

FIELD-WIDE EXPLORATION AND PRODUCTION WASTE MANAGEMENT PLAN

**NORTH PARK BASIN PROJECT AREA
JACKSON COUNTY, COLORADO**

JANUARY 2016

Prepared for:

**SANDRIDGE EXPLORATION AND PRODUCTION, LLC
Oklahoma City, Oklahoma**

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WASTE MANAGEMENT PLAN**

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EXECUTIVE SUMMARY

SandRidge Exploration and Production, LLC (SandRidge) is an oil and gas exploration and production company operating in the North Park Basin in Jackson County, Colorado. SandRidge is registered with the Colorado Oil and Gas Conservation Commission (COGCC) and was assigned Operator No. 10598.

In an effort to promote the minimization of wastes that would otherwise be disposed off-site, SandRidge is proposing to manage water-based bentonitic E&P wastes generated during well drilling activities via bioremediation land treatment techniques, allowing SandRidge to beneficially use the wastes after achieving compliance with applicable COGCC rules.

This document outlines the operational requirements to be implemented when land treating residual water-based bentonitic drilling fluids and associated drill cuttings on the drill pad locations where they were generated to comply with COGCC Rule 907.e.(2). These materials will be treated on-site via solidification and bioremediation techniques. Once compliant with the COGCC Table 910-1 concentration levels, the materials will be utilized on-site or at other COGCC-permitted facilities in the North Park Basin operated by SandRidge, as defined in this Field-Wide Exploration and Production (E&P) Waste Management Plan. Facility locations are illustrated on Figure 1.

1.0 REGULATORY FRAMEWORK

SandRidge has developed practices and procedures to ensure that on-site land treatment of water-based bentonitic drilling fluids and associated drill cuttings are managed in a way to achieve compliance with the COGCC 900 Series Rules (Appendix A). The practices and procedures for this plan are identified in the following sections.



2.0 PRACTICES AND PROCEDURES

2.1 GENERAL

Water-based bentonitic drill cuttings will be solidified and bioremediated utilizing commercially available solidification and bioremediation products (e.g. EcoSponge, Geozorb, etc.) on SandRidge operated oil and gas production well pads located in Jackson County, Colorado. Only residual water-based bentonitic drilling fluids and associated drill cuttings generated by SandRidge will be land treated at these locations. No other E&P wastes will be deposited at these sites. If land treatment occurs on an adjacent area not being utilized for oil and gas operations, SandRidge will obtain prior written surface owner approval per COGCC Rule 907.e.(2)G.

2.2 MATERIAL HANDLING

2.2.1 Drilling Fluids

SandRidge will employ closed-loop drilling techniques at the production well pad locations. The drill cuttings will be mechanically separated from water-based bentonitic drilling fluids and stored on-site in temporary aboveground storage tanks. Drilling fluids will be disposed of accordingly per COGCC Rule 907.d.

2.2.2 Drill Cuttings

After the drill cuttings are mechanically separated from the drilling fluids, they will be conveyed into a temporary cuttings cell. SandRidge will use suitable solidification and bioremediation materials to further dry the cuttings and prevent free liquids from leaching from the cuttings themselves. Potential solidification and bioremediation materials that will be used include one of the commercially available products identified above, although native soil may also be used as well. Once removed from the temporary cuttings cell, the drill cuttings will be temporarily stockpiled followed by spreading in evenly sized windrows on a designated area of the drilling pad to prevent pooling, ponding, or run-off of fluids. The solidified drill cuttings will be stockpiled in windrows in the designated treatment area to a maximum width of twelve feet and a maximum lift of four feet. Biodegradation of the cuttings will be enhanced by disking, tilling, aerating, or the addition of nutrients, water, and/or biological amendments to promote microbial hydrocarbon degradation, as needed.

2.3 STORMWATER CONTROLS

The drill cuttings windrows will be surrounded by perimeter structural controls, such as an earthen berm, to prevent potential stormwater run-on and run-off. Bi-weekly (14-day) inspections of these controls will be conducted to ensure that they are properly maintained. Following any precipitation event significant enough to cause erosion, the liquid level within the controls will be inspected and removed for proper disposal, as needed. These structural controls will be maintained at all times while soil treatment activities are being conducted.

2.4 WEED CONTROL

Invasive weed control will be conducted in the disturbed areas associated with the land treatment areas.

2.5 GREATER SAGE GROUSE HABITAT STIPULATIONS

If the treatment area is located within an identified greater sage grouse leks habitat, material turning activities will occur outside of seasonal stipulations for the greater sage-grouse (i.e. March 1 to June 30).

3.0 SAMPLING PLAN

The following describes the procedures that will be used to sample and analyze drill cuttings that have been bioremediated to ensure that they are compliant with the COGCC Table 910-1 concentration levels prior to their beneficial use.

3.1 CONFIRMATION SAMPLING

One composite soil sample consisting of four to five discrete grab samples will be periodically collected for every 100 cubic yards of cuttings being treated to gauge bioremediation progress. The number of composite samples to be collected will be based on measuring the dimensions of each drill cuttings windrow from which their volumes, expressed in cubic yards, will be determined. The samples will be collected using a hand auger or similar sampling device, then containerized and preserved pursuant to well-established sample collection protocols, after which they will be delivered to an independent third-party laboratory for analysis under strict chain-of-custody (COC) procedures. The samples will be analyzed for total petroleum hydrocarbons (TPH)-gasoline range organics (GRO), TPH-diesel range organics (DRO), benzene, toluene, ethylbenzene, and total xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), electrical conductivity (EC), pH, sodium adsorption ratio (SAR), and COGCC Table 910-1 metals, except boron using the analytical methods prescribed in the EPA publication SW-846 *Methods for Evaluating Solid Waste, Physical/Chemical Methods*.

3.2 NON-COMPLIANT SAMPLES

Additional samples of the cuttings will be periodically collected until compliance with Table 910-1 concentration levels is achieved for the confirmation analysis addressed in Section 3.1 above.

If any of the above analytes exceed Table 910-1 concentration levels following a three-year treatment period, then SandRidge will either:

- 1.) Dispose of the cuttings at a permitted commercial disposal facility;
- 2.) Prepare and submit a plan to the COGCC to bury the cuttings and cover it with at least three feet of clean soil, if the cuttings only exceed inorganics (EC, pH, or SAR); or
- 3.) Use it at another location outside of active agricultural areas if the cuttings only exceed inorganics.

If buried off site, then written land owner permission will be obtained.



4.0 BENEFICIAL USE

Upon receipt of analytical results demonstrating that the treated cuttings are compliant with the COGCC Table 910-1 concentration levels, they will be beneficially used on-site or at other COGCC-permitted facilities in the North Park Basin operated by SandRidge.

4.1 TYPES OF BENEFICIAL USE

The treated cuttings will be beneficially used as construction material at SandRidge operated oil and gas locations. Specifically, the treated cuttings will be used in the construction and maintenance of well pads, access roads, containment berms or other similar applications.

4.2 SURFACE OWNER AGREEMENT

Written authorization from the surface owner will be obtained by SandRidge if land treatment occurs in an adjacent area not being utilized for oil and gas operations.



5.0 DOCUMENTATION

5.1 RECORDKEEPING

SandRidge will maintain the following records:

- Name of the on-site production well(s) and pad where cuttings were generated;
- Volumes of drill cuttings treated and solidification and/or bioremediation materials used;
- Treatment type and date;
- Date of transfer of the treated material from the treatment area to the area of beneficial use;
- Name of transporter;
- Location where the treated cuttings were used, recorded using GPS coordinates; and
- The manner in which the treated cuttings were beneficially used.

Upon written request by the COGCC, this information will be provided within five business days, in a format readily reviewable. The recordkeeping format is included as Table 1.

5.2 CLOSURE

Once the treated cuttings meet the Table 910-1 concentration levels and have been removed from the treatment area for on-site or off-site beneficial use, SandRidge will request closure of the treatment area by submitting a Sundry Notice Form 4 that includes a report summarizing the sampling activities and the corresponding analytical results.



