

Fluid Leak Detection Plan

Archer Field Oil and Gas Development Plan

This Fluid Leak Detection Plan has been prepared by Chaco Energy Company (Chaco) for its Archer Field Oil and Gas Development Plan (OGDP) in Cheyenne County, Colorado. The Plan addresses the Energy & Carbon Management Commission (ECMC) requirement at Rule 304.c.(13) to prepare a Fluid Leak Detection Plan and the fluid leak detection requirements in Rules 608-609 and 1102-1104. The Plan addresses the following locations:

Table 1. Locations

Location	Location ID	Qtr Qtr T12S R44W	Lat/Lon
Champlin 360 Amoco A #4	380504 (Re-entry)	NWSE Sec. 29	38.977390, -102.359945
Pelton 41-31 #1	380356 (Re-entry)	NENE Sec. 31	38.969823, -102.373764
Champlin Tank Pad	New	NWSW Sec. 29	38.977813, -102.369827
Pelton Tank Pad	New	NENE Sec. 31	38.970818, -102.372405

1.0 Introduction and Site Description

Chaco will re-enter and complete one previously plugged and abandoned conventional vertical well at each well pad location. Chaco will construct a separate tank pad for each well location. The primary target is helium gas. Wells will also produce natural gas. Each location is on fee surface and will produce fee minerals. Table 2 describes land use and acreage.

Table 2. Land Use and Acreage

Location	Land Use	O&G Location (acre)	Working Pad Surface (acre)	Production Pad (acre)
Champlin 360 Amoco A #4	Crop	2.07	1.80	0.23
Pelton 41-31 #1	Rangeland	2.07	1.80	0.23
Champlin Tank Pad	Rangeland	1.06	0.87	0.87
Pelton Tank Pad	Rangeland	0.66	0.52	0.52

Chaco will re-enter each well using a workover rig. Chaco will remove the well plug, run new production casing, and perforate the well. Chaco will use freshwater for well re-entry and recycled produced water for well completion. Freshwater returns will be stored in a steel tank and recirculated. Recycled produced water will be stored in a truck tank for 1 day of well completion.

During production, well pads will contain only a wellhead. Gas from the wellhead will be piped underground to the associated tank pad.

Each tank pad will contain one 3-phase separator, one produced water tank, one condensate tank, and an enclosed combustor. Gas will be piped underground from the tank pad to tie into the existing Ladder Creek Gathering System operated by Tumbleweed Midstream. Produced water will be trucked off site approximately twice per month for disposal in an ECMC-permitted underground injection control well operated by a third-party operator. Condensate will be trucked off site for commercial sale approximately 4 times per year.

Site elevations are listed in Table 3. Estimated durations for each phase of development are listed in Table 4.

Table 3. Site Elevations

Location	Elevation (feet)	Location	Elevation (feet)
Champlin 360 Amoco A #4	4,364	Champlin Tank Pad	4,390
Pelton 41-31 #1	4,357	Pelton Tank Pad	4,360

Table 4. Phases of Development

Phase	Duration (days)
Construction	2
Drilling (Re-entry)	2
Completion	1
Interim Reclamation	1
Production	20 years, est.

2.0 Well Pad – Re-entry and Completion Fluid Leak Detection Measures

Drilling (Re-entry) Operations

During well re-entry, Chaco will use a workover rig and freshwater to remove the well plug. An estimated 800 bbl of freshwater will be used at each well location. At each location, freshwater will be stored in one 500-bbl steel tank. It will be transferred to the workover rig using a water pump and steel line.

Fuel for the workover rig will be stored onboard the rig in an integrated fuel tank.

Before well re-entry, an inspection of the equipment will be conducted by the rig operators trained in integrity management of the system. Inspection will include visual, manual, and function testing of valves, hoses, and transfer lines to ensure that connections are secure. The workover rig is self-leveling. A synthetic liner will be placed under the workover rig to capture incidental leaks or drips.

The workover rig operator will shut down the water transfer pump and will close the supply valve when transfer or circulation are complete. The system and fluid containers will be inspected daily during use for signs of drips, leaks, or spills.

Completion Operations

During well completion, Chaco will use freshwater to prepare cement on site using pallets of bulk bagged cement and a pump truck. Cement will be circulated to the surface for all casing runs. An estimated 112 bbls of cement is needed per well. The pumper will stop the cement in the casing when it nears the surface to avoid generating excess or waste.

Chaco will use recycled produced water to perforate the well. At each location, recycled produced water will be stored in a truck tank for 1 day of well completion. It will be transferred using a steel line.

The operator will monitor pressure and containment for potential leaks. Visual inspections will be conducted throughout operations to look for signs of leakage. Shutoff valves and an emergency shut down system will be in place to prevent overflows. Table 5 lists specific monitoring, inspection, testing, and maintenance procedures.

