not only do the plugging operations prevent an abandoned well from becoming a conduit for contamination to occur, but well construction and completion methods also contribute to the prevention of contamination.	WSEO Rule: Part III, Chapter 4	WSEO - Part III Water Well Minimum Construction Standards. Chapter 4 Well Completion and Maintenance, Section 4: Water Well Plugging and Abandonment. Page 4-3.	WSEO: (b) The well owner is responsible to ensure that any well (including any test well or replaced well) which is permanently abandoned or removed from service shall be entirely plugged to prevent contamination from the surface or any other source and to remove any further hazard potential that an unused well or abandoned drill hole might pose.	Required	---
2 - Construction	Construct Access Roads	Sediments	2.20	Restrict grades 8-9%.	Control and reduce sediment discharge from roads.	ROD FSEIS	ROD FSEIS Appendix A BLM's Practices and Restrictions for the PAPA page A-6 - A-7	A.4 Roads: To control or reduce sediment from roads, guidance involved proper road placement and buffer strips to stream channels, graveling, proper drainage, seasonal closure, and in some cases, redesign or closure of old roads will be developed when necessary. A.4 Roads: Main artery roads, regardless of primary user, will be crowned, ditched, drained, and if deemed appropriate by the BLM AO, surfaced with gravel to reduce sediment, salt, and phosphate loading to the Green and/or New Fork Rivers.	BLM Handbook 9113-1 Road Design	BLM H-9113-1 - .12 Design Guidelines, Section H. Drainage Elements. Page 11	BLM H-9113-1: H. Drainage Elements. Proper drainage is critical in road design. Protection of the road, adjacent upstream land, and downstream lands depend upon proper drainage design. This requires knowledge of both hydrology and hydraulics.	Required	SUP/ COAs
2 - Construction						BLM Gold Book	BLM Gold Book Chapter 4 Construction and Maintenance - Road Design and Construction page 25	BLM Gold Book: The gradient should not exceed 8 percent except for pitch grades (300 feet or less in length) in order to minimize environmental effects. In mountainous or dissected terrain, grades greater than 8 percent up to 16 percent may be permissible with prior approval of the surface management agency.				Required	SUP/ COAs
2 - Construction	Construct Access Roads	Sediments	2.21	Restrict slopes to 3:1 instead of 2:1 even for non-erosive soils.	Control and reduce sediment discharge from roads.	BLM Gold Book	Chapter 4 Construction and Maintenance - Road Design and Construction page 22	Construction and Reclamation Considerations: New road construction or reconstruction by the operator must be suitable for the intended use and must comply with BLM road and safety standards, such as those found in BLM's 9113-Roads Manual.	43 CFR 3160 - Onshore Order #1 BLM Handbook 9113-1 Road Design	OO#1 - Federal Register Volume 72, No. 44, Section III Application for Permit to Drill (APD), D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10332. BLM H-9113-1 - .12 Design Guidelines. Pages 4 - 13	OO#1: b. New or Reconstructed Access Roads. The operator must design roads based upon the class or type of road, the safety requirements, traffic characteristics, environmental conditions, and the vehicles the road is expected to carry. The operator must describe for all road construction or reconstruction: • Road width; • Maximum grade; • Crown design; • Turnouts; • Drainage and ditch design; • On-site and off-site erosion control; • Revegetation of disturbed areas; • Location and size of culverts and/or bridges; • Fence cuts and/or cattleguards; • Major cuts and fills; • Source and storage of topsoil; and • Type of surfacing materials, if any, that will be used. BLM H-9113-1: .12 Design Guidelines. Bureau roads are designed and constructed primarily to support the protection, development, use, and administration of public lands and resources with minimum impact on the environment. Bureau roads must ensure the safety of the user, but should respect the natural setting of the area. [see document for additional information]	Required	SUP/ COAs
2 - Construction						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-6	A.4 Roads: Roads will be constructed as described in BLM Manual 9113. New main artery roads will be designed to reduce sediment, salt, and phosphate loading to the Green and New Fork Rivers. Where necessary, running surfaces of the roads will be gravelled if the base does not already contain sufficient aggregate.				Required	SUP/ COAs
2 - Construction	Pipelines	Surface water runoff, sediments, release of produced fluids	2.22	Restrict stream crossings until after spring runoff.	Minimize impacts to riparian environments.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.6 Pipelines: Crossings of ephemeral, intermittent, and perennial streams associated with road and utility line construction will generally be restricted until after spring runoff and normal flows are established.				Required	---

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Project Phase	Activity	Source (of Potential Contamination)	Practic ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
2 - Construction	Construction and Operations of Water Wells	Water Supply Wells	2.23	Steam-clean all water well construction equipment prior to use in well.	Avoid introducing contaminants during water well installation/use.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.	WSEO Rule: Part III, Chapter 3 and 4	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 1: Water Well Siting. Page 3-1. WSEO - Part III Water Well Minimum Construction Standards. Chapter 4 Well Completion and Maintenance, Section 1: Disinfection. Page 4-1.	WSEO, Chapter 3: (a) General Considerations. (i) All wells shall be sited and constructed in such a manner that the well does not act as a conduit for the transmission of contaminants from either above or below ground to the ground water resource. WSEO, Chapter 4: (b) The well driller shall: (i) Clean all casing, tools, drilling equipment, and materials prior to beginning the drilling and construction of every well. (ii) Clean all pumping equipment and well construction materials (including sand or gravel used in an artificial filter-packed well) before placing them in the well or borehole. (iii) Ensure that only potable water is used for drilling and for mixing of sealing material. (c) The pump installer shall: (i) Clean all pumping, wiring, and other equipment prior to placement in the well. (ii) Clean all materials that may come in contact with down-hole equipment.	Required	---
2 - Construction			2.24	Locate water wells away from potential sources of contamination with consideration to geology and location on well pad with relation to gas wells as well as any setback distances as stated in the WSEO minimum standards.	Avoid introducing contaminants during water well installation/use.				WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 1: Water Well Siting. Pages 3-1 3-2.	WSEO: (a) General Considerations. (i) All wells shall be sited and constructed in such a manner that the well does not act as a conduit for the transmission of contaminants from either above or below ground to the ground water resource. (e) Setback Distances from Contaminant Sources. (i) Water wells shall be located the minimum lateral distance from any common pollutant sources listed below: Livestock Containment Pens - 50 feet Livestock Sewage Lagoons - 50 feet Sewer - 50 feet Septic Tank - 50 feet Disposal (Leach) Field - 100 feet (ii) Beyond minimum distances, an attempt shall be made to locate the well upgradient from contaminant sources.	Required	---
2 - Construction			2.25	Construct water wells to SEO minimum standards or better	Avoid introducing contaminants during water well installation/use.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.	WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 1: Water Well Siting. Page 3-1.	WSEO: (a) General Considerations. (i) All wells shall be sited and constructed in such a manner that the well does not act as a conduit for the transmission of contaminants from either above or below ground to the ground water resource.	Required	---
2 - Construction			2.26	Use approved sampling protocols and use discrete zone sampling bailer to collect groundwater sample from screened interval.	Avoid introducing contaminants during water well installation/use.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.	WSEO Rule: Part III, Chapter 3 and 4	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 1: Water Well Siting. Page 3-1. WSEO - Part III Water Well Minimum Construction Standards. Chapter 4 Well Completion and Maintenance, Section 1: Disinfection. Page 4-1.	WSEO, Chapter 3: (a) General Considerations. (i) All wells shall be sited and constructed in such a manner that the well does not act as a conduit for the transmission of contaminants from either above or below ground to the ground water resource. WSEO, Chapter 4: (a) Each person who repairs, modifies, works on, or otherwise affects the physical components of a well shall clean and disinfect the pump, electrical wiring and controls, drop pipe, and all other equipment each and every time the pump, electrical wiring and controls, drop pipe, and other equipment is placed into the well.	Required	---
2 - Construction			2.27	Use EPA Method 8260B for analysis of BTEX.	Ensure water quality good for intended purpose.								Required
2 - Construction	Construction and Operation of Water Wells	Water Supply Wells	2.28	Use non-toxic, hydrocarbon-free pipe thread compound.	Avoid introducing contaminants during water well installation/use.	API RP 52	Section 5 Drilling Site and Right-Of-Way Preparation - 5.2 Site Construction page 8	5.2 Site Construction (d): If a water well is drilled to supply water, the well should be constructed and equipped to minimize the possibility of groundwater contamination. The water well should not be deeper than the surface casing if there is a reasonable chance that abnormal pressure could be encountered while drilling. Water well construction and monitoring as well as drinking water testing, if applicable, should be in accordance with SDWA requirements.	WSEO Rule: Part III, Chapter 3	WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 1: Water Well Siting. Page 3-1. WSEO - Part III Water Well Minimum Construction Standards. Chapter 3 Well Construction, Section 2: Water Well Construction. Page 3-5.	WSEO, Chapter 3, Section 1: (a) General Considerations. (i) All wells shall be sited and constructed in such a manner that the well does not act as a conduit for the transmission of contaminants from either above or below ground to the ground water resource. WSEO, Chapter 3, Section 2: (d) Casing. (iii)(C) All solvents, pipe dope, and glue must be NSF [National Sanitation Foundation] approved or an acceptable equivalent.	Required	---