FIGURES

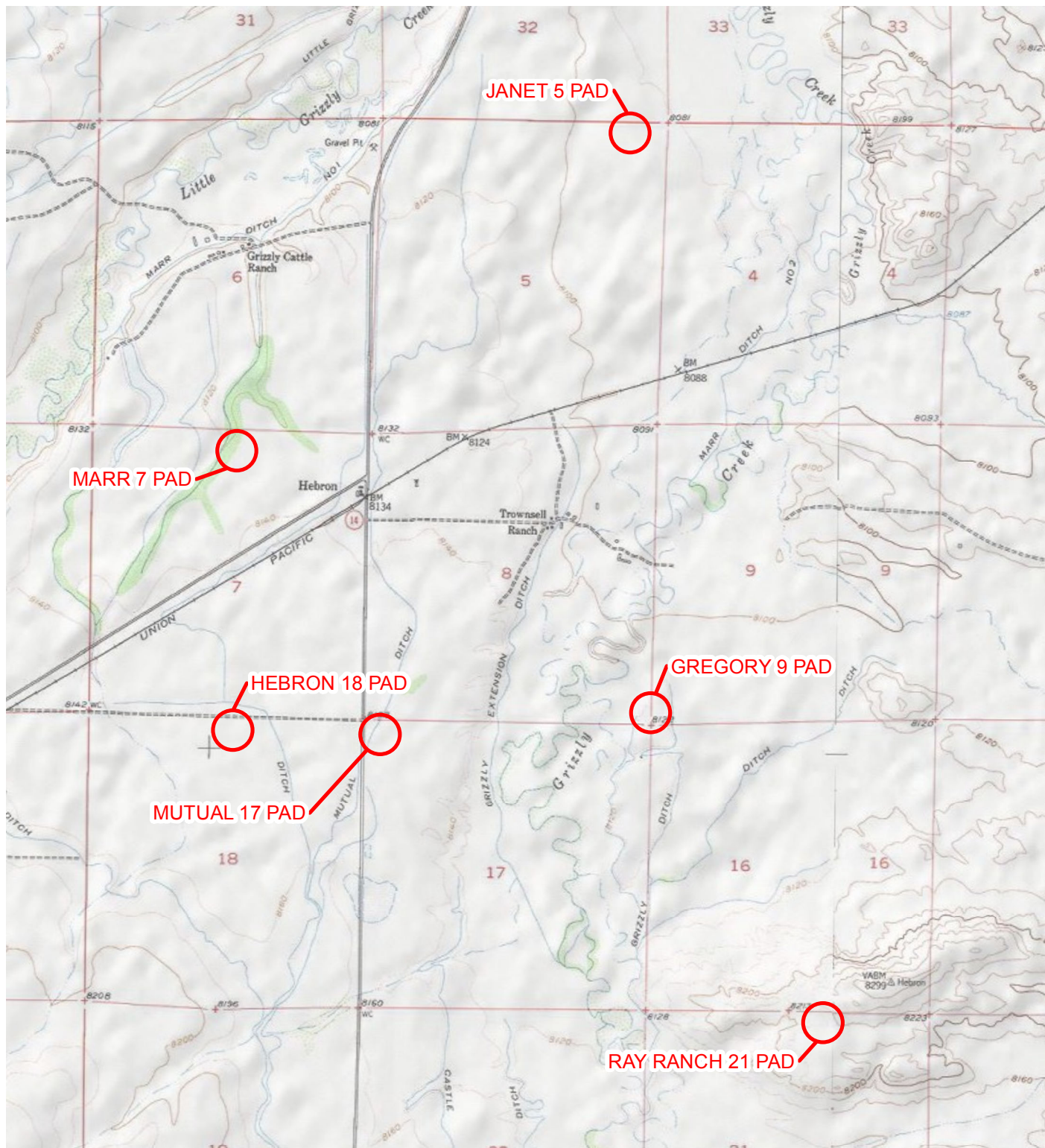


IMAGE COURTESY OF ESRI/USGS

LEGEND

○ SITE LOCATION

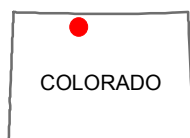
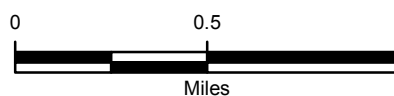


FIGURE 1
SITE LOCATION MAP
NORTH PARK BASIN E&P WASTE MANAGEMENT PLAN
JACKSON COUNTY, COLORADO

SANDRIDGE EXPLORATION AND PRODUCTION, LLC



TABLES

TABLE 1
DRILLING PAD LOCATION TRACKING SHEET

NORTH PARK BASIN PROJECT AREA EXPLORATION & PRODUCTION WASTE MANAGEMENT PLAN
SANDRIDGE EXPLORATION AND PRODUCTION, LLC

Pad Name	Facility ID	Production Well Name	API No.	Spud Date	Completion Date	Material Volume Generated	Treatment Type	Treatment Date	Sample Date(s)	Date of Transfer	Reuse Location	Name of Transporter	Comments
Gregory 9 Pad	439603	Gregory #5-09H	05-057-06535										
Hebron 18 Pad	414127	Hebron 01-18HR	05-057-06536										
Mutual 17 Pad	324757	Mutual 01-17H	05-057-06534										
Marr 7 Pad	413754	Marr 06-07H	05-057-06497										
Janet 5 Pad	434832	Janet 1-05H	05-057-06522										
Ray Ranch 21 Pad	438250	Ray Ranch #7-21H	05-057-06531										



APPENDIX A

E&P WASTE MANAGEMENT

901. INTRODUCTION

- a. **General.** The rules and regulations of this series establish the permitting, construction, operating and closure requirements for pits, methods of E&P waste management, procedures for spill/release response and reporting, and sampling and analysis for remediation activities. The 900 Series rules are applicable only to E&P waste, as defined in § 34-60-103(4.5), C.R.S., or other solid waste where the Colorado Department Of Public Health And Environment has allowed remediation and oversight by the Commission.
- b. **COGCC reporting forms.** The reporting required by the rules and regulations of this series shall be made on forms provided by the Director. Alternate forms may be used where equivalent information is supplied and the format has been approved by the Director.
- c. **Additional requirements.** Whenever the Director has reasonable cause to believe that an operator, in the conduct of any oil or gas operation, is performing any act or practice which threatens to cause or causes a violation of Table 910-1 and with consideration of water quality standards or classifications established by the Water Quality Control Commission ("WQCC") for waters of the state, the Director may impose additional requirements, including but not limited to, sensitive area determination, sampling and analysis, remediation, monitoring, permitting and the establishment of points of compliance. Any action taken pursuant to this Rule shall comply with the provisions of Rules 324A. through D. and the 500 Series rules.
- d. **Alternative compliance methods.** Operators may propose for prior approval by the Director alternative methods for determining the extent of contamination, sampling and analysis, or alternative cleanup goals using points of compliance.
- e. **Sensitive area determination.** When the operator or Director has data that indicate an impact or threat of impact to ground water or surface water, the Director may require the operator to make a sensitive area determination and that determination shall be subject to the Director's approval. The sensitive area determination shall be made using appropriate geologic and hydrogeologic data to evaluate the potential for impact to ground water and surface water, such as soil borings, monitoring wells, or percolation tests that demonstrate that seepage will not reach underlying ground water or waters of the State and impact current or future uses of these waters. Operators shall submit data evaluated and analysis used in the determination to the Director.
- f. **Sensitive area operations.** Operations in sensitive areas shall incorporate adequate measures and controls to prevent significant adverse environmental impacts and ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC standards and classifications.

902. PITS - GENERAL AND SPECIAL RULES

- a. Pits used for exploration and production of oil and gas shall be constructed and operated to protect public health, safety, and welfare and the environment, including soil, waters of the state, and wildlife, from significant adverse environmental, public health, or welfare impacts from E&P waste, except as permitted by applicable laws and regulations.
- b. Pits shall be constructed, monitored, and operated to provide for a minimum of two (2) feet of freeboard at all times between the top of the pit wall at its point of lowest elevation and

the fluid level of the pit. A method of monitoring and maintaining freeboard shall be employed. Any unauthorized release of fluids from a pit shall be subject to the reporting requirements of Rule 906.