Table 5. Monitoring, Inspection, Testing, Maintenance Procedures and Schedule

Equipment	Monitoring, Inspection, Testing, Maintenance Procedures	Schedule
Workover Rig and Generator	Operators will visually monitor and will function test the workover rig. They will look for signs of overheating, drips, or leaks onto the ground, and at	Continuous while operating

Equipment	Monitoring, Inspection, Testing, Maintenance Procedures	Schedule
	connection points to fuel or water. Any deficiencies will be corrected promptly. A spill or leak will be treated with the spill response material maintained on site and disposed of appropriately as oily waste at a disposal facility authorized to accept the waste.	
Fuel Tank	The fuel tank will be integrated with the workover rig. It will have a liner underneath the fuel tank that will be monitored for signs of drips, leaks, or staining. Valves will be kept tightened to avoid leakage. The fuel meter will be monitored for evidence of excessive fuel use that could indicate a leak.	Daily
Above-ground Containment	Fluid will be contained in tanks. The area will be monitored for signs of leak or damage and will be repaired promptly.	Daily
Transfer Lines	Transfer lines and valves on equipment will be monitored visually at the connection points for stains, drips, or other signs of leakage requiring correction.	Continuous while operating

3.0 Tank Pad – Produced Fluid Leak Detection Measures

Production

During production, well pads will contain only a wellhead, chemical for well treatment inside a polyethylene tote, and buried flowline.

On the tank pads, tanks will be inside of steel secondary containment, consistent with Rule 603.o. The containment will be sized to contain 150 percent of the volume of the largest tank. Fluid containing equipment will be visually inspected daily by the operator for signs of drips, leaks, or spills. Fluid level sensors will be installed on tanks to provide continuous tank level monitoring. A valve or fitting found to be ineffective will be repaired promptly. Table 6 lists specific monitoring, inspection, testing, and maintenance procedures.

Table 6. Monitoring, Inspection, Testing, Maintenance Procedures and Schedule

Equipment	Monitoring, Inspection, Testing, Maintenance Procedures	Schedule
Tanks	Tanks will undergo testing per manufacturer's specifications prior to being put into service for production. Periodic integrity testing after initial startup will occur per API or STI standards and manufacturer's recommendations.	Pre-start up
Secondary Containment	Tanks and the separator will be located inside of secondary containment sized to contain 150 percent of the volume of the largest tank. Secondary containment will be visually inspected for evidence of damage, deterioration, or loss of integrity. Repairs will be made promptly to prevent the risk of migration from a leak or spill.	Daily

Chemical Container	The chemical container used for well treatment at the wellhead will be in polyethylene containment and monitored for signs of damage, deterioration, or leakage. Deficiencies will be corrected promptly.	Daily
Loading and Unloading	Loading and unloading will occur inside of steel secondary containment. Catch basins will be installed on loadout piping. Loadout piping will contain bull plugs when not in use.	Daily
Intra-facility Transfer Lines	Transfer lines will be monitored visually at the connection points for stains, drips, or other signs of leakage requiring correction and will be repaired promptly.	Daily
Isolation Valves	The operator will maintain isolation valves by performing function tests or maintaining the valve in accordance with its manufacturer's specifications per Rule 1103.a.	Annual
Production Flowline	The 3-inch-diameter buried steel off-location flowline will contain the gas stream. The flowline will be installed per Rule 1102. Before the flowline is buried, it will be pressure tested to maximum operating pressure, according to manufacturer specifications. The operator will verify the integrity of the flowline by performing a monthly audio, visual, olfactory (AVO) survey of the line and annual static-head test, in accordance with Rule 1104.	Pre-start up Monthly Annual

4.0 Reporting and Recordkeeping

Inspections and testing will be documented. Documentation will list the activity, date, time, finding, and personnel. Associated testing results will be included. Written records and a copy of this plan will be maintained in Chaco's Denver, Colorado office. The Fluid Leak Detection Plan will be provided to the site operator.

The potential need for spill response will address rule requirements for notification, reporting, response actions, corrective action, and remediation. Waste will be properly classified as exploration and production (E&P) or non-E&P waste. A spill will be reported to ECMC in accordance with Rule 912.b and using a Form 19. If remediation is required, a Form 27 will also be submitted.

5.0 Site-specific Best Management Practices

Best management practices are listed in Table 7.

Table 7. Site-specific Best Management Practices

Best Management Practices
<ul style="list-style-type: none"> Site personnel will be trained in spill prevention, response, and response equipment on at least an annual basis. Training will include how spills or releases will be investigated, controlled, and contained.
<ul style="list-style-type: none"> Spills or releases will be investigated, controlled, or contained in accordance with Rule 912.a.

Best Management Practices	
<ul style="list-style-type: none">• Cleanup material from potential small spills will be treated as oily waste. A potential larger spill or release will be temporarily bermed or contained until third-party support, as needed, provides additional response and remediation.• If a spill or release meets criteria in Rule 912.b, it will be reported as specified in the rule.• Site personnel will be trained to conduct inspections using AVO procedures.• Equipment and transfer lines will be monitored daily during well re-entry and completion for signs of drips, leaks, or spills, which will be corrected promptly.• Flowlines will be installed consistent with Rule 1102. In accordance with Rule 1104, before a flowline is put into service, it will be pressure tested to maximum pressure and AVO leak detection.• The operator will maintain shutoff valves on flowlines in accordance with Rule 1103.• Per Rule 1104, the operator will conduct a monthly AVO survey to detect failures or signs of leaks from the wellhead and flowlines.• The operator will conduct annual flowline integrity testing in accordance with Rule 1104.• Site personnel will be instructed on procedures for documenting and recordkeeping for inspections and testing.	