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3 - Drilling	O&G Well Drilling	Surface Casing	3.1	All water used must be permitted by the State Engineer's Office.	Ensure water quality good for intended purpose.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-14	A.12 Groundwater and Surface Water: All water used in association with this project will be permitted through the Wyoming State Engineer's Office.	WSEO Rule: Part II, Chapter 1	WSEO - Part II Ground Water, Chapter 1 General Information, Section 5: Who is Required to File. Page 1.	WSEO: Any individual, company or corporation or other entity that intends to beneficially utilize ground water must obtain an approved permit from the State Engineer before commencing construction, including test holes, on any ground water development.	Required	---
3 - Drilling		Drilling fluids	3.2	Avoid discharge of oil-based drilling mud into reserve pit and handle such occurrences appropriately.	Minimize/avoid on-site storage of oil-based drilling mud.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Siting and Operation: The Operator will exercise extreme caution to avoid discharging oil-based drilling mud into the reserve pit. Should an event occur where it is necessary for oil-based mud to be discharged to the reserve pit, the Operator will immediately initiate the following actions: (a) The reserve pit will be secured to prevent birds and other wildlife from getting into the oil contaminated cuttings, fluids, and mud. (b) The Operator will submit a plan to the BLM-PFO describing how the contaminated pit will be managed (i.e., will the contaminated material/fluids be treated in place, and if so by what method; or will the contaminants be removed to a WDEQ-approved disposal facility).	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-9 and 4-11.	WOGCC: (bb) All pits shall be fenced completely and for any produced water pit, workover, completions, or emergency pit found containing oil, sheens, condensate, other hydrocarbons or chemicals proven to be hazardous to public health, safety and welfare, or to wildlife, domestic animals, or migratory birds, the Owner or Operator shall have these fluids removed as soon as practical or in accordance with Chapter 4, Section 1(dd) of these rules. If timely fluid removal is not possible, the pit should be netted or otherwise secured in a manner that avoids the loss of wildlife, domestic animals, or migratory birds. (dd) All retaining pits shall be kept reasonably free of surface accumulations of oil and other liquid hydrocarbon substances and shall be cleaned within ten (10) days after discovery of the accumulation by the Owner/Operator or notice from the Supervisor. (ii) Closure. (v) When drilling with oil-based muds, oil-based mud solids must be removed and disposed in a permitted facility; solidified using a Commission approved commercial pit treatment, roadspread, landspread, landfarmed; or, bioremediated in accordance with Commission or Wyoming Department of Environmental Quality rules.	Required	---
3 - Drilling	O&G Well Design and Construction	Casing Design	3.3	Case and cement all wells in alignment with approved 8-point drilling plan.	Ensure that strength and integrity of materials used are protective of groundwater.	OO#2	III Requirements, Section B. Casing and Cementing Requirements page 11	B. Casing and Cementing Requirements: The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. Determination of casing setting depth shall be based on all relevant factors, including: presence/absence of hydrocarbons; fracture gradients; usable water zones; formation pressures; lost circulation zones; other minerals; or other unusual characteristics. All indications of usable water shall be reported.	43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 22	Additional reference: WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-32.	WOGCC: (a)(iv) Setting depths of all casing strings shall be determined by taking into account formation fracture gradients and the maximum anticipated pressure to be maintained within the wellbore	Required	---
3 - Drilling								B. Casing and Cementing Requirements: Minimum design factors for tensions, collapse, and burst that are incorporated into the casing design by an operator/lessee shall be submitted to the authorized operator for his review and approval along with the APD for all exploratory wells or as otherwise specified by the authorized officer.					
3 - Drilling								B. Casing and Cementing Requirements: Casing design shall assume formation pressure gradients of 0.44 to 0.50 psi per foot for exploratory wells (lacking better data).					
3 - Drilling								B. Casing and Cementing Requirements: Casing design shall assume fracture gradients from 0.70 to 1.00 psi per foot for exploratory wells (lacking better data).					
3 - Drilling								B. Casing and Cementing Requirements: Casing collars shall have a minimum clearance of 0.422 inches on all sides in the hole/casing annulus, with recognition that variances can be granted for justified exceptions.					
3 - Drilling								B. Casing and Cementing Requirements: All waiting on cement times shall be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.					

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3 - Drilling	O&G Well Design and Construction	Casing Design	3.3	Case and cement all wells in alignment with approved 8-point drilling plan.	Ensure that strength and integrity of materials used are protective of groundwater.	OO#2		B. Casing and Cementing Requirements (1a): All casing, except the conductor casing, shall be new or reconditioned and tested casing. All casing shall meet or exceed API standards for new casing. The use of reconditioned and tested used casing shall be subject to approval by the authorized officer: approval will be contingent upon the wall thickness of any such casing being verified to be at least 87 1/2 percent of the nominal wall thickness of new casing.	43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 22	Additional reference: WOGCC Chapter 3, Section 22 General Drilling Rules.		Required	---			
3 - Drilling								B. Casing and Cementing Requirements (1b): For liners, a minimum of 100 feet of overlap between a string of casing and the next larger casing is required. The interval of overlap shall be sealed and tested. The liner shall be tested by a fluid entry or pressure test to determine whether a seal between the liner top and next larger string has been achieved. The test pressure shall be the maximum anticipated pressure to which the seal will be exposed. No test shall be required for liners that do not incorporate or need a seal mechanism.				Required	---			
3 - Drilling								III Requirements, Section B. Casing and Cementing Requirements, 1. Minimum Standards and Enforcement Provisions for Casing and Cementing page 12 B. Casing and Cementing Requirements (1c): The surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing.				Additional reference: WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-31.	WOGCC: (a)(i) Surface casing shall be set in or through an impervious formation and shall be cemented by the pump and plug or displacement or other approved method with sufficient cement to fill the annulus to the top of the hole, all in accordance with reasonable requirements of the Supervisor. If cement is not circulated to the surface during the primary operation, the Owner/Operator shall perform supplemental cementing operations to assure that the annular space from the casing shoe to the surface is filled with cement.	Required	---	
3 - Drilling								B. Casing and Cementing Requirements (1f): Surface casing shall have centralizers on the bottom 3 joints of the casing (a minimum of 1 centralizer per joint, starting with the shoe joint).				Additional reference: WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-31.	WOGCC: (a)(i) Unless otherwise approved by the Supervisor, surface casing shall be set at a minimum of three (3) joints or approximately one hundred (100) to one hundred twenty (120) feet below the depth of any Wyoming Office of State Engineer permitted water supply wells designated for domestic, stock water, irrigation or municipal use, within a minimum of one-quarter (1/4) mile radius and shall be cemented to surface.	Required	---	
3 - Drilling								B. Casing and Cementing Requirements (1d): All of the above described tests (1a - 1c) shall be recorded in the drilling log.				43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 20	Additional reference: WOGCC Chapter 3, Section 20 Well Records and Reports. Page 3-29.	WOGCC: The Owner/Operator shall keep on the leased premises, or at his headquarters in the field, or otherwise conveniently available to the Supervisor, accurate and complete records of the drilling, redrilling, deepening, repairing, plugging, or abandoning of all wells, and of all other well operations, and of all alterations to casing. These records shall show all the formations penetrated, the content and quality of oil, gas, or water in each formation tested, and the kinds, weight, size, and landed depth of casing used in drilling each well on the leased premises, and any other information obtained in the course of the well operation.	Required	---
3 - Drilling								B. Casing and Cementing Requirements (1e): All indications of usable water shall be reported to the authorized officer prior to running the next string of casing or before plugging orders are requested, whichever occurs first.							Required	---
3 - Drilling								B. Casing and Cementing Requirements (1g): Top plugs shall be used to reduce contamination of cement by displacement fluid. A bottom plug or other acceptable technique, such as a preflush fluid, inner string cement method, etc., shall be utilized to help isolate the cement from contamination by the mud fluid being displaced ahead of the cement slurry.				43 CFR 3160 - Onshore Order #2			Required	---
3 - Drilling								III Requirements, Section B. Casing and Cementing Requirements, 1. Minimum Standards and Enforcement Provisions for Casing and Cementing page 13 B. Casing and Cementing Requirements (1h): All casing strings below the conductor shall be pressure tested to 0.22 psi per foot of casing string length or 1500 psi, whichever is greater, but not to exceed 70 percent of the minimum internal yield. If pressure declines more than 10 percent in 30 minutes, corrective action shall be taken.				43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 23	Additional reference: WOGCC Chapter 3, Section 23 Blowout Preventers. Page 3-42.	WOGCC: (vii) Minimum Requirements for BOP equipment testing. (B) All casing below the conductor pipe shall be pressure tested to 0.22 psi per foot or one thousand five hundred (1,500) psi, whichever is greater, but not to exceed seventy percent (70%) of the minimum internal yield strength of the casing. A stable pressure shall be maintained for thirty (30) minutes.	Required	---
3 - Drilling								B. Casing and Cementing Requirements (1i): On all exploratory wells, and on that portion of any well approved for a 5M BOPE (blowout preventer and related equipment) system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.				43 CFR 3160 - Onshore Order #2			Required	---