- c. Any accumulation of oil or condensate in a pit shall be removed within twenty-four (24) hours of discovery. Operators shall use skimming, steam cleaning of exposed liners, or other safe and legal methods as necessary to maintain pits in clean condition and to control hydrocarbon odors. Only de minimis amounts of hydrocarbons may be present unless the pit is specifically permitted for oil or condensate recovery or disposal use. A Form 15, Earthen Pit Report/Permit, may be revoked by the Director and the Director may require that the pit be closed if an operator repeatedly allows more than de minimis amounts of oil or condensate to accumulate in a pit. This requirement is not applicable to properly permitted and properly fenced, lined, and netted skim pits that are designed, constructed, and operated to prevent impacts to wildlife, including migratory birds.
- d. Where necessary to protect public health, safety and welfare or to prevent significant adverse environmental impacts resulting from access to a pit by wildlife, migratory birds, domestic animals, or members of the general public, operators shall install appropriate netting or fencing.
- e. Pits used for a period of no more than three (3) years, or more than three (3) years if the Director has issued a variance, for storage, recycling, reuse, treatment, or disposal of E&P waste or fresh water, as applicable, may be permitted in accordance with Rule 903 to service multiple wells, subject to Director approval.
- f. Unlined pits shall not be constructed on fill material.
- g. Except as allowed under Rule 904.a, unlined pits shall not be constructed in areas where pathways for communication with ground water or surface water are likely to exist.
- h. Produced water shall be treated in accordance with Rule 907 before being placed in a production pit.
- i. Operators shall utilize appropriate biocide treatments to control bacterial growth and related odors as needed.

903. PIT PERMITTING/REPORTING REQUIREMENTS

- a. An Earthen Pit Report/Permit, Form 15, shall be submitted to the Director for prior approval for the following pits:
 - (1) All production pits.
 - (2) Special purpose pits except those reported under Rule 903.b.(1) or Rule 903.b.(2).
 - (3) Drilling pits designed for use with fluids containing hydrocarbon concentrations exceeding 10,000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm.
 - (4) Multi-well pits containing produced water, drilling fluids, or completion fluids that will be recycled or reused, except where reuse consists only of moving drilling fluids from one (1) oil and gas location to another such location for reuse there.
- b. An Earthen Pit Report/Permit, Form 15, shall be submitted within thirty (30) calendar days after construction for the following:

- (1) Special purpose pits used in the initial phase of emergency response.
- (2) Flare pits where there is no risk of condensate accumulation.
- c. An Earthen Pit Report/Permit, Form 15, shall not be required for drilling pits using water-based bentonitic drilling fluids with concentrations of TPH and chloride below those referenced in Rule 903.a.(3).
- d. An Earthen Pit Report/Permit, Form 15, shall be completed in accordance with the instructions in Appendix I. Failure to complete the form in full may result in delay of approval or return of form.
- e. The Director shall endeavor to review any properly completed Earthen Pit Report/Permit, Form 15, within thirty (30) calendar days after receipt. In order to allow adequate time for pit permit review and approval, operators shall submit an Earthen Pit Report/Permit, Form 15, at the same time as the Application for Permit-to-Drill, Form 2, is submitted. The Director may condition permit approval upon compliance with additional terms, provisions, or requirements necessary to protect the waters of the state, public health, or the environment.

904. PIT LINING REQUIREMENTS AND SPECIFICATIONS

- a. Pits that were constructed before May 1, 2009 on federal land, or before April 1, 2009 on other land, shall comply with their permit conditions and the rules in effect at the time of their construction. The following pits shall be lined if they are constructed on or after May 1, 2009 on federal land, or on or after April 1, 2009 on other land:
 - (1) Drilling pits designed for use with fluids containing hydrocarbon concentrations exceeding 10,000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm.
 - (2) Production pits, other than skim pits, unless the operator demonstrates to the Director's satisfaction that the quality of the produced water is equivalent to or better than that of the underlying groundwater or the operator can clearly demonstrate by substantial evidence, such as by appropriate percolation tests, that seepage will not reach the underlying aquifer or waters of the state at contamination levels in excess of applicable standards. Subject to Rule 901.c, this requirement shall not apply to such pits in Huerfano or Las Animas Counties constructed before May 1, 2011, or to such pits in Washington, Yuma, Logan, or Morgan counties constructed before May 1, 2013.
 - (3) Special purpose pits, except emergency pits constructed during initial emergency response to spills/releases, or flare pits where there is no risk of condensate accumulation.
 - (4) Skim pits.
 - (5) Multi-well pits used to contain produced water, drilling fluids, or completion fluids that will be recycled or reused, except where reuse consists only of moving drilling fluids from one oil and gas location to another such location for reuse there. Subject to Rule 901.c, this requirement shall not apply to multi-well pits used to contain produced water in Huerfano or Las Animas Counties constructed before May 1, 2011, or to multi-well

pits used to contain produced water in Washington, Yuma, Logan, or Morgan counties constructed before May 1, 2013.

(6) Pits at centralized E&P waste management facilities and UIC facilities.

b. The following specifications shall apply to all pits that are required to be lined by rule or by permit condition:

(1) Materials used in lining pits shall be of a synthetic material that is impervious, has high puncture and tear strength, has adequate elongation, and is resistant to deterioration by ultraviolet light, weathering, hydrocarbons, aqueous acids, alkali, fungi or other substances in the produced water.

(2) All pit lining systems shall be designed, constructed, installed, and maintained in accordance with the manufacturers' specifications and good engineering practices.

(3) Field seams must be installed and tested in accordance with manufacturer specifications and good engineering practices. Testing results must be maintained by the operator and provided to the Director upon request.

c. The following specifications shall also apply to pits that are required to be lined, except those at centralized E&P waste management facilities, unless an oil and gas operator demonstrates to the satisfaction of the Director that a liner system offering equivalent protection to public health, safety, and welfare, including the environment and wildlife resources, will be used:

(1) Liners shall have a minimum thickness of twenty-four (24) mils. The synthetic or fabricated liner shall cover the bottom and interior sides of the pit with the edges secured with at least a twelve (12) inch deep anchor trench around the pit perimeter. The anchor trench shall be designed to secure, and prevent slippage or destruction of, the liner materials.

(2) The foundation for the liner shall be constructed with soil having a minimum thickness of twelve (12) inches after compaction covering the entire bottom and interior sides of the pit, and shall be constructed so that the hydraulic conductivity shall not exceed 1.0×10^{-7} cm/sec after testing and compaction. Compaction and permeability test results measured in the laboratory and field must be maintained by the operator and provided to the Director upon request.

(3) As an alternative to the soil foundation described in Rule 904.c.(2), the foundation may be constructed with bedding material that exceeds a hydraulic conductivity of 1.0×10^{-7} cm/sec, if a double synthetic liner system is used; however, the bottom and sides of the pit shall be padded with soil or synthetic matting type material and shall be free of sharp rocks or other material that are capable of puncturing the liner. Each synthetic liner shall have a minimum thickness of twenty-four (24) mils.

d. The following specifications shall also apply to pits used at centralized E&P waste management facilities, unless an oil and gas operator demonstrates to the satisfaction of the Director that a liner system offering equivalent protection to public health, safety, and welfare, including the environment and wildlife resources, will be used:

(1) Liners shall have a minimum thickness of sixty (60) mils. The synthetic or fabricated liner shall cover the bottom and interior sides of the pit with the edges secured

with at least a twelve (12) inch deep anchor trench around the pit perimeter. The anchor trench shall be designed to secure, and prevent slippage or destruction of, the liner materials.

- (2) The foundation for the liner shall be constructed with soil having a minimum thickness of twenty-four (24) inches after compaction covering the entire bottom and interior sides of the pit, and shall be constructed so that the hydraulic conductivity shall not exceed 1.0×10^{-7} cm/sec after testing and compaction. Compaction and permeability test results measured in the laboratory and field must be maintained by the operator and provided to the Director upon request.
 - (3) As an alternative to the soil foundation described in Rule 904.d.(2), a secondary liner consisting of a geosynthetic clay liner, which is a manufactured hydraulic barrier typically consisting of bentonite clay or other very low permeability material, supported by geotextiles or geomembranes, which are held together by needling, stitching, or chemical adhesives, may be used.
- e. In Sensitive Areas, the Director may require a leak detection system for the pit or other equivalent protective measures, including but not limited to, increased record-keeping requirements, monitoring systems, and underlying gravel fill sumps and lateral systems. In making such determination, the Director shall consider the surface and subsurface geology, the use and quality of potentially-affected ground water, the quality of the produced water, the hydraulic conductivity of the surrounding soils, the depth to ground water, the distance to surface water and water wells, and the type of liner.

905. CLOSURE OF PITS, AND BURIED OR PARTIALLY BURIED PRODUCED WATER VESSELS.

- a. Drilling pits shall be closed in accordance with the 1000-Series Rules.
- b. Pits not used exclusively for drilling operations, buried or partially buried produced water vessels, and emergency pits shall be closed in accordance with an approved Site Investigation and Remediation Workplan, Form 27. The workplan shall be submitted for prior Director approval and shall include a description of the proposed investigation and remediation activities in accordance with Rule 909. Emergency pits shall be closed and remediated as soon as the initial phase of emergency response operations are complete or process upset conditions are controlled.
 - (1) Operators shall ensure that soils and ground water meet the concentration levels of Table 910-1.
 - (2) **Pit evacuation.** Prior to backfilling and site reclamation, E&P waste shall be treated or disposed in accordance with Rule 907.
 - (3) Liners shall be disposed as follows:
 - A. **Synthetic liner disposal.** Liner material shall be removed and disposed in accordance with applicable legal requirements for solid waste disposal.
 - B. **Constructed soil liners.** Constructed soil liner material may be removed for treatment or disposal, or, where left in place, the material shall be ripped and mixed with native soils in a manner to alleviate compaction and prevent an impermeable barrier to infiltration and ground water flow and shall meet soil standards listed in Table 910-1.

- (4) Soil beneath the low point of the pit must be sampled to verify no leakage of the managed fluids. Soil left in place shall meet the standards listed in Table 910-1.
- c. **Discovery of a spill/release during closure.** When a spill/release is discovered during closure operations, operators shall report the spill/release on the Spill/Release Report, Form 19, in accordance with Rule 906. Leaking pits and buried or partially buried produced water vessels shall be closed and remediated in accordance with Rules 909. and 910.
- d. **Unlined drilling pits.** Unlined drilling pits shall be closed and reclaimed in accordance with the 1000 Series rules and operators shall ensure that soils and ground water meet the concentration levels in Table 910-1.

906. SPILLS AND RELEASES

- a. **General.** Operators shall, immediately upon discovery, control and contain all spills/releases of E&P waste or produced fluids to protect the environment, public health, safety, and welfare, and wildlife resources. Operators shall investigate, clean up, and document impacts resulting from spills/releases as soon as practicable. The Director may require additional activities to prevent or mitigate threatened or actual significant adverse environmental impacts on any air, water, soil or biological resource, or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.
- b. **Reporting spills or releases of E&P Waste or produced fluids.**
 - (1) Report to the Director. Operators shall report a spill or release of E&P Waste or produced fluids that meet any of the following criteria to the Director verbally or in writing as soon as practicable, but no more than twenty-four (24) hours after discovery (the "Initial Report").
 - A. A spill/release of any size that impacts or threatens to impact any waters of the state, a residence or occupied structure, livestock, or public byway;
 - B. A spill/release in which one (1) barrel or more of E&P Waste or produced fluids is spilled or released outside of berms or other secondary containment;
 - C. A spill/release of five (5) barrels or more regardless of whether the spill/release is completely contained within berms or other secondary containment.

The Initial Report to the Director shall include, at a minimum, the location of the spill/release and any information available to the Operator about the type and volume of waste involved.

If the Initial Report was not made by submitting a COGCC Spill/Release Report, Form 19 the Operator must submit a Form 19 with the Initial Report information as soon as practicable but not later than 72 hours after discovery of the spill/release unless extended by the Director.

In addition to the Initial Report to the Director, the Operator shall make a supplemental report on Form 19 not more than 10 calendar days after the spill/release is discovered that includes an 8 1/2 x 11 inch topographic map showing the governmental section and location of the spill or an aerial photograph showing the location of the spill; all pertinent

information about the spill/release known to the Operator that has not been reported previously; and information relating to the initial mitigation, site investigation, and remediation measures conducted by the Operator.

The Director may require further supplemental reports or additional information.

- (2) Notification to the local government. In addition to the Initial Report to the Director, as soon as practicable, but not more than 24 hours after discovery of a spill/release of E & P Waste or produced fluids reportable under Rule 906.b.(1)A or B, above, an Operator shall provide verbal or written notification to the entity with jurisdiction over emergency response within the local municipality if the spill/release occurred within a municipality or the local county if the spill/release did not occur within a municipality. The notification shall include, at a minimum, the information provided in the Initial Report to the Director.
 - (3) Notification to the Surface Owner. In addition to the Initial Report to the Director, within 24 hours after discovery of a spill/release of E & P Waste or produced fluids reportable under Rule 906.b.(1)A or B, an Operator shall provide verbal notification to the affected Surface Owner or the Surface Owner's appointed tenant. If the Surface Owner cannot be reached within 24 hours, the Operator shall continue good faith efforts to notify the Surface Owner until notice has been provided. The verbal notification shall include, at a minimum, the information provided in the Initial Report to the Director.
 - (4) Report to Environmental Release/Incident Report Hotline. A spill/release of any size which impact or threaten to impact any surface water supply area shall be reported to the Director and to the Environmental Release/Incident Report Hotline (1-877-518-5608). Spills and releases that impact or threaten a surface water intake shall be verbally reported to the emergency contact for that facility immediately after discovery.
 - (5) Reporting chemical spills or releases. Chemical spills and releases shall be reported in accordance with applicable state and federal laws, including the Emergency Planning and Community Right-to-Know Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Oil Pollution Act, and the Clean Water Act, as applicable.
- c. **Remediation of spills/releases.** When threatened or actual significant adverse environmental impacts on any air, water, soil or other environmental resource from a spill/release exist or when necessary to ensure compliance with the concentration levels in Table 910-1 with consideration to WQCC ground water standards and classifications, the Director may require operators to submit a Site Investigation and Remediation Workplan, Form 27.
- (1) Such spills/releases shall be remediated in accordance with Rules 909 and 910.
 - (2) The operator shall make good faith efforts to notify and consult with the affected Surface Owner, or the Surface Owner's appointed tenant, prior to commencing operations to remediate E&P waste from a spill/release in an area not being utilized for oil and gas operations. Such efforts shall not unreasonably delay commencement of remediation approved by the Director.

d. **Spill/release prevention.**

- (1) **Secondary containment.** Secondary containment structures shall be sufficiently impervious to contain discharged material. Secondary containment that was constructed before May 1, 2009 on federal land, or before April 1, 2009 on other land, shall comply with the rules in effect at the time of construction. Secondary containment constructed on or after May 1, 2009 on federal land, or on or after April 1, 2009 on other land shall be constructed or installed around all tanks containing oil, condensate, or produced water with greater than 3,500 milligrams per liter (mg/l) total dissolved solids (TDS) and shall be sufficient to contain the contents of the largest single tank and sufficient freeboard to contain precipitation. Operators are also subject to tank and containment requirements under Rules 603. and 604. This requirement shall not apply to water tanks with a capacity of fifty (50) barrels or less.
- (2) **Spill/release evaluation.** Operators shall determine and document the cause of a spill/release of E & P Waste or produced fluids and, to the extent practicable, identify and timely implement measures to prevent spills/releases due to similar causes in the future.

907. MANAGEMENT OF E&P WASTE

a. **General requirements.**

- (1) **Operator obligations.** Operators shall ensure that E&P waste is properly stored, handled, transported, treated, recycled, or disposed to prevent threatened or actual significant adverse environmental impacts to air, water, soil or biological resources or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.
- (2) E&P waste management activities shall be conducted, and facilities constructed and operated, to protect the waters of the state from significant adverse environmental impacts from E&P waste, except as permitted by applicable laws and regulations.
- (3) **Reuse and recycling.** To encourage and promote waste minimization, operators may propose plans for managing E&P waste through beneficial use, reuse, and recycling by submitting a written management plan to the Director for approval on a Sundry Notice, Form 4, if applicable. Such plans shall describe, at a minimum, the type(s) of waste, the proposed use of the waste, method of waste treatment, product quality assurance, and shall include a copy of any certification or authorization that may be required by other laws and regulations. The Director may require additional information.

b. **Waste transportation.**

- (1) E&P waste, when transported off-site within Colorado for treatment or disposal, shall be transported to facilities authorized by the Director or waste disposal facilities approved to receive E&P waste by the Colorado Department of Public Health and Environment. When transported to facilities outside of Colorado for treatment or disposal, E&P waste shall be transported to facilities authorized and permitted by the appropriate regulatory agency in the receiving state.

- (2) **Waste generator requirements.** Generators of E&P waste that is transported off-site shall maintain, for not less than five (5) years, copies of each invoice, bill, or ticket and such other records as necessary to document the following requirements A through F:

- A. The date of the transport;
- B. The identity of the waste generator;
- C. The identity of the waste transporter;
- D. The location of the waste pickup site;
- E. The type and volume of waste; and
- F. The name and location of the treatment or disposal site.