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3 - Drilling	O&G Well Design and Construction	Completion and Produced Fluids	3.4	Case and cement all wells in alignment with approved 8-point drilling plan.	Ensure well integrity.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-16	A.14 Hazardous Waste Disposal: All natural gas wells will be cased and cemented to protect subsurface mineral and freshwater zones.	43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 22	OO#2 - III Requirements, Section B. Casing and Cementing Requirements. Page 11. Additional reference: WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-32	OO#2: The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals WOGCC: (a)(vi) Natural gas, which may be encountered in a substantial quantity in any section of cable tool drilled hole above the ultimate objective, shall be shut off with reasonable diligence either by mudding, by casing, or other approved method, and confined to its original source to the satisfaction of the Supervisor.	Required	---	
3 - Drilling		Mud program		3.5	Comply with mud program requirements per OO#2.	Ensure integrity of geologic formations during drilling.	OO#2	III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 13 - 14	C. Mud Program Requirements (1): Record slow pump speed on daily drilling report after mudding up.	43 CFR 3160 - Onshore Order #2			Required	---
3 - Drilling								III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 14	C. Mud Program Requirements (2): Visual mud monitoring equipment shall be in place to detect volume changes indicating loss or gain of circulating fluid volume.					
3 - Drilling								III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 14	C. Mud Program Requirements (3): When abnormal pressures are anticipated, electronic/mechanical mud monitoring equipment shall be required, which shall include as a minimum; pit volume totalizer (PVT); stroke counter; and flow sensor.					
3 - Drilling								III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 14	C. Mud Program Requirements (4): A mud test shall be performed every 24 hours after mudding up to determine, as applicable: density, viscosity, gel strength, filtration, and pH.					
3 - Drilling								III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 14	C. Mud Program Requirements (5): A trip tank shall be used on 10M and 15M systems and on upgraded 5M systems as determined by the authorized officer.					
3 - Drilling								III Requirements, Section C. Mud Program Requirements, Minimum Standards and Enforcement Provisions for Mud Program and Equipment page 14	C. Mud Program Requirements (6): Gas detecting equipment shall be installed in the mud return system for exploratory wells or wells where abnormal pressure is anticipated, and hydrocarbon gas shall be monitored for pore pressure changes.					
3 - Drilling	Pit Closure	Spent drilling and completions fluids	3.6	Conduct sampling and field documentation during closure.	Document chemicals of concern will not result in groundwater impacts.	API 51R	Section 8 Production and Water Handling Facilities - 8.9 Closure and Abandonment of Facilities page 39	8.9.3 Pit Closure: All pits and surface impoundments should be properly closed after they are dry and free of waste; then they should be backfilled and graded to conform to the surrounding terrain. Closure must also be in accordance with any local and/or state regulations. The location of closed pits should be documented. Materials removed from pits should be reclaimed, recycled or disposed.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-11 and 4-13.	(ii) Closure. Closure must be conducted in accordance with lease and landowner obligations and with local, state, and federal regulations: (iii) Closure standards and testing requirements for all pits will be determined by the Supervisor based upon site-specific conditions. (qq) Reclamation: Production pit areas and reserve pits will be reclaimed after they have dried sufficiently following the removal of any oil, sheens, or other hydrocarbons, or if they contain chemicals harmful to wildlife, domestic animals and migratory birds, or if proven to be hazardous to public health, safety and welfare, and no later than one (1) year after the date of last use, unless the Supervisor grants an administrative variance for just cause and after Oil and Gas Conservation Commission staff inspection.	Required	ECM	
3 - Drilling						API RP 52	Section 8 Decommissioning - 8.1 Chemical and Waste Disposal page 13	8.1.6 Reserve pit fluids and solids should be reclaimed and the pit closed within the time allotted by regulatory agencies. Disposal methods are regulated by the state or EPA region, and all disposal should be in accordance with the regulations in effect at the location. Landowner concurrence may be necessary for on-site land disposal. A pit sampling protocol may be required for sampling the pit liquids and solids (sludge).						(rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation.
3 - Drilling	O&G Well Drilling	Diesel Fuel Tanks for Drill Rig	3.7	Ensure fuel tanks used for drilling have secondary containment.	Provides both secondary containment for incidental leak or spill from fuel tank.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 12	6.1.6 Selection, Use, and Storage of Fuels and Completion Fluids: For both new and existing well sites, all fuels, treatment chemicals, completion brines, and other similar liquids should be properly stored in labeled containers intended for that purpose. Containment should be constructed so spilled fuels or chemicals do not reach the ground.	WOGCC Rule: Chapter 4, Section 4	WOGCC Chapter 4, Section 4 Workmanlike Operations. Page 4-16.	WOGCC: (a)(vii) Maintain tanks in a workmanlike manner which will preclude seepage from their confines and provide for all applicable safety measures. Owners or Operators should be aware of their responsibility to comply with Spill Prevention Control and Countermeasures Plan (SPCC, 40 CFR 112) requirements that regulate the prevention and containment of crude oil spills. SPCC regulations and guidelines specify that applicable facilities construct appropriate containment or diversionary structures or equipment to prevent discharged oil from reaching waters of the United States.	Required	SPCC Plan	

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3 - Drilling	O&G Well Design and Construction	Mud program	3.8	Evaluate top of cement for integrity using standard geological techniques.	Prevent migration of fluids from producing zones into freshwater zones.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-16	A.14 Hazardous Waste Disposal: All natural gas wells will be cased and cemented to protect subsurface mineral and freshwater zones.	43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 22	OO#2 - III Requirements, Section B. Casing and Cementing Requirements. Page 11. WOGCC Chapter 3, Section 22 General Drilling Rules. Page 3-32	OO#2: The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals WOGCC: (a)(vi) Natural gas, which may be encountered in a substantial quantity in any section of cable tool drilled hole above the ultimate objective, shall be shut off with reasonable diligence either by mudding, by casing, or other approved method, and confined to its original source to the satisfaction of the Supervisor.	Required	---
3 - Drilling			3.9	Evaluate top of cement for integrity using state of the art technology (e.g., circulation volumes, temperature surveys, acoustic integrity surveys).	Prevent migration of fluids from producing zones into freshwater zones.							Required	---
3 - Drilling	O&G Well Design and Construction	Blowouts	3.10	Install and maintain blow-out preventers on wellheads.	Minimize potential for blow out.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: All blow-out preventer equipment and all elastomers in the mud system will be suitable for oil based mud.	43 CFR 3160 - Onshore Order #2	OO#2 - III Requirements, Section A. Well Control Requirements. Page 5.	OO#2: 2. a. i. A well control device shall be installed at the surface that is capable of complete closure of the well bore.	Required	---
3 - Drilling			3.11	Install and maintain well control.	Minimize potential for blow out.	API RP 52	Section 6 Drilling Operations - 6.4 Formation Pressure Control page 11	6.4 Formation Pressure Control: Pressure control equipment should be installed, tested, and maintained in proper working condition.	WOGCC Rule: Chapter 3, Section 23	WOGCC Chapter 3, Section 23 Blowout Preventers. Pages 3-36 - 3-43.	WOGCC: (a) Blowout preventers (BOPs) and related equipment shall be installed and maintained during the drilling of all wells in accordance with the following rules [i - viii] unless altered, modified, or changed, for a particular pool or pools, upon hearing before the Commission.	Required	---
3 - Drilling	O&G Well Drilling	Wellhead Cellar	3.12	Install one foot of concrete in bottom of concrete vault or corrugated steel cellar.	Contain spills at wellhead.							Voluntary	---
3 - Drilling		Mousehole	3.13	Install steel casing with concrete plug in bottom.	Minimize risk of fluids released to shallow subsurface during drilling.								Voluntary
3 - Drilling	Completions Gas Wells	Hydraulic Fracturing	3.14	Install/utilize instrumentation that provides real-time monitoring of fracturing to help ensure proper pressures maintained.	Ensure fracture/stimulation integrity.	API RP 52	Section 7 Completion, Testing, and Plugging and Abandonment Operations - 7.2 Completion Operations page 12	7.2.7 Fracturing Stimulation: Methods for mixing fracturing fluids and subsequent high pressure injection should be reviewed by all involved personnel. Potential environmental impact of accidental discharges should be reviewed. Emergency response plans for handling any accidental discharges should be reviewed with all involved personnel. All unused chemicals and fluids should be removed from the location by the service company upon completion of the job. Fluids should not be disposed of to the surface or lease facilities.	WOGCC Rule: Chapter 3, Section 45	WOGCC Chapter 3, Section 45 Well Stimulation. Page 3-65	WOGCC: (i) During the well stimulation operation, the Owner or Operator shall monitor and record the annulus pressure at the bradenhead. If intermediate casing has been set on the well being stimulated, the pressure in the annulus between the intermediate casing and the production casing shall also be monitored and recorded. A continuous record of the annulus pressure during the well stimulation shall be submitted on Well Completion or Recompletion Log (Form 3) or on a Sundry Notice (Form 4).	Required	---
3 - Drilling	O&G Well Drilling	Drilling fluids	3.15	Minimize potential for discharging oil based mud into reserve pit.	Minimize leakage or potential for migration of constituents from drilling fluids into subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Siting and Operation: The Operator will exercise extreme caution to avoid discharging oil-based drilling mud into the reserve pit. Should an event occur where it is necessary for oil-based mud to be discharged to the reserve pit, the Operator will immediately initiate the following actions: (a) The reserve pit will be secured to prevent birds and other wildlife from getting into the oil contaminated cuttings, fluids, and mud. (b) The Operator will submit a plan to the BLM-PFO describing how the contaminated pit will be managed (i.e., will the contaminated material/fluids be treated in place, and if so by what method; or will the contaminants be removed to a WDEQ-approved disposal facility).	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-9 and 4-11.	WOGCC: (bb) All pits shall be fenced completely and for any produced water pit, workover, completions, or emergency pit found containing oil, sheens, condensate, other hydrocarbons or chemicals proven to be hazardous to public health, safety and welfare, or to wildlife, domestic animals, or migratory birds, the Owner or Operator shall have these fluids removed as soon as practical or in accordance with Chapter 4, Section 1(dd) of these rules. If timely fluid removal is not possible, the pit should be netted or otherwise secured in a manner that avoids the loss of wildlife, domestic animals, or migratory birds. (dd) All retaining pits shall be kept reasonably free of surface accumulations of oil and other liquid hydrocarbon substances and shall be cleaned within ten (10) days after discovery of the accumulation by the Owner/Operator or notice from the Supervisor. (ii) Closure. (v) When drilling with oil-based muds, oil-based mud solids must be removed and disposed in a permitted facility; solidified using a Commission approved commercial pit treatment, roadspread, landsread, landfarmed; or, bioremediated in accordance with Commission or Wyoming Department of Environmental Quality rules.	Required	---
3 - Drilling	O&G Well Design and Construction	Blowouts	3.16	Perform real-time monitoring during drilling with means for emergency shutdown of drilling.	Prevent release of fluids from the well bore.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 14	6.1.8 Blowout Prevention Equipment (BOPE): All BOPE should be selected, installed, and properly maintained in order to prevent uncontrolled releases to the environment.	43 CFR 3160 - Onshore Order #2	OO#2 - III Requirements, Section A. Well Control Requirements. Page 5.	OO#2: 1. Blowout preventer (BOP) and related equipment (BOPE) shall be installed, used, maintained, and tested in manner necessary to assure well control and shall be in place and operational prior to drilling the surface casing shoe unless otherwise approved by the APD.	Required	---
3 - Drilling	O&G Well Drilling	Mousehole	3.17	Remove oil-based fluids with vacuum truck.	Minimize risk of fluids released to shallow subsurface during drilling.							Voluntary	---
3 - Drilling		Diesel Fuel Tanks	3.18	Stage tanks on area lined with HDPE liner.	Provides secondary containment for incidental leak or spill from fuel tank.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.1 Completion, Stimulation, and Workover Operations page 12	6.1.6 Selection, Use, and Storage of Fuels and Completion Fluids: For both new and existing well sites, all fuels, treatment chemicals, completion brines, and other similar liquids should be properly stored in labeled containers intended for that purpose. Containment should be constructed so spilled fuels or chemicals do not reach the ground.	WOGCC Rule: Chapter 4, Section 4	WOGCC Chapter 4, Section 4 Workmanlike Operations. Page 4-16.	WOGCC: (a)(ii) Maintain all materials and chemicals in an orderly and safe manner. Material and equipment stored on the lease and or well site shall be limited to serviceable equipment commonly associated with the operation of a lease or well. Refuse should be disposed of properly as provided elsewhere in these rules.	Voluntary	---