Such records shall be signed by the transporter, made available for inspection by the Director during normal business hours, and copies thereof shall be furnished to the Director upon request.

c. Produced water.

- (1) **Treatment of produced water.** Produced water shall be treated prior to placement in a production pit to prevent crude oil and condensate from entering the pit.

- (2) **Produced water disposal.** Produced water may be disposed as follows:

- A. Injection into a Class II well, permitted in accordance with Rule 325.;
- B. Evaporation/percolation in a properly permitted pit;
- C. Disposal at permitted commercial facilities;
- D. Disposal by roadspreading on lease roads outside sensitive areas for produced waters with less than 3,500 mg/l TDS when authorized by the surface owner and in accordance with an approved waste management plan per Rule 907.a.(3). Roadspreading of produced waters shall not impact waters of the state, shall not result in pooling or runoff, and the adjacent soils shall meet the concentration levels in Table 910-1. Flowback fluids shall not be used for dust suppression.
- E. Discharging into state waters, in accordance with the Water Quality Control Act and the rules and regulations promulgated thereunder.
 - i. Operators shall provide the Colorado discharge permit number, latitude and longitude coordinates, in accordance with Rule 215.f, of the discharge outfall, and sources of produced water on a Source of Produced Water for Disposal, Form 26, and shall include a U.S.G.S. topographic map showing the location of the discharge outfall.
 - ii. Produced water discharged pursuant to this subsection (2).E. may be put to beneficial use in accordance with applicable state statutes and regulations governing the use and administration of water.

F. Evaporation in a properly lined pit at a centralized E&P waste management facility permitted in accordance with Rule 908.

- (3) **Produced water reuse and recycling.** Produced water may be reused for enhanced recovery, drilling, and other approved uses in a manner consistent with existing water rights and in consideration of water quality standards and classifications established by the WQCC for waters of the state, or any point of compliance established by the Director pursuant to Rule 324D.
- (4) **Mitigation.** Water produced during operation of an oil or gas well may be used to provide an alternative domestic water supply to surface owners within the oil or gas field, in accordance with all applicable laws, including, but not limited to, obtaining the necessary approvals from the WQCD for constructing a new "waterworks," as defined by Section 25-1-107(1)(X)(II)(A), C.R.S. Any produced water not so used shall be disposed of in accordance with subsection (2) or (3). Providing produced water for domestic use within the meaning of this subsection (4) shall not constitute an admission by the operator that the well is dewatering or impacting any existing water well. The water produced shall be to the benefit of the surface owner within the oil and gas field and may not be sold for profit or traded.

d. **Drilling fluids.**

- (1) **Recycling and reuse.** Drilling pit contents may be recycled to another drilling pit for reuse consistent with Rule 903.
- (2) **Treatment and disposal.** Drilling fluids may be treated or disposed as follows:
 - A. Injection into a Class II well permitted in accordance with Rule 325;
 - B. Disposal at a commercial solid waste disposal facility; or
 - C. Land treatment or land application at a centralized E&P waste management facility permitted in accordance with Rule 908.
- (3) **Additional authorized disposal of water-based bentonitic drilling fluids.** Water-based bentonitic drilling fluids may be disposed as follows:
 - A. Drying and burial in pits on non-crop land. The resulting concentrations shall not exceed the concentration levels in Table 910-1, below; or
 - B. Land application as follows:
 - i. **Applicability.** Acceptable methods of land application include, but are not limited to, production facility construction and maintenance, and lease road maintenance.
 - ii. **Land application requirements.** The average thickness of water-based bentonitic drilling fluid waste applied shall be no more than three (3) inches prior to incorporation. The waste shall be applied to prevent ponding or erosion and shall be incorporated as a beneficial amendment into the native soils within ten (10) days of application. The resulting concentrations shall not exceed those in Table 910-1.

- iii. **Surface owner approval.** Operators shall obtain written authorization from the surface owner prior to land application of water-based bentonitic drilling fluids.
 - iv. **Operator obligations.** Operators shall maintain a record of the source, the volume, and the location where the land application of the water-based bentonitic drilling fluid occurred. Upon the Director's written request, this information shall be provided within five (5) business days, in a format readily reviewable by the Director. Operators with control and authority over the wells from which the water-based bentonitic drilling fluid wastes are obtained retain responsibility for the land application operation, and shall diligently cooperate with the Director in responding to complaints regarding land application of water-based bentonitic drilling fluids.
 - v. **Approval.** Prior Director approval is not required for reuse of water-based bentonitic drilling fluids for land application as a soil amendment.
- e. **Oily waste.** Oily waste includes those materials containing crude oil, condensate or other E&P waste, such as soil, frac sand, drilling fluids, and pit sludge that contain hydrocarbons.
- (1) Oily waste may be treated or disposed as follows:
 - A. Disposal at a commercial solid waste disposal facility;
 - B. Land treatment onsite; or
 - C. Land treatment at a centralized E&P waste management facility permitted in accordance with Rule 908.
 - (2) Land treatment requirements:
 - A. In the case of a reportable spill, Operators shall submit a Site Investigation and Remediation Workplan, Form 27, for prior approval by the Director. Treatment shall thereafter be completed in accordance with the workplan and Rules 909. and 910.
 - B. Free oil shall be removed from the oily waste prior to land treatment.
 - C. Oily waste shall be spread evenly to prevent pooling, ponding, or runoff.
 - D. Contamination of stormwater runoff, ground water, or surface water shall be prevented.
 - E. Biodegradation shall be enhanced by disking, tilling, aerating, or addition of nutrients, microbes, water or other amendments, as appropriate.
 - F. Land-treated oily waste incorporated in place or beneficially reused shall not exceed the concentrations in Table 910-1.
 - G. When land treatment occurs in an area not being utilized for oil and gas operations, operators shall obtain prior written surface owner approval. When land treatment occurs on an approved Oil and Gas Location prior

to completion of interim reclamation or on the surface disturbance remaining after interim reclamation, notice shall be provided to the surface owner.

H. Land treatment shall be conducted in a manner that does not preclude compliance with reclamation rules 1003 and 1004.

f. **Other E&P Waste.** Other E&P waste such as workover fluids, tank bottoms, pigging wastes from gathering and flow lines, and natural gas gathering, processing, and storage wastes may be treated or disposed of as follows:

- (1) Disposal at a commercial solid waste disposal facility;
- (2) Treatment at a centralized E&P waste management facility permitted in accordance with Rule 908;
- (3) Injection into a Class II injection well permitted in accordance with Rule 325; or
- (4) An alternative method proposed in a waste management plan in accordance with rule 907.a.(3) and approved by the Director.

907A. MANAGEMENT OF NON-E&P WASTE

- a. Certain wastes generated by oil and gas-related activities are non-E&P wastes and are not exempt from regulation as solid or hazardous wastes. These wastes need to be properly identified and disposed of in accordance with state and federal regulations.
- b. Certain wastes generated by oil and gas-related activities can either be E&P wastes or non-E&P wastes depending on the circumstances of their generation.
- c. The hazardous waste regulations require that a hazardous waste determination be made for any non-E&P solid waste. Hazardous wastes require storage, treatment, and disposal practices in accordance with 6 C.C.R. 1007-3. All non-hazardous/non-E&P wastes are considered solid waste which require storage, treatment, and disposal in accordance with 6 C.C.R. 1007-2.

908. CENTRALIZED E&P WASTE MANAGEMENT FACILITIES

- a. **Applicability.** Operators may establish non-commercial, centralized E&P waste management facilities for the treatment, disposal, recycling or beneficial reuse of E&P waste. This rule applies only to non-commercial facilities, which means the operator does not represent itself as providing E&P waste management services to third parties, except as part of a unitized area or joint operating agreement or in response to an emergency. Centralized facilities may include components such as land treatment or land application sites, pits, and recycling equipment.
- b. **Permit requirements.** Before any person shall commence construction of a centralized E&P waste management facility, such person shall file with the Director an application on Form 28 and pay a filing and service fee established by the Commission (see Appendix III), and obtain the Director's approval. The application shall contain the following:
 - (1) The name, address, phone and fax number of the operator, and a designated contact person.