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3 - Drilling	Completions Gas Wells	Frac Fluids	3.19	Treat/discharge or dispose via underground injection spent frac fluids.	Limit potential for frac fluids to impact groundwater via improper disposal.							Voluntary	---
3 - Drilling		Hydraulic Fracturing	3.20	Use fracture geometry models and real-time monitoring (casing pressure, annulus pressure, flow rate and fluid densities) to evaluate/minimize potential for fracture extension out of target zone.	Ensure fracture/stimulation integrity.				WOGCC Rule: Chapter 3, Section 45	WOGCC Chapter 3, Section 45 Well Stimulation. Page 3-63	WOGCC: (e) The Owner or Operator shall provide a detailed description of the proposed well stimulation design, which shall include: (i) The anticipated surface treating pressure range; (ii) The maximum injection treating pressure; (iii) The estimated or calculated fracture length and fracture height.	Voluntary	---
3 - Drilling	O&G Well Drilling	Surface Casing	3.21	Use freshwater for drilling that meets applicable water quality standards. Use recycled water for drilling in place of fresh water where it is available and of adequate quality.	Ensure water quality good for intended purpose.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-14	A.12 Groundwater and Surface Water: All fresh water used for the drilling of the surface casing must comply with all requirements concerning water quality as set forth by the WOGCC Regulations.				Required	---
3 - Drilling	O&G Well Drilling	Drilling fluids	3.22	Utilize HDPE liner in reserve pits.	Prevent leakage or potential for migration of constituents from drilling fluids into subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, as well as locating staging areas for storage of equipment away from drainages will prevent potential contaminants from entering surface waters.	WOGCC Rule: Chapter 4, Section 4	WOGCC Chapter 4, Section 4 Workmanlike Operations. Page 4-16.	WOGCC: (a)(vii) Maintain tanks in a workmanlike manner which will preclude seepage from their confines and provide for all applicable safety measures. Owners or Operators should be aware of their responsibility to comply with Spill Prevention Control and Countermeasures Plan (SPCC, 40 CFR 112) requirements that regulate the prevention and containment of crude oil spills. SPCC regulations and guidelines specify that applicable facilities construct appropriate containment or diversionary structures or equipment to prevent discharged oil from reaching waters of the United States.	Required	SPCC Plan
3 - Drilling													
3 - Drilling		Drilling fluids	3.24	Utilize semi-closed or fully-closed loop mud system.	Minimize leakage or potential for migration of constituents from drilling fluids into subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2 - A-3	A.2 Project Citing and Operation: Reserve pits will not be located in areas where groundwater is less than 50 feet from the surface. A closed system will be required if water shows in the rat or mouse hole.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7	WOGCC: (u) Location. In areas where ground water is less than twenty feet (20') below the surface, a closed system must be utilized for well drilling operations.	Required	---
3 - Drilling													
3 - Drilling		Drilling fluids	3.24	Utilize semi-closed or fully-closed loop mud system.	Minimize leakage or potential for migration of constituents from drilling fluids into subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-2 - A-3	A.2 Project Citing and Operation: All oil-based mud drilling operations will be completed through a closed mud system and all oil-based mud will be contained in the closed system.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-7	WOGCC: (u) Location. In areas where ground water is less than twenty feet (20') below the surface, a closed system must be utilized for well drilling operations.	Required	---
3 - Drilling													
3 - Drilling		Drilling fluids	3.24	Utilize semi-closed or fully-closed loop mud system.	Minimize/avoid on-site storage of oil-based drilling mud.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: All blow-out preventer equipment and all elastomers in the mud system will be suitable for oil based mud.	WOGCC Rule: Chapter 3, Section 23	WOGCC Chapter 3, Section 23 Blowout Preventers.		Required	---

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3 - Drilling	O&G Well Drilling	Drilling fluids	3.24	Utilize semi-closed or fully-closed loop mud system.	Minimize/avoid on-site storage of oil-based drilling mud.	API RP 52	Section 6 Drilling Operations - 6.3 Drilling Fluid System page 11	6.3 Drilling Fluid System: All drilling fluid, but especially oil-based drilling fluids, should be returned to the supplier or saved for reuse, if possible. Special effort should be made when using oil-based or saline drilling fluid to prevent loss of fluid by the use of drain pans for the drill pipe, drip pans under the floor, vacuum cleaners, and skimmers.				Voluntary	---	
3 - Drilling		Drill Rig	3.25	Utilize vacuum system on rig to collect drilling mud spilled on rig floor and return to mud system.	Control minor drilling mud spills during drilling.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: Any cuttings dropped or mud spilled will be immediately cleaned up and placed in the approved containment device.				Required	---	
4 - Production	Fluids Handling	Tank Batteries – Produced water/ condensate	4.1	Conduct internal tank inspections.	Maintain tank integrity standards.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (a)(3) Routinely scheduled tests and inspections of lines, vessels, dump valves, hoses, and other pollution prevention equipment where failure(s) and/or malfunction(s) could result in a potential spill incident. These tests and inspections should be commensurate with the complexity, conditions, and circumstances of the facility.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans. 40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.7: (e) Inspections, tests, and records. Conduct inspections and tests required by this part in accordance with written procedures that you or the certifying engineer develop for the facility. You must keep these written procedures and a record of the inspections and tests, signed by the appropriate supervisor or inspector, with the SPCC Plan for a period of three years. Records of inspections and tests kept under usual and customary business practices will suffice for purposes of this paragraph. 40 CFR 112.9: (3) Except as described in paragraph (c)(5) of this section for flow-through process vessels and paragraph (c)(6) of this section for produced water containers and any associated piping and appurtenances downstream from the container, periodically and upon a regular schedule visually inspect each container of oil for deterioration and maintenance needs, including the foundation and support of each container that is on or above the surface of the ground.	Required	SPCC Plan	
4 - Production			4.2	Conduct routine external inspections.	Maintain tank integrity standards.	API 51R	Section 8 Production and Water Handling Facilities - 8.5 Operation and Maintenance page 28	8.5.3 Equipment Inspection Routine inspections should be considered on all equipment operating in corrosive environments. All safety equipment should be tested on a routine basis to ensure proper operation.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.9: (6) (ii) Produced Water Containers: On a regular schedule, visually inspect and/or test the produced water container and associated piping for leaks, corrosion, or other conditions that could lead to a discharge as described in §112.1(b) in accordance with good engineering practice.	Required	SPCC Plan	
4 - Production		Produced Water	4.3	Dispose of produced water according to OO #7 using permitted facilities.	Eliminate storage, treatment and disposal of produced water on surface, except at permitted disposal facilities.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: Produced water from oil and gas operations will be disposed of in accordance with the requirements of Onshore Oil and Gas Order No. 7.	43 CFR 3160 - Onshore Order #7	OO#7 - Federal Register Volume 58, No. 172. Section III Requirements; A. General Requirements.	OO#7: All produced water from Federal/Indian leases must be disposed of by (1) injection into the subsurface; (2) into pits; or (3) other acceptable methods approved by the authorized officer, including surface discharge under NPDES permit. Injection is generally the preferred method of disposal.	Required	SUP	
4 - Production		Liquids Gathering System – Produced water/ condensate		4.4	Conduct quality control testing, including hydrotesting, during installation.	Minimize potential for installation-related leaks (e.g., welds).	API 51R	Section 7 Lease Gathering and System Lines - 7.4 Construction and Installation page 22	7.4.5 Upon completion, lines should be inspected and pressure tested for possible leaks in accordance with state and local codes.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.8 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore facilities (excluding production facilities).	40 CFR 112.8: (d) Facility transfer operations, pumping, and facility process. (4) Regularly inspect all aboveground valves, piping, and appurtenances. During the inspection you must assess the general condition of items, such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces. You must also conduct integrity and leak testing of buried piping at the time of installation, modification, construction, relocation, or replacement.	Required	SPCC Plan
4 - Production				4.5	Install, monitor, and maintain SCADA system on 24/7 basis.	24/7 monitoring of LGS allows shut-in of system if problems encountered.							Voluntary	---
4 - Production				4.6	Install pipeline shutoff valves at New Fork River pipeline crossings (manual or MOV).	Provide means of stopping flow in event of release from pipeline in or near river.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-16	A.14 Hazardous Waste Disposal: Where applicable and/or required by law, streams at pipeline crossings will be protected from contamination by pipeline shutoff valves or other systems capable of minimizing accidental discharge.					Required
4 - Production	Gas/Fluids Treatment	Production Equipment – Produced water/ condensate	4.7	Install and maintain impervious drip storage devices such as: --Drum storage; --Drum storage with secondary containment; or --Blow down piping directly to tank.	Minimize potential for releases to impact soil/enter Vadose zone.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 37	8.7.5 Control and Containment: Some methods which can be used to control and contain discharged substances, particularly oil, include: a) retaining walls or dikes around tanks and other spill prone equipment,	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b),The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank, will not escape the containment system before cleanup occurs. At a minimum, you must use one of the following prevention systems or its equivalent: (1) For onshore facilities: (i) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (ii) Curbing or drip pans; (iii) Sumps and collection systems; (iv) Culverting, gutters, or other drainage systems; (v) Weirs, booms, or other barriers; (vi) Spill diversion ponds; (vii) Retention ponds; or (viii) Sorbent materials.	Required	SPCC Plan	

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4 - Production	Gas/Fluids Treatment	Production Equipment – Produced water/ condensate	4.8	Install and maintain production packs with one or more containment features.	Minimize potential for releases to impact soil/enter subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: The appropriate containment and/or diversionary structures or equipment, including walls and floor, to prevent discharged fluid from reaching ground, surface, or navigable waters, will be impervious to any oil, glycol, produced water, or other fluid for 72 hours and will be constructed so that any discharge from a primary containment system, such as a tank or pipe, will not drain, infiltrate, or otherwise escape to ground, surface, or navigable waters before cleanup is completed.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b),The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank, will not escape the containment system before cleanup occurs. At a minimum, you must use one of the following prevention systems or its equivalent: (1) For onshore facilities: (i) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (ii) Curbing or drip pans; (iii) Sumps and collection systems; (iv) Culverting, gutters, or other drainage systems; (v) Weirs, booms, or other barriers; (vi) Spill diversion ponds; (vii) Retention ponds; or (viii) Sorbent materials.	Required	SPCC Plan	
4 - Production		Treatment Chemical Storage (e.g., TEG)	4.9	Install and maintain secondary containment structures such as:	Minimize potential for releases to impact soil/enter Vadose zone.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: Treaters, dehydrators, and other production facilities installed on location, that have the potential to leak or spill oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety, will be placed on or within appropriate containment and/or diversionary structure to prevent spilled or leaking fluid from reaching ground, surface, or navigable waters.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.9: (c.) Oil production facility bulk storage containers. (2) construct all tank battery, separation, and treating facility installations, so that you provide a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation.	Required	SUP/ SPCC Plan	
4 - Production	Well Treatment	Treatment Chemical Storage (e.g., methanol; corrosion inhibitors)		Poly drums with containment troughs; or Steel drums with containment troughs								Required	SUP/ SPCC Plan	
4 - Production	Fluids Handling	Tank Batteries – Produced water/ condensate	4.10	Install/construct containment structures or devices.	Minimize potential for releases entering groundwater.	API 51R	Section 8 Production and Water Handling Facilities - 8.3 Facility Design page 26	8.3.1 Equipment Sizing, Specifications, and Design: Consideration should be given to the following items in designing and constructing production facilities. g) The following items should be considered in installing bulk storage and loading facilities. 1) Adequate fire/retaining walls or other containment measures should be provided around tanks, where necessary to comply with regulatory requirements, in order to contain accidental discharges and prevent environmental damage. 2) Installation of impervious foundations or liners under storage tanks should be considered to allow detection and containment of fluid releases.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.9: If you are the owner or operator of an onshore oil production facility (excluding a drilling or workover facility), you must: (c.) Oil production facility bulk storage containers. (2) ...construct all tank battery, separation, and treating facility installations, so that you provide a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. You must safely confine drainage from undiked areas in a catchment basin or holding pond. (6) Produced water containers. For each produced water container, comply with§112.9(c)(2).	Required	---	
4 - Production						ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: All storage tank batteries, including drain sumps and sludge holdings at compressor facilities, installed on location and designed to contain any oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety, will be surrounded by a secondary means of containment for the entire contents of the largest single tank in use plus one foot of freeboard for precipitation or 110 percent of the capacity of the largest vessel. The appropriate containment and/or diversionary structures or equipment, including walls and floor, to prevent discharged fluid from reaching ground, surface, or navigable waters, will be impervious to any oil, glycol, produced water, or other fluid for 72 hours and will be constructed so that any discharge from a primary containment system, such as a tank or pipe, will not drain, infiltrate, or otherwise escape to ground, surface, or navigable waters before cleanup is completed.				Required	SUP/ SPCC Plan	
4 - Production		Tank Batteries – Produced water/ condensate	4.11	Institute integrity management/corrosion prevention practices.	Minimize potential for leaks.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (a)(2) Maintenance and/or corrosion abatement programs to provide for continued adequacy of all equipment.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.9: (3) Except as described in paragraph (c)(5) of this section for flow-through process vessels and paragraph (c)(6) of this section for produced water containers and any associated piping and appurtenances downstream from the container, periodically and upon a regular schedule visually inspect each container of oil for deterioration and maintenance needs, including the foundation and support of each container that is on or above the surface of the ground.	Voluntary	SPCC Plan	
4 - Production			4.12	Minimize on-site tank storage and replace with LGS.	Consolidate fluids handling and reduce number of potential point sources.	ROD FSEIS	Section 2.0 Decision - 2.7 Liquid Gathering System page 6	2.7 Liquid Gathering System: This ROD requires Ultra, Shell, and QEP to install a liquids gathering system to reduce the amount of truck traffic associated with production.					Required	SUP/ SPCC Plan/ ROD
4 - Production			4.13	Load Outs – Produced water/ condensate	Install and maintain drip buckets.	Minimize potential for releases during transfer to trucks.	API 51R	Section 8 Production and Water Handling Facilities - 8.3 Facility Design page 26	8.3.1 Equipment Sizing, Specifications, and Design: Consideration should be given to the following items in designing and constructing production facilities. g) The following items should be considered in installing bulk storage and loading facilities. 4) Installation of drip pans or other containment should be considered at truck or barge loading/unloading hose connections to contain any spillage.					Required

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4 - Production	Fluids Handling	Produced Water	4.14	Apply produced water with appropriate TDS levels and no hazardous materials to roads in accordance with BLM authorization.	Eliminate storage and treatment of produced water on surface.				WOGCC Rule: Chapter 4, Section 1 WDEQ Rule: Chapter 3, Section 11	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-12. WDEQ Chapter 3, Section 11 Construction and Operation in Compliance with Issued Permit. Page 3-14.	WOGCC: (mm) Landfarming and landspreading must be approved by the DEQ. Jurisdiction over roadspreading or road application is shared by DEQ and the Commission. WDEQ: The permittee shall: (d) Conduct all land application or surface disposal operations in accordance with all statements, representations and procedures presented in the complete permit application and supporting documents; and the terms and conditions of the permit; (e) Reuse treated wastewater in accordance with all statements, representations and procedures presented in the complete permit application and supporting documents; and the terms and conditions of the permit.	Required	SUP	
4 - Production			4.15	Produced water will be disposed of in closed storage system where ground water is close to surface.	Eliminate storage and treatment of produced water on surface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-8	A.5 Production Facilities: In areas where ground water exists 50 feet or less from the surface (Wyoming Oil and Gas Conservation Commission), produced water from oil and gas operations will be disposed of in an approved closed storage system or by other acceptable means complying with Onshore Order No. 7.	43 CFR 3160 - Onshore Order #7	OO#7 - Federal Register Volume 58, No. 172. Section III Requirements; A. General Requirements.	OO#7: All produced water from Federal/Indian leases must be disposed of by (1) injection into the substance; (2) into pits; or (3) other acceptable methods approved by the authorized officer, including surface discharge under NPDES permit. Injection is generally the preferred method of disposal.	Required	SUP	
4 - Production			4.16	Properly dispose of all water.	Eliminate storage and treatment of produced water on surface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-9	A.6 Pipelines: Waters that do not meet applicable state or federal standards will be evaporated, treated, or disposed of at an approved disposal facility. The disposal of all water (hydrostatic test water, stormwater, produced water) will be done in conformance with WDEQ-Water Quality Division (WQD). BLM Onshore Oil and Gas Order No.7, and WOGCC rules and regulations.	43 CFR 3160 - Onshore Order #7 WDEQ Rule: Water Quality, Chapter 4 WOGCC Rule: Chapter 4			Required	SUP	
4 - Production			4.17	Dispose of produced water according to OO #7 using permitted facilities.	Eliminate storage, treatment and disposal of produced water on surface, except at permitted disposal facilities.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-3	A.2 Project Citing and Operation: Produced water from oil and gas operations will be disposed of in accordance with the requirements of Onshore Oil and Gas Order No. 7.	43 CFR 3160 - Onshore Order #7	OO#7 - Federal Register Volume 58, No. 172. Section III Requirements; A. General Requirements.	OO#7: All produced water from Federal/Indian leases must be disposed of by (1) injection into the substance; (2) into pits; or (3) other acceptable methods approved by the authorized officer, including surface discharge under NPDES permit. Injection is generally the preferred method of disposal.	Required	SUP	
4 - Production		Load Outs – Produced water/ condensate	4.18	Reduce truck loading/unloading through LGS.	Eliminate potential source of releases.	ROD FSEIS	Section 2.0 Decision - 2.7 Liquid Gathering System page 6	2.7 Liquid Gathering System: This ROD requires Ultra, Shell, and QEP to install a liquids gathering system to reduce the amount of truck traffic associated with production.				Required	ROD	
4 - Production			4.19	Verify transporter training.	Minimize potential for releases during transfer to trucks.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (b) Training programs should be developed on spill prevention fundamentals and presented to operating personnel as often as necessary to keep them well versed on spill prevention practices.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.7 - Oil Pollution Prevention, General Requirements for Spill Prevention, Control, and Countermeasure Plans.	40 CFR 112.7: (f) Personnel, training, and discharge prevention procedures. (3) Schedule and conduct discharge prevention briefings for your oil-handling personnel at least once a year to assure adequate understanding of the SPCC Plan for that facility. Such briefings must highlight and describe known discharges as described in §112.1(b) or failures, malfunctioning components, and any recently developed precautionary measures.	Required	---	
4 - Production			4.20	Use sound tanks that are in good working condition.	Maintain tank integrity standards.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (a)(1) Modification of existing facilities or installation of new equipment or instrumentation, as needed, to reduce the possibility of spills, commensurate with the risk involved. Consideration should be given to the use of alarms, automatic shutdown equipment, or fail-safe equipment to prevent, control, or minimize potential spills resulting from equipment failure or human error.	40 CFR 112: Oil Pollution Prevention	40 CFR 112.9 - Spill Prevention, Control, and Countermeasure Plan Requirements for onshore oil production facilities (excluding drilling and workover facilities).	40 CFR 112.9: (c) Oil production facility bulk storage containers. (4) Engineer or update new and old tank battery installations in accordance with good engineering practice to prevent discharges.	Required	SPCC Plan	
4 - Production		Fluids Handling	Tank Batteries – Produced water/ condensate	4.21	Where possible, locate Enardo valves (end-of-line vent valves) to interior of tank battery containment/pad.	Minimize potential impacts from releases from Enardo valves (end-of-line vent valves) during upsets.	API 51R	Section 8 Production and Water Handling Facilities - 8.3 Facility Design page 28	8.3.1 Equipment Sizing, Specifications, and Design: Consideration should be given to the following items in designing and constructing production facilities. i) The following items should be considered in planning, installing, and using pits, firewalls, and dikes. 10) Any drain lines through dikes should be equipped with valves/blinds that are normally closed and locked.				Voluntary	---
4 - Production				4.22	Where appropriate, construct with poly-pipe instead of steel. If steel is used, integrity management should be employed.	Eliminate potential for corrosion induced leaks.	API 51R	Section 8 Production and Water Handling Facilities - 8.7 Spill Prevention, Response, and Cleanup page 36	8.7.2 Prevention: (a)(2) Maintenance and/or corrosion abatement programs to provide for continued adequacy of all equipment.				Voluntary	---