- (2) The name, address, and phone number of the surface owner of the site, if not the operator, and the written authorization of such surface owner.
- (3) The legal description of the site.
- (4) A general topographic, geologic, and hydrologic description of the site, including immediately adjacent land uses, a topographic map of a scale no less than 1:24,000 showing the location, and the average annual precipitation and evaporation rates at the site.
- (5) **Centralized facility siting requirements.**
 - A. A site plan showing drainage patterns and any diversion or containment structures, and facilities such as roads, fencing, tanks, pits, buildings, and other construction details.
 - B. Scaled drawings of entire sections containing the proposed facility. The field measured distances from the nearer north or south and nearer east or west section lines shall be measured at ninety (90) degrees from said section lines to facility boundaries and referenced on the drawing. A survey shall be provided including a complete description of established monuments or collateral evidence found and all aliquot corners.
 - C. The facility shall be designed to control public access, prevent unauthorized vehicular traffic, provide for site security both during and after operating hours, and prevent illegal dumping of wastes. Appropriate measures shall also be implemented to prevent access to the centralized facility by wildlife or domestic animals.
 - D. Centralized facilities shall have a fire lane of at least ten (10) feet in width around the active treatment areas and within the perimeter fence. In addition, a buffer zone of at least ten (10) feet shall be maintained within the perimeter fire lane.
 - E. Surface water diversion structures, including, but not limited to, berms and ditches, shall be constructed to accommodate a one hundred (100) year, twenty four (24) hour event. The facility shall be designed and constructed with a run-on control system to prevent flow onto the facility during peak discharge and a run-off control system to contain the water volume from a twenty-five (25) year, twenty-four (24) hour storm.
- (6) **Waste profile.** For each type of waste, the amounts to be received and managed by the facility shall be estimated on a monthly average basis. For each waste type to be treated, a characteristic waste profile shall be completed.
- (7) **Facility design and engineering.** Facility design and engineering data, including plans and elevations, design basis, calculations, and process description.
 - A. Geologic data, including, but not limited to:
 - i. Type and thickness of unconsolidated soils;
 - ii. Type and thickness of consolidated bedrock, if applicable;
 - iii. Local and regional geologic structures; and

- iv. Any geologic hazards that may affect the design and operation of the facility.

B. Hydrologic data, including, but not limited to:

- i. Surface water features within two (2) miles;
- ii. Depth to shallow ground water and major aquifers;
- iii. Water wells within one (1) mile of the site boundary and well depth, depth to water, screened intervals, yields, and aquifer name;
- iv. Hydrologic properties of shallow ground water and major aquifers including flow direction, flow rate, and potentiometric surface;
- v. Site location in relation to the floodplain of nearby surface water features;
- vi. Existing quality of shallow ground water; and
- vii. An evaluation of the potential for impacts to nearby surface water and ground water.

C. Engineering data, including, but not limited to:

- i. Type and quantity of material required for use as a liner, including design components;
- ii. Location and depth of cut for liners;
- iii. Location, dimensions, and grades of all surface water diversion structures;
- iv. Location and dimensions of all surface water containment structures; and
- v. Location of all proposed facility structures and access roads.

(8) **Operating plan.** An operating plan, including, but not limited to:

- A. A detailed description of the method of treatment, loading rates, and application of nutrients and soil amendments;
- B. Dust and moisture control;
- C. Sampling;
- D. Inspection and maintenance;
- E. Emergency response;
- F. Record-keeping;
- G. Site security;

H. Hours of operation;

I. Noise and odor mitigation; and

J. Final disposition of waste. Where treated waste will be beneficially reused, a description of reuse and method of product quality assurance shall be included.

(9) Ground water monitoring.

A. Water Wells.

Water samples shall be collected from water wells known to the operator or registered with the Colorado State Engineer within a one (1) mile radius of the proposed facility and shall be analyzed to establish baseline water quality. Analytical parameters shall be selected based upon the proposed waste stream and shall include, at a minimum, all major cations and anions, total dissolved solids, iron and manganese, nutrients (nitrates, nitrites, selenium), benzene, toluene, ethylbenzene, xylenes, pH, and specific conductance. Operators shall use reasonable good faith efforts to identify and obtain access to such water wells for the purpose of collecting water samples. If access cannot be obtained, then the operator shall notify the Director of the wells for which access was not obtained and sampling of such wells by the operator shall not be required. Not conducting sampling because access to water wells cannot be obtained shall not be grounds for denial of the proposed facility.

Copies of all test results described above shall be provided to the Director and the water well owner within three (3) months of collecting the samples. Laboratory results shall also be submitted to the Director in an electronic data deliverable format.

B. Site-specific monitoring wells.

- i. Where applicable, the Director shall require ground water monitoring to ensure compliance with the concentration levels in Table 910-1 and WQCC standards and classifications by establishing points of compliance, unless an oil and gas operator demonstrates to the satisfaction of the Director that an alternative method offering equivalent protection of public health, safety, and welfare, including the environment and wildlife resources, can be employed and provided the operator employs a dual liner with a leak detection system that provides for immediate leak detection from the uppermost liner. All monitoring well construction must be completed in accordance with the State Engineer's regulations on well construction, "Water Well Construction Rules" (2 C.C.R. 402-2).
- ii. Where monitoring is required, the direction of flow, ground water gradient and quality of water shall be established by the installation of a minimum of three (3) monitor wells, including an up-gradient well and two (2) down-gradient wells that will serve as points of compliance, or other methods authorized by the Director.

- (10) **Surface water monitoring.** Where applicable, the Director shall require baseline and periodic surface water monitoring to ensure compliance with WQCC surface water standards and classifications. Operators shall use reasonable good faith efforts to obtain access to such surface water for the purpose of collecting water samples. If access cannot be obtained, then the operator shall notify the Director of the surface water for which access was not obtained and sampling of such surface water by the operator shall not be required. Not conducting sampling because access to surface water cannot be obtained shall not be grounds for denial of the proposed facility.
 - (11) **Contingency plan.** A contingency plan that describes the emergency response operations for the facility, 24-hour contact information for the person who has authority to initiate emergency response actions, and an outline of responsibilities under the joint operating agreement regarding maintenance, closure, and monitoring of the facility.
- c. **Permit approval.** The Director shall endeavor to approve or deny the properly completed permit within thirty (30) days after receipt and may condition permit approval as necessary to prevent any threatened or actual significant adverse environmental impact on air, water, soil or biological resources or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.
 - d. **Financial assurance.** The operator of a centralized E&P waste management facility shall submit for the Director's approval such financial assurance as required by Rule 704. prior to issuance of the operating permit.
 - e. **Facility modifications.** Throughout the life of the facility the operator shall submit proposed modifications to the facility design, operating plan, permit data, or permit conditions to the Director for prior approval.
 - f. **Annual permit review.** To ensure compliance with permit conditions and the 900 Series rules, the facility permit shall be subject to an annual review by the Director. To facilitate this review, the operator shall submit an annual report summarizing operations, including the types and volumes of waste actually handled at the facility. The Director may require additional information.
 - g. **Closure.**
 - (1) **Preliminary closure plan.** A general preliminary plan for closure shall be submitted with the Centralized E&P Waste Management Facility Permit, Form 28. The preliminary closure plan shall include, but not be limited to:
 - A. A general plan for closure and reclamation of the entire facility, including a description of the activities required to decommission and remove all equipment, close and reclaim pits, dispose of or treat residual waste, collect samples as needed to verify compliance with soil and ground water standards, implement post-closure monitoring, and complete other remediation, as required.
 - B. An estimate of the cost to close and reclaim the entire facility and to conduct post-closure monitoring. Cost estimates shall be subject to review by the Director.

- (2) **Final closure plan.** A detailed Site Investigation and Remediation Workplan, Form 27, shall be submitted at least sixty (60) days prior to closure for approval by the Director. The workplan shall include, but not be limited to, a description of the activities required to decommission and remove all equipment, close and reclaim pits, dispose of or treat residual waste, collect samples as needed to verify compliance with soil and ground water standards, implement post-closure monitoring, and complete other remediation, as required.
- h. Operators may be subject to local requirements for zoning and construction of facilities and shall provide copies of any approval notices, permits, or other similar types of notifications for the facility from local governments or other agencies to the Director for review prior to issuance of the operating permit.