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5 - Closure	Interim and Final Reclamation	Sediment loss	5.1	Apply appropriate erosion control measures.	Control and reduce sediment discharge from reclaimed areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: Disturbances should be reclaimed or managed to approach zero sediment discharge. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan will include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity.	43 CFR 3160 - Onshore Order #1 WOGCC Rule: Chapter 4, Section 1	OO#1 - Federal Register Volume 72, No. 44, Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10333. WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-13.	OO#1: j. Plans for Surface Reclamation: The operator must submit a plan for the surface reclamation or stabilization of all disturbed areas. This plan must address interim (during production) reclamation for the area of the well pad not needed for production, as well as final abandonment of the well location. Such plans must include, as appropriate: • Configuration of the reshaped topography; • Drainage systems; • Segregation of spoil materials (stockpiles); • Surface disturbances; • Backfill requirements; • Proposals for pit/sump closures; • Redistribution of topsoil; • Soil treatments; • Seeding or other steps to reestablish vegetation; • Weed control; and • Practices necessary to reclaim all disturbed areas, including any access roads and pipelines. WOGCC: (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation.	Required	---
5 - Closure	Pad Decommissioning	Pit closure	5.2	Comply with SEO requirements for plugging and abandoning water wells prior to pit closure.	Remove potential source areas.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-14	A.12 Groundwater and Surface Water: All water wells put to beneficial use, including produced water associated with this project, will be under the jurisdiction of the Wyoming State Engineer's Office.	WSEO Rule: Part III, Chapter 4	WSEO - Part III Water Well Minimum Construction Standards, Chapter 4 Well Completion and Maintenance, Section 4: Water Well Plugging and Abandonment. Pages 4-3 - 4-4.	WSEO Part III, Chapter 4, Section 4: [see section for specific requirements].	Required	---
5 - Closure	Pit Closure	Spent drilling mud and cuttings, spent completions fluids	5.3	Comply with WOGCC requirements for pit closures.	Minimize potential for chemicals of concern in residual material from impacting subsurface post-closure.	API 51R	Section 8 Production and Water Handling Facilities - 8.9 Closure and Abandonment of Facilities page 39	8.9.3 Pit Closure: All pits and surface impoundments should be properly closed after they are dry and free of waste; then they should be backfilled and graded to conform to the surrounding terrain. Closure must also be in accordance with any local and/or state regulations. The location of closed pits should be documented. Materials removed from pits should be reclaimed, recycled or disposed.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-11 and 4-13.	WOGCC: (ii) Closure. Closure must be conducted in accordance with lease and landowner obligations and with local, state, and federal regulations: (iii) Closure standards and testing requirements for all pits will be determined by the Supervisor based upon site-specific conditions. (qq) Reclamation. Production pit areas and reserve pits will be reclaimed after they have dried sufficiently following the removal of any oil, sheens, or other hydrocarbons, (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation.	Required	---
5 - Closure	O&G Well Plugging and Abandonment	Subsurface or subsurface releases	5.4	Comply with WOGCC requirements for plugging and abandonment.	Eliminate potential conduits for migration of contaminants into/through subsurface.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-16	A.14 Hazardous Waste Disposal: Unproductive wells and wells that have completed their intended purpose will be properly abandoned and plugged using procedures identified by the Wyoming Oil and Gas Conservation Commission (WOGCC) and the BLM.	43 CFR 3160 - Onshore Order #1 43 CFR 3160 - Onshore Order #2 WOGCC Chapter 3, Section 18	OO#1 - Federal Register Volume 72, No. 44, Section XII Abandonment; A. Plugging. Page 10338. OO#2 - III Requirements, Section G. Drilling Abandonment Requirements. Page 16. WOGCC Chapter 3, Section 18 Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4). Page 3-26.	OO#1: For depleted production wells, the operator must submit a Notice of Intent to Abandon and obtain the BLM's approval before plugging. OO#2: All formations bearing usable-quality water, oil, gas, or geothermal resources, and/or a prospectively valuable deposit of minerals shall be protected. WOGCC: (b)(iii) Wells with production casing must be plugged by placing cement plugs of at least one hundred foot (100') length consisting of approved cement and additives, mixed at a density approved by the Supervisor or his Authorized Agent at least every two thousand five hundred feet (2,500'), in the base of the surface casing, and at least one hundred feet (100') inside the casing at the surface. If multiple casing strings are present, a minimum one hundred foot (100') plug must be placed in the annulus between each casing string at the outside casing shoe, and a minimum one hundred foot (100') plug in each annulus at the surface.	Required	---

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5 - Closure	O&G Well Plugging and Abandonment	Subsurface or subsurface releases	5.4	Comply with WOGCC requirements for plugging and abandonment.	Eliminate potential conduits for migration of contaminants into/through subsurface.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.4 Plugging and Abandonment - 6.4.2 Subsurface page 17	6.4.2.2 Plugging Purpose: Well plugging operations are focused primarily on protecting USDW, isolating downhole formations productive of hydrocarbons or used for injection, and protecting surface soils and surface waters. A surface plug prevents surface water runoff from seeping into the wellbore and migrating into USDW. Cement plugs isolating hydrocarbon and injection/disposal intervals and a plug at the base of the lowermost USDW accomplish this primary purpose.	WOGCC Rule: Chapter 3, Section 18	WOGCC Chapter 3, Section 18 Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4). Page 3-26	WOGCC: (b)(iii) Wells with production casing must be plugged by placing cement plugs of at least one hundred foot (100') length consisting of approved cement and additives, mixed at a density approved by the Supervisor or his Authorized Agent at least every two thousand five hundred feet (2,500'), in the base of the surface casing, and at least one hundred feet (100') inside the casing at the surface. If multiple casing strings are present, a minimum one hundred foot (100') plug must be placed in the annulus between each casing string at the outside casing shoe, and a minimum one hundred foot (100') plug in each annulus at the surface.	Required	---				
5 - Closure						API RP 52	Section 7 Completion, Testing, and Plugging and Abandonment Operations - 7.4 Plugging and Abandonment page 13	7.4 Plugging and Abandonment: Plugging and abandonment of subsurface zones should be accomplished according to applicable state and federal regulations. All permits should be properly filed with the appropriate agencies. API Bulletin E3, Well Abandonment and Inactive Well Practices for U.S. Exploration and Production Operations, Environmental Guidance Document, provides additional guidance on well plugging practices.	WOGCC Rule: Chapter 3, Section 18	WOGCC Chapter 3, Section 18 Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4). Page 3-26	WOGCC: (a) It shall be the duty of any Owner, Operator, or person who assumes ownership, or contractor, drilling any well, seismic, stratigraphic test, core, or other exploratory hole, whether cased or uncased, regardless of diameter, to plug said hole in accordance with the requirements of the Supervisor or as set forth hereinafter and in a manner sufficient to properly protect all fresh water bearing formations and possible or probable oil or gas bearing formations.	Required	---				
5 - Closure							Section 8 Decommissioning - 8.3 Local Restoration page 13	8.3.4: If a water supply well is used and abandoned, it should be plugged in accordance with applicable regulations.	WSEO Rule: Part III, Chapter 4	WSEO - Part III Water Well Minimum Construction Standards, Chapter 4 Well Completion and Maintenance, Section 4: Water Well Plugging and Abandonment. Page 4-3.	WSEO: (b) The well owner is responsible to ensure that any well (including any test well or replaced well) which is permanently abandoned or removed from service shall be entirely plugged to prevent contamination from the surface or any other source and to remove any further hazard potential that an unused well or abandoned drill hole might pose.	Required	---				
5 - Closure		Open Hole								OO#2	III Requirements, Section G. Drilling Abandonment Requirements, 1. Open Hole page 17	G. Drilling Abandonment Requirements (1i): A cement plug shall be placed to extend at least 50 feet below the bottom (except as limited by total depth (TD) or plugged back total depth (PBD)), to 50 feet above the top of: (a) Any zone encountered during which contains fluid or gas with a potential to migrate; (b) Any prospectively valuable deposit of minerals.	43 CFR 3160 - Onshore Order #2			Required	---
5 - Closure										III Requirements, Section G. Drilling Abandonment Requirements, 1. Open Hole page 17	G. Drilling Abandonment Requirements (1ii): All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of the hole, plus an additional 10 percent of slurry for each 1,000 feet of depth.			Required	---		
5 - Closure										III Requirements, Section G. Drilling Abandonment Requirements, 1. Open Hole page 17	G. Drilling Abandonment Requirements (1iii): No plug, except the surface plug, shall be less than 25 sacks without receiving specific approval from the authorized officer.			Required	---		
5 - Closure		III Requirements, Section G. Drilling Abandonment Requirements, 1. Open Hole page 17	G. Drilling Abandonment Requirements (1iv): Extremely thick sections of single formation may be secured by placing 100-foot plugs across the top and bottom of the formation, and in accordance with item (1)ii hereof.	43 CFR 3160 - Onshore Order #2	Additional reference: WOGCC Chapter 3, Section 18 Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4).					Required	---						
5 - Closure		III Requirements, Section G. Drilling Abandonment Requirements, 1. Open Hole page 17	G. Drilling Abandonment Requirements (1v): In the absence of productive zones or prospectively valuable deposits of minerals which otherwise require placement of cement plugs, long sections of open hole shall be plugged at least every 3,000 feet. Such plugs shall be placed across in-gauge sections of the hole, unless otherwise approved by the authorized officer.	WOGCC Rule: Chapter 3, Section 18						Required	---						

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5 - Closure	O&G Well Plugging and Abandonment	Cased hole	5.4	Comply with WOGCC requirements for plugging and abandonment.	Eliminate potential conduits for migration of contaminants into/through subsurface.	OO#2	III Requirements, Section G. Drilling Abandonment Requirements, 2. Cased Hole page 17	G. Drilling Abandonment Requirements (2): In lieu of the cement plug, a bridge plug is acceptable, provided: (i) - The bridge plug is set within 50 feet to 100 feet above the open perforations (ii) - The perforations are isolated from any open hole below (iii) - The bridge plug is capped with 50 feet of cement. If a bailer is used to cap this plug, 35 feet of cement shall be sufficient.	43 CFR 3160 - Onshore Order #2 WOGCC Rule: Chapter 3, Section 18	Additional reference: WOGCC Chapter 3, Section 18 Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4).		Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 2. Cased Hole page 17	G. Drilling Abandonment Requirements (2): A cement plug shall be placed opposite all open perforation and extend to a minimum of 50 feet below (except as limited by TD or PBTD) to 50 feet above the perforated interval. All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of hole, plus an additional 10 percent of slurry for each 1,000 feet of depth.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 3. Casing Removed from Hole page 17	G. Drilling Abandonment Requirements (3): If any casing is cut and recovered, a cement plug shall be placed to extend at least 50 feet above and below the stub. The exposed hole resulting from the casing removal shall be secured as required in items 1i and 1ii (<i>Open Hole Requirements</i>) hereof.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 4. Intermediate String page 17	G. Drilling Abandonment Requirements (4): An additional cement plug placed to extend a minimum of 50 feet above and below the shoe of the surface casing for intermediate string, as appropriate.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 5. Annular Space page 17	G. Drilling Abandonment Requirements (5): No annular space that extends to the surface shall be left open to the drilled hole below. If this condition exists, a minimum of the top 50 feet of annulus shall be plugged with cement.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 6. Isolating Medium page 18	G. Drilling Abandonment Requirements (6): Any cement plug which is the only isolating medium for a usable water interval or a zone containing a prospectively valuable deposit of minerals shall be tested by tagging with the drill string. Any plugs placed where the fluid level will not remain static also shall be tested by either tagging the plug with the working pipe string, or pressuring to a minimum pump (surface) pressure of 1,000 psi, with no more than a 10 percent drop during a 15-minute period (cased hole only). If the integrity of any other plug is questionable, or if the authorized officer has specific concerns for which he/she orders a plug to be tested, it shall be tested in the same manner.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 7. Silica Sand or Silica Flour page 18	G. Drilling Abandonment Requirements (7): Silica sand or silica flour shall be added to cement exposed to bottom hole static temperatures above 230 °F to prevent heat degradation of the cement.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 8. Surface Plug page 18	G. Drilling Abandonment Requirements (8): A cement plug of at least 50 feet shall be placed across all annuluses. The top of this plug shall be placed as near the eventual casing cutoff point as possible.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 9. Mud page 18	G. Drilling Abandonment Requirements (9): Each of the intervals between plugs shall be filled with mud of sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling such interval. In the absence of other information at the time plugging is approved, a minimum mud weight of 9 pounds per gallon shall be specified.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 10. Surface Cap page 18	G. Drilling Abandonment Requirements (10): All casing shall be cut-off at the base of the cellar or 3 feet below final restored ground level (whichever is deeper). The well bore shall then be covered with a metal plate at least 1/4 inch thick and welded in place, or a 4-inch pipe, 10-feet in length, 4 feet above ground and embedded in cement as specified by the authorized officer. The well location and identity shall be permanently inscribed. A weep hole shall be left if a metal plate is welded in place.				Required	---
5 - Closure							III Requirements, Section G. Drilling Abandonment Requirements, 11. Cellar page 18	G. Drilling Abandonment Requirements (11): The cellar shall be filled with suitable material as specified by the authorized officer and the surface restored in accordance with the instructions of the authorized officer.				Required	---

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5 - Closure	Interim and Final Reclamation	Sediment loss	5.5	Manage disturbed areas to minimize runoff.	Control and reduce sediment discharge from reclaimed areas.	API 51R	Section 8 Production and Water Handling Facilities - 8.4 Construction Considerations page 32	8.4.8 Interim Reclamation: Interim reclamation consists of minimizing the footprint of disturbance by reclaiming to the extent possible all portions of the site not required for production operations. The portions of the cleared site not needed for operational and safety purposes are recontoured to a final or intermediate contour that blends with the surrounding topography as much as possible.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44, Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10333.	OO#1: j. Plans for Surface Reclamation: The operator must submit a plan for the surface reclamation or stabilization of all disturbed areas. This plan must address interim (during production) reclamation for the area of the well pad not needed for production, as well as final abandonment of the well location. Such plans must include, as appropriate: • Configuration of the reshaped topography; • Drainage systems; • Segregation of spoil materials (stockpiles); • Surface disturbances; • Backfill requirements; • Proposals for pit/sump closures; • Redistribution of topsoil; • Soil treatments; • Seeding or other steps to reestablish vegetation; • Weed control; and • Practices necessary to reclaim all disturbed areas, including any access roads and pipelines.	Required	---		
5 - Closure							Section 8 Production and Water Handling Facilities - 8.9 Closure and Abandonment of Facilities page 40	8.9.4 Land Reclamation and Restoration: All disturbed areas are then recontoured back to the original contour or a contour that blends with the surrounding landform, topsoil is redistributed, and the site revegetated, using native plant species or agency approved seed mixes using native plant species or agency approved seed mixes "that are acceptable to the landowner or trustee.	WOGCC Rule: Chapter 3, Section 17	WOGCC Chapter 3, Section 17 Subsequent Report of Abandonment (SRA, Form 4). Page 3-25.	WOGCC Chapter 3: (b) Reclamation must be completed in accordance with the landowner's reasonable requests, and/or resemble the original vegetation and contour of adjoining lands. Where practical, topsoil must be stockpiled during construction for use in reclamation. All disturbed areas on state lands will be recontoured and reseeded unless the Wyoming Office of State Lands and Investments approves otherwise. Appendix F of these rules includes information on reseeded.	Required	---		
5 - Closure							Section 8 Decommissioning - 8.3 Local Restoration page 13	8.3.1: The site should be restored to a condition that satisfies lease obligations and regulatory requirements. Ditches, dikes, and containment walls should be leveled. The land should be contoured to minimize erosion in the event of heavy rainfall. Topsoil, whether stockpiled at the site or hauled to the location, should be spread as part of the final contouring. A productive topsoil is necessary for replanting.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-13.	WOGCC Chapter 4: (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation. All disturbed areas on state lands will be reseeded. Appendix F of these rules includes information on seeding.	Required	---		
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-13	A.8 Wetlands, Riparian Areas, and Flood Plains: Where disturbance of wetlands, riparian areas, streams, and ephemeral/intermittent stream channels cannot be avoided, COE Section 404 permits will be obtained by the operator as necessary.	COE: 33 CFR 320: General Regulatory Policies 33 CFR 323: Permits for Discharges of Dredged or Fill Material into Waters of the United States EPA: 40 CFR 230: Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material WOGCC: Appendix F Selected Grasses and Forbs Useful in Revegetating Disturbed Lands in Wyoming	Required	---				
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.7 Reclamation: Streams, wetlands, and riparian areas disturbed during project construction will be restored to as near pre-project conditions as practical, and if impermeable soils contributed to wetland formation, soils will be compacted to reestablish impermeability. A.7 Reclamation: Areas will be recontoured and BLM-approved species will be used for reclamation. A.7 Reclamation: Disturbed channel beds will be reshaped to their approximate original configuration.	OO#1 - Federal Register Volume 72, No. 44, Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10333.	OO#1: j. Plans for Surface Reclamation: The operator must submit a plan for the surface reclamation or stabilization of all disturbed areas. This plan must address interim (during production) reclamation for the area of the well pad not needed for production, as well as final abandonment of the well location. Such plans must include, as appropriate: • Configuration of the reshaped topography; • Drainage systems; • Segregation of spoil materials (stockpiles); • Surface disturbances; • Backfill requirements; • Proposals for pit/sump closures; • Redistribution of topsoil; • Soil treatments; • Seeding or other steps to reestablish vegetation; • Weed control; and • Practices necessary to reclaim all disturbed areas, including any access roads and pipelines.	Required	---			
5 - Closure			Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: On producing locations, Operators will be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes will be backfilled and blended into the surrounding terrain, reseeded, and erosion control measures installed. Erosion control measures will be required after slope reduction. Facilities will be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.	43 CFR 3160 - Onshore Order #1 WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-13.	WOGCC: (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation. All disturbed areas on state lands will be reseeded. Appendix F [WOGCC Appendix F Selected Grasses and Forbs Useful in Revegetating Disturbed Lands in Wyoming] of these rules includes information on seeding.	Required	---						
5 - Closure					5.6	Reclaim slopes to approximate original contours.	Minimize footprint of disturbed area subject to erosion forces.	ROD FSEIS							