909. SITE INVESTIGATION, REMEDIATION, AND CLOSURE

- a. **Applicability.** This section applies to the closure and remediation of pits other than drilling pits constructed pursuant to Rule 903.a.(3); investigation, reporting and remediation of spills/releases; permitted waste management facilities including treatment facilities; plugged and abandoned wellsites; sites impacted by E&P waste management practices; or other sites as designated by the Director.
- b. **General site investigation and remediation requirements.**
 - (1) **Sensitive Area Determination.** Operators shall complete a sensitive area determination in accordance with Rule 901.e.
 - (2) **Sampling and analyses.** Sampling and analysis of soil and ground water shall be conducted in accordance with Rule 910. to determine the horizontal and vertical extent of any contamination in excess of the concentrations in Table 910-1.
 - (3) **Management of E&P waste.** E&P waste shall be managed in accordance with Rule 907.
 - (4) **Pit evacuation.** Prior to backfilling and site reclamation, E&P waste shall be treated or disposed in accordance with Rule 907. and the 1000 Series rules.
 - (5) **Remediation.** Remediation shall be performed in a manner to mitigate, remove, or reduce contamination that exceeds the concentrations in Table 910-1 in order to ensure protection of public health, safety, and welfare, and to prevent and mitigate significant adverse environmental impacts. Soil that does not meet concentrations in Table 910-1 shall be remediated. Ground water that does not meet concentrations in Table 910-1 shall be remediated in accordance with a Site Investigation and Remediation Workplan, Form 27.
 - (6) **Reclamation.** Remediation sites shall be reclaimed in accordance with the 1000 Series rules for reclamation.
- c. **Site Investigation And Remediation Workplan, Form 27.** Operators shall prepare and submit for prior Director approval a Site Investigation and Remediation Workplan, Form 27, for the following operations and remediation activities:
 - (1) Unlined pit closure when required by Rule 905.
 - (2) Remediation of spills/releases in accordance with Rule 906.

- (3) Land treatment of oily waste in accordance with Rule 907.e.
 - (4) Closure of centralized E&P waste management facilities in accordance with Rule 908.g.
 - (5) Remediation of impacted ground water in accordance with Rule 910.b.(4).
- d. **Multiple sites.** Remediation of multiple sites may be submitted on a single workplan with prior Director approval.
- e. **Closure.**
- (1) Remediation and reclamation shall be complete upon compliance with the concentrations in Table 910-1, or upon compliance with an approved workplan.
 - (2) **Notification of completion.** Within thirty (30) days after conclusion of site remediation and reclamation activities operators shall provide the following notification of completion:
 - A. Operators conducting remediation operations in accordance with Rule 909.b. shall submit to the Director a Site Investigation and Remediation Workplan, Form 27, containing information sufficient to demonstrate compliance with these rules.
 - B. Operators conducting remediation under an approved workplan shall submit to the Director, by adding or attaching to the original workplan, information sufficient to demonstrate compliance with the workplan.
- f. **Release of financial assurance.** Financial assurance required by Rule 706. may be held by the Director until the required remediation of soil and/or ground water impacts is completed in accordance with the approved workplan, or until cleanup goals are met.

910. CONCENTRATIONS AND SAMPLING FOR SOIL AND GROUND WATER

- a. **Soil and groundwater concentrations.** The concentrations for soil and ground water are in Table 910-1. Ground water standards and analytical methods are derived from the ground water standards and classifications established by WQCC.
- b. **Sampling and analysis.**
- (1) **Existing workplans.** Sampling and analysis for sites subject to an approved workplan shall be conducted in accordance with the workplan and the sampling and analysis requirements described in this rule.
 - (2) **Methods for sampling and analysis.** Sampling and analysis for site investigation or confirmation of successful remediation shall be conducted to determine the nature and extent of impact and confirm compliance with appropriate concentration levels in Table 910-1.
 - A. **Field analysis.** Field measurements and field tests shall be conducted using appropriate equipment, calibrated and operated according to manufacturer specifications, by personnel trained and familiar with the equipment.

- B. **Sample collection.** Samples shall be collected, preserved, documented, and shipped using standard environmental sampling procedures in a manner to ensure accurate representation of site conditions.
- C. **Laboratory analytical methods.** Laboratories shall analyze samples using standard methods (such as EPA SW-846 or API RP-45) appropriate for detecting the target analyte. The method selected shall have detection limits less than or equal to the concentrations in Table 910-1.
- D. **Background sampling.** Samples of comparable, nearby, non-impacted, native soil, ground water or other medium may be required by the Director for establishing background conditions.

(3) **Soil sampling and analysis.**

- A. **Applicability.** If soil contamination is suspected or known to exist as a result of spills/releases or E&P waste management, representative samples of soil shall be collected and analyzed in accordance with this rule.
- B. **Sample collection.** Samples shall be collected from areas most likely to have been impacted, and the horizontal and vertical extent of contamination shall be determined. The number and location of samples shall be appropriate to the impact.
- C. **Sample analysis.** Soil samples shall be analyzed for contaminants listed in Table 910-1 as appropriate to assess the impact or confirm remediation. The analytical parameters shall be selected based on site-specific conditions and process knowledge and shall be agreed to and approved by the Director.
- D. **Soil impacted by produced water.** For impacts to soil due to produced water, samples from comparable, nearby non-impacted native soil shall be collected and analyzed for purposes of establishing background soil conditions including pH and electrical conductivity (EC). Where EC of the impacted soil exceeds the level in Table 910-1, the sodium adsorption ratio (SAR) shall also be determined.
- E. **Soil impacted by hydrocarbons.** For impacts to soil due to hydrocarbons, samples shall be analyzed for TPH or organic compounds per Table 910-1 as determined by site-specific conditions and process knowledge..

(4) **Ground water sampling and analysis.**

- A. **Applicability.** Operators shall collect and analyze representative samples of ground water in accordance with these rules under the following circumstances:
 - (i) Where ground water contamination is suspected or known to exceed the concentrations in Table 910-1;
 - (ii) Where impacted soils are in contact with ground water; or
 - (iii) Where impacts to soils extend down to the high water table.

- B. **Sample collection.** Samples shall be collected from areas most likely to have been impacted, downgradient or in the middle of excavated areas. The number and location of samples shall be appropriate to determine the horizontal and vertical extent of the impact. If the concentrations in Table 910-1 are exceeded, the direction of flow and a ground water gradient shall be established, unless the extent of the contamination and migration can otherwise be adequately determined.
- C. **Sample analysis.** Ground water samples shall be analyzed for benzene, toluene, ethylbenzene, xylene, and API RP-45 constituents, or other parameters appropriate for evaluating the impact. The analytical parameters shall be selected based on site-specific conditions and process knowledge and shall be agreed to and approved by the Director.
- D. **Impacted ground water.** Where ground water contaminants exceed the concentrations listed in Table 910-1, operators shall notify the Director and submit to the Director for prior approval a Site Investigation and Remediation Workplan, Form 27, for the investigation, remediation, or monitoring of ground water to meet the required concentrations in Table 910-1.

911. PIT, BURIED OR PARTIALLY BURIED PRODUCED WATER VESSEL, BLOWDOWN PIT, AND BASIC SEDIMENT/TANK BOTTOM PIT MANAGEMENT REQUIREMENTS PRIOR TO DECEMBER 30, 1997.

- a. **Applicability.** This rule applies to the management, operation, closure and remediation of drilling, production and special purpose pits, buried or partially buried produced water vessels, blowdown pits, and basic sediment/tank bottom pits put into service prior to December 30, 1997 and unlined skim pits put into service prior to July 1, 1995. For pits constructed after December 30, 1997 and skim pits constructed after July 1, 1995, operators shall comply with the requirements contained in Rules 901. through 910.
- b. **Inventory.** Operators were required to submit to the Director no later than December 31, 1995, an inventory identifying production pits, buried or partially buried produced water vessels, blowdown pits, and basic sediment/tank bottom pits that existed on June 30, 1995. The inventory required operators to provide the facility name, a description of the location, type, capacity and use of pit/vessel, whether netted or fenced, lined or unlined, and where available, water quality data. Operators who have failed to submit the required inventory are in continuing violation of this rule.
- c. **Sensitive area determination.**
 - (1) For unlined production and special purpose pits constructed prior to July 1, 1995 and not closed by December 30, 1997, operators were required to determine whether the pit was located within a sensitive area in accordance with the Sensitive Area Determination Decision Tree, Figure 901-1 (now Rule 901.e.) and submit data evaluated and analysis used in the determination to the Director on a Sundry Notice, Form 4. In December 2008, Figure 901-1 was deleted from the 900-Series Rules.
 - (2) For steel, fiberglass, concrete, or other similar produced water vessels that were buried or partially buried and located in sensitive areas prior to December 30, 1997, operators were required to test such vessels for integrity, unless a monitoring or leak detection system was put in place.

d. The following permitting/reporting requirements applied to pits constructed prior to December 30, 1997:

(1) A Sundry Notice, Form 4, including the name, address, and phone number of the primary contact person operating the production pit for the operator, the facility name, a description of the location, type, capacity and use of pit, engineering design, installation features and water quality data, if available, was required for the following:

A. Lined production pits and lined special purpose pits constructed after July 1, 1995.

B. Unlined production pits constructed prior to July 1, 1995 which are lined in accordance with Rule 905. by December 30, 1997.