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5 - Closure	Interim and Final Reclamation	Sediment loss	5.6	Reclaim slopes to approximate original contours.	Minimize footprint of disturbed area subject to erosion forces.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: Disturbances should be reclaimed or managed to approach zero sediment discharge. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan will include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10333. WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-13.	OO#1: j. Plans for Surface Reclamation: The operator must submit a plan for the surface reclamation or stabilization of all disturbed areas. This plan must address interim (during production) reclamation for the area of the well pad not needed for production, as well as final abandonment of the well location. Such plans must include, as appropriate: • Configuration of the reshaped topography; • Drainage systems; • Segregation of spoil materials (stockpiles); • Surface disturbances; • Backfill requirements; • Proposals for pit/sump closures; • Redistribution of topsoil; • Soil treatments; • Seeding or other steps to reestablish vegetation; • Weed control; and • Practices necessary to reclaim all disturbed areas, including any access roads and pipelines. WOGCC: (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation. All disturbed areas on state lands will be reseeded. Appendix F [WOGCC Appendix F Selected Grasses and Forbes Useful in Revegetating Disturbed Lands in Wyoming] of these rules includes information on seeding.	Required	---
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-5 - A-6	A.3 Soil, Erosion, and Sediment Control: Projects requiring soil interpretations include: construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads and associated disturbances; and reclamation projects.	WOGCC Rule: Chapter 4, Section 1			Required	---
5 - Closure	Pad Decommissioning	Historical leaks and spills	5.7	Remediate/remove soil or fill material impacted above state standards.	Remove potential source areas post-closure.	API 51R	Section 6 Producing, Injection/Disposal Wells - 6.4 Plugging and Abandonment - 6.4.3 Surface page 18	6.4.3.2 Cleanup and Remediation: Pits should be emptied and reclaimed to a condition similar to the rest of the reclaimed pad area. Pits should be allowed to dry or be solidified in situ before filling.	43 CFR 3160 - Onshore Order #1	OO#1 - Federal Register Volume 72, No. 44. Section XII Abandonment. B. Reclamation. Page 10338.	OO#1: Pits containing fluid must not be breached (cut) and pit fluids must be removed or solidified before backfilling. Pits may be allowed to air dry subject to BLM or FS approval, but the use of chemicals to aid in fluid evaporation, stabilization, or solidification must have prior BLM or FS approval.	Required	---
5 - Closure	Pad Decommissioning	Historical leaks and spills	5.7	Remediate/remove soil or fill material impacted above state standards.	Remove potential source areas post-closure.	API 51R	Section 8 Production and Water Handling Facilities - 8.9 Closure and Abandonment of Facilities page 39	8.9.2 Equipment Removal: The following equipment removal issues should be considered. a) Tanks, separation vessels, meter runs, surface lines, pumps, and any other exposed surface equipment should be removed. Removal of the associated equipment foundations should be considered. b) Exposed piping segments from surface or subsurface equipment connecting to buried lines should be removed to a depth consistent with subsequent land use or, preferably, to the depth of buried lines. Where feasible or where desired to limit potential future liabilities, consideration should be given to removing buried lines. c) Where appropriate, each outlet of any abandoned lines should be permanently sealed.				Required	---
5 - Closure						API RP 52	Section 8 Decommissioning - 8.2 Contaminated Soil page 13	8.2 Contaminated Soil: Any soil contaminated by operations should be remediated as necessary. Inspection of the site is recommended to assess contamination. Remediation methods and acceptance criteria vary depending on the local, state, and federal regulations in effect at the location. The type, location, and extent of contamination and remediation should be documented and maintained in the well records.			Required	---	

POLLUTION PREVENTION MATRICES
 PINEDALE ANTICLINE PROJECT AREA

Project Phase	Activity	Source (of Potential Contamination)	Practice ID	Operator Practice	Operator Mitigation Measure	Reference Document	Reference Document Section / Page	Reference Document Language (Applicable BMP)	Applicable Rules / Regulations	Applicable Rules / Regulations: Document Section / Page	Applicable Rules / Regulations Language	Required or Voluntary	Operator Reference
5 - Closure	Interim and Final Reclamation	Sediment loss	5.8	Revegetate disturbed areas.	Minimize footprint of disturbed area subject to erosion forces.	ROD FSEIS	Appendix A BLM's Practices and Restrictions for the PAPA page A-5	A.3 Soil, Erosion, and Sediment Control: Operators will avoid adverse impacts to soils by: promptly revegetating disturbed areas using adapted species.	43 CFR 3160 - Onshore Order #1 WOGCC Rule: Chapter 4, Section 1	OO#1 - Federal Register Volume 72, No. 44. Section III Application for Permit to Drill (APD). D. Components of a Complete APD Package. 4. Surface Use Plan of Operations. Page 10333. WOGCC Chapter 4, Section 1 Pollution and Surface Damage (Forms 14A and 14B). Page 4-13.	OO#1: j. Plans for Surface Reclamation: The operator must submit a plan for the surface reclamation or stabilization of all disturbed areas. This plan must address interim (during production) reclamation for the area of the well pad not needed for production, as well as final abandonment of the well location. Such plans must include, as appropriate: • Configuration of the reshaped topography; • Drainage systems; • Segregation of spoil materials (stockpiles); • Surface disturbances; • Backfill requirements; • Proposals for pit/sump closures; • Redistribution of topsoil; • Soil treatments; • Seeding or other steps to reestablish vegetation; • Weed control; and • Practices necessary to reclaim all disturbed areas, including any access roads and pipelines. WOGCC: (rr) Site rehabilitation should be in accordance with reasonable landowner's wishes, and/or resemble the original vegetation and contour of the adjoining lands. Where practical, topsoil must be stockpiled during construction for use in rehabilitation. All disturbed areas on state lands will be reseeded. Appendix F [WOGCC Appendix F Selected Grasses and Forbes Useful in Revegetating Disturbed Lands in Wyoming] of these rules includes information on seeding.	Required	---
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.7 Reclamation: Disturbed channel beds will be reshaped to their approximate original configuration.				Required	---
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.7 Reclamation: Streams, wetlands, and riparian areas disturbed during project construction will be restored to as near pre-project conditions as practical, and if impermeable soils contributed to wetland formation, soils will be compacted to reestablish impermeability.				Required	---
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-10	A.7 Reclamation: Reclamation activities will begin on disturbed wetland areas immediately after completion of project activities.				Required	---
5 - Closure							Appendix A BLM's Practices and Restrictions for the PAPA page A-11	A.7 Reclamation: Disturbances should be reclaimed or managed to approach zero sediment discharge. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan will include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity.				Required	---
5 - Closure						Pinedale Anticline Project Area Monitoring for Success. pages 1 - 13.	This Reclamation Monitoring Plan was developed to give standardized guidance for monitoring reclamation success in the Pinedale Anticline Project Area (PAPA). This Plan contains criteria that are required to be measured and reported annually to the Bureau of Land Management (BLM) and Pinedale Anticline Project Office (PAPO).	Required				---	
5 - Closure						Section 6 Producing, Injection/Disposal Wells - 6.4 Plugging and Abandonment - 6.4.3 Surface page 19	6.4.3.3 Soil Erosion: Disturbed areas, such as roads, pits, and well sites, may need to be further remediated depending on lease agreements.	Required				---	
5 - Closure						Section 8 Production and Water Handling Facilities - 8.4 Construction Considerations page 32	8.4.8 Interim Reclamation: Interim reclamation consists of minimizing the footprint of disturbance by reclaiming to the extent possible all portions of the site not required for production operations. The portions of the cleared site not needed for operational and safety purposes are recontoured to a final or intermediate contour that blends with the surrounding topography as much as possible.	Required				---	
5 - Closure						Section 8 Decommissioning - 8.3 Local Restoration page 13	8.3.2: Reseeding and replanting of the location should be done with plants and grasses native to the area. Soil amendments to encourage establishment of vegetation should be calculated based upon soil testing results. Erosion mitigation is a primary objective of reseeded.	Required				---	
5 - Closure	Pipeline Decommissioning	In-Situ	5.9	Seal ends of pipeline or remove pipeline.	Ensure decommissioned lines will not impact groundwater.	BLM Gold Book	Chapter 6 Reclamation and Abandonment - Pipeline and Flowline Reclamation page 45	Final abandonment of pipelines and flowlines will involve flushing and properly disposing of any fluids in the lines. All surface lines and any lines that are buried close to the surface that may become exposed due to water or wind erosion, soil movement, or anticipated subsequent use, must be removed. Deeply buried lines may remain in place unless otherwise directed by the authorized officer.	WOGCC Rule: Chapter 4, Section 1	WOGCC Chapter 4, Section 15 Production Facilities and Natural Gas Facility Equipment and Flowline Abandonment. Page 4-33	WOGCC: (b) The Supervisor may require the Owner or Operator to abandon and/or remove all above ground piping. If flowlines or facility piping are removed, the removal shall be done in a manner that prevents the escape of fluids, that is: (i) Purge with fresh water or inert gases, drain and depressure; then, (ii) Seal the line or cap at both ends. If not removed, the Owner or Operator will be required to mark remaining piping to identify as purged piping.	Required	---