(2) An Application For Permit For Unlined Pit, Form 15 was required for the following:

A. Unlined production pits and special purpose pits in sensitive areas constructed prior to July 1, 1995, and not closed by December 30, 1997.

B. Unlined production pits outside sensitive areas constructed after July 1, 1995 and not closed by December 30, 1997.

(3) An Application For Permit For Unlined Pit, Form 15 and a variance under Rule 904.e.(1). (repealed, now Rule 502.b.) was required for unlined production pits and unlined special purpose pits in sensitive areas constructed after July 1, 1995.

(4) A Sundry Notice, Form 4 was required for unlined production pits outside sensitive areas receiving produced water at an average daily rate of five (5) or less barrels per day calculated on a monthly basis for each month of operation constructed prior to December 30, 1997.

e. The Director may have established points of compliance for unlined production pits and special purpose pits and for lined production pits in sensitive areas constructed after July 1, 1995.

f. Closure requirements.

(1) Operators of production or special purpose pits existing on July 1, 1995 which were closed before December 30, 1997, were required to submit a Sundry Notice, Form 4, within thirty (30) days of December 30, 1997. The Sundry Notice, Form 4 shall include a copy of the existing pit permit, if a permit was obtained, and a description of the closure process.

(2) Pits closed prior to December 30, 1997 were required to be reclaimed in accordance with the 1000 Series rules. Pits closed after December 30, 1997 shall be closed in accordance with the 900 Series rules and reclaimed in accordance with the 1000 Series rules.

(3) Operators of steel, fiberglass, concrete or other similar produced water vessels buried or partially buried and located in sensitive areas were required to repair or replace vessels and tanks found to be leaking. Operators shall repair or replace vessels and tanks found to be leaking. Operators shall submit to the Director a Sundry Notice, Form 4, describing the integrity testing results and action taken within thirty (30) days of December 30, 1997.

- (4) Closure of pits and steel, fiberglass, concrete or other similar produced water vessels, and associated remediation operations conducted prior to December 30, 1997 are not subject to Rules 905., 906., 907., 909. and 910.

912. VENTING OR FLARING NATURAL GAS

- a. The unnecessary or excessive venting or flaring of natural gas produced from a well is prohibited.
- b. Except for gas flared or vented during an upset condition, well maintenance, well stimulation flowback, purging operations, or a productivity test, gas from a well shall be flared or vented only after notice has been given and approval obtained from the Director on a Sundry Notice, Form 4, stating the estimated volume and content of the gas. The notice shall indicate whether the gas contains more than one (1) ppm of hydrogen sulfide. If necessary to protect the public health, safety or welfare, the Director may require the flaring of gas.
- c. Gas flared, vented or used on the lease shall be estimated based on a gas-oil ratio test or other equivalent test approved by the Director, and reported on Operator's Monthly Report of Operations, Form 7.
- d. Flared gas that is subject to Sundry Notice, Form 4, shall be directed to a controlled flare in accordance with Rule 903.b.(2) or other combustion device operated as efficiently as possible to provide maximum reduction of air contaminants where practicable and without endangering the safety of the well site personnel and the public.
- e. Operators shall notify the local emergency dispatch or the local governmental designee of any natural gas flaring. Notice shall be given prior to flaring when flaring can be reasonably anticipated, or as soon as possible, but in no event more than two (2) hours after the flaring occurs.

**Table 910-1
CONCENTRATION LEVELS¹**

Contaminant of Concern	Concentrations
Organic Compounds in Soil	
TPH (total volatile and extractable petroleum hydrocarbons)	500 mg/kg
Benzene	0.17 mg/kg ²
Toluene	85 mg/kg ²
Ethylbenzene	100 mg/kg ²
Xylenes (total)	175 mg/kg ²
Acenaphthene	1,000 mg/kg ²
Anthracene	1,000 mg/kg ²
Benz(a)anthracene	0.22 mg/kg ²
Benzo(b)fluoranthene	0.22 mg/kg ²
Benzo(k)fluoranthene	2.2 mg/kg ²
Benzo(a)pyrene	0.022 mg/kg ²
Chrysene	22 mg/kg ²
Dibenzo(a,h)anthracene	0.022 mg/kg ²
Fluoranthene	1,000 mg/kg ²
Fluorene	1,000 mg/kg ²
Indeno(1,2,3,c,d)pyrene	0.22 mg/kg ²
Naphthalene	23 mg/kg ²
Pyrene	1,000 mg/kg ²

Organic Compounds in Ground Water	
Benzene	5 µg/l ³
Toluene	560 to 1,000 µg/l ³
Ethylbenzene	700 µg/l ³
Xylenes (Total)	1,400 to 10,000 µg/l ^{3,4}
Inorganics in Soils	
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background
Sodium Adsorption Ratio (SAR)	<12 ⁵
pH	6-9
Inorganics in Ground Water	
Total Dissolved Solids (TDS)	<1.25 x background ³
Chlorides	<1.25 x background ³
Sulfates	<1.25 x background ³
Metals in Soils	
Arsenic	0.39 mg/kg ²
Barium (LDNR True Total Barium)	15,000 mg/kg ²
Boron (Hot Water Soluble)	2 mg/l ³
Cadmium	70 mg/kg ^{3,6}
Chromium (III)	120,000 mg/kg ²
Chromium (VI)	23 mg/kg ^{2,6}
Copper	3,100 mg/kg ²
Lead (inorganic)	400 mg/kg ²
Mercury	23 mg/kg ²
Nickel (soluble salts)	1,600 mg/kg ^{2,6}
Selenium	390 mg/kg ^{2,6}
Silver	390 mg/kg ²
Zinc	23,000 mg/kg ^{2,6}
Liquid Hydrocarbons in Soils and Ground Water	
Liquid hydrocarbons including condensate and oil	Below detection level

COGCC recommends that the latest version of EPA SW 846 analytical methods be used where possible and that analyses of samples be performed by laboratories that maintain state or national accreditation programs.

¹ Consideration shall be given to background levels in native soils and ground water.

² Concentrations taken from CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007).

³ Concentrations taken from CDPHE-WQCC Regulation 41 - The Basic Standards for Ground Water.

⁴ For this range of standards, the first number in the range is a strictly health-based value, based on the WQCC's established methodology for human health-based standards. The second number in the range is a maximum contaminant level (MCL), established under the Federal Safe Drinking Water Act which has been determined to be an acceptable level of this chemical in public water supplies, taking treatability and laboratory detection limits into account. The WQCC intends that control requirements for this chemical be implemented to attain a level of ambient water quality that is at least equal to the first number in the range except as follows: 1) where ground water quality exceeds the first number in the range due to a release of contaminants that occurred prior to September 14, 2004 (regardless of the date of discovery or subsequent migration of such contaminants) clean-up levels for the entire contaminant plume shall be no more restrictive than the second number in the range or the ground water quality resulting from such release, whichever is more protective, and 2) whenever the WQCC has adopted alternative, site-specific standards for the chemical, the site-specific standards shall apply instead of these statewide standards.

⁵ Analysis by USDA Agricultural Handbook 60 method (20B) with soluble cations determined by method (2). Method (20B) = estimation of exchangeable sodium percentage and exchangeable potassium percentage from soluble cations. Method (2) = saturated paste method (note: each analysis requires a unique sample of at least 500 grams). If soils are saturated, USDA Agricultural Handbook 60 with soluble cations determined by method (3A) saturation extraction method.

⁶ The table value for these inorganic constituents is taken from the CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007). However, because these values are high, it is possible that site-specific geochemical conditions may exist that could allow these constituents to migrate into ground water at

levels exceeding ground water standards even though the concentrations are below the table values. Therefore, when these constituents are present as contaminants, a secondary evaluation of their leachability must be performed to ensure ground water protection.