



Fluid Leak Detection Plan

Introduction

The Wade 8-59 17 Pad is located on FEE surface in the SESW of Section 17, Township 8 North, Range 59 West and will have a total of 7 wells, 4 oil tanks, and 2 water tanks. The proposed disturbed area for this location will be 10.96 acres with a working pad surface area of 8.16 acres. The pad will then be reclaimed down to 9.45 acres for permanent production.

Drilling Operations Leak Detection/Prevention Measures

During drilling operations, regular Auditory, Visual, and Olfactory Monitoring (AVO) inspections are performed on equipment containing hydrocarbons, fluids, or associated chemicals. AVO inspections include taking the time to look, smell and listen for leaks.

The fluid management system used during drilling operations is monitored from the rig floor ("dog-house") for changes in pressure, volume, or rate which are used as indicators for leak detection. In the event abrupt changes in operating conditions are identified on surface equipment used to manage fluids, rig personnel are deployed to inspect the system including transfer lines and storage tanks.

Operator utilizes a polyethylene liner beneath the drilling rig during drilling operations to ensure there is an impermeable layer between the rig and the earth. The use of this liner prevents hydrocarbons and other fluids from reaching the soil in the unlikely event a leak does occur. The liner is inspected for integrity throughout drilling operations and maintenance/repair to the liner occurs as needed.

Completion Operations Leak Detection/Prevention Measures

During completion operations, regular AVO inspections are performed on all lines, containers/tanks/totes containing fluids or fluid additives as well as any storage tank (i.e., container, vessel, etc.) that is used for hydrocarbon storage or through which hydrocarbons or other fluids pass through.

The fluid transfer system used during completion operations is monitored from the on-site mobile command center for changes in pressure, volume, or rate which are used as indicators for leak detection. In the event abrupt changes in operating conditions are identified on equipment used to in fluid transfer, completions personnel are deployed to inspect the system including pumps, transfer lines and storage tanks.

Operator utilizes a polyethylene liner beneath the areas where completions equipment (including pump trucks and other heavy equipment) is placed on the pad to ensure there is an impermeable layer between the equipment and the earth. The use of this liner prevents hydrocarbons and other fluids from reaching the soil in the unlikely event a leak does occur. The liner is inspected for integrity throughout the completions phase and maintenance/repair to the liner occurs as needed.

Production Operations Leak Detection/Prevention Measures

During production operations an AVO inspection occurs any time personnel is on location. Generally, personnel are on location daily during the first year of production. Site visits occur less frequently as a well(s) matures. However, it is very common for a multi-well horizontal

pad to be inspected multiple times in a given week. Field staff have been instructed to take the time to look, smell, and listen for leaks as part of standard field protocols. AVO is performed on tanks, components, truck load out equipment, flowlines, and process piping. Personnel walk down the lines and equipment of the entire facility and look, listen, and smell for leaks at connections, flanges, pump seals, valves, and other components associated with well production equipment.

Staff are required to inspect all above-ground flowlines for leaks. This will include walking the entire line from separator to custody transfer point (as applicable), running hands along the line, listening, smelling, and looking for any hydrocarbon release points.

In the event a leak is identified, staff should make an immediate attempt to address the leak by attempting to repair the component(s). If the leak cannot be repaired immediately, staff will record that an attempt to repair was made and schedule the leak for repair at the next available opportunity – i.e., when parts arrive, when the proper tools/equipment are available, during the next scheduled shut down, etc. Once the leak is repaired, the repaired component, valve, gasket, etc. will be re-inspected within 5 days of repair by performing another AVO or other approved instrument monitoring method (AIMM).

Tanks will be designed, constructed, and maintained in accordance with NFPA Code 30 (2008 version). Inspection and record retention of tank inspections will be in accordance per SPCC regulation. All records will be made available to the COGCC upon request.

Operator will install an engineered containment system around and beneath the tank battery. The containment system is constructed of a perimeter of walls that are post driven into the ground around a flexible geotextile base. All components including the underlayment are sprayed with a polyurea liner technology. This liner technology maintains impermeability and puncture resistance under exposure to UV rays, weather extremes, and chemicals commonly encountered in oil and natural gas production and provides seamless protection.

During truck loadout, additional inspection protocols include the inspection of loading equipment including the hoses, couplings, and valves to ensure no dripping, leaking, or other liquid or vapor loss occurs during liquid loadout events.

Other Monitoring Practices

Routine SPCC inspections will be conducted and documented pursuant U.S. EPA requirements. The location will be equipped with a SCADA system that allows for remote monitoring and shut-in capabilities.

Annual flowline testing will be conducted in accordance with COGCC's 1100-Series rules. Production facilities will be pressure tested to ensure integrity.

Additionally, Operator has developed a robust Leak Detection and Repair (LDAR) program, which utilizes Forward Looking Infrared (FLIR®) cameras to identify and fix leaks. These inspections will begin during the drilling phase and continue throughout the life of the Oil & Gas Location.

Record Keeping

Operator has developed and will maintain site-specific inspection protocols to monitor the Production Facilities for leaks on the Warbler Pad as discussed above. Inspection records are kept, maintained and stored in various corporate systems. In the event an inspection results in maintenance or repair, these actions are logged in an internal well/facility maintenance database. All leaks (e.g., agency-reportable, agency-nonreportable) are logged and tracked until the issue has reached final resolution. Leaks are reviewed and discussed on a monthly basis; root-cause analyses are performed when as necessary. Required testing (i.e., pressure testing, flowline integrity testing) is tracked, recorded, and maintained in various corporate systems.

Proposed Best Management Practices

1. During drilling, completion, and production operations, regular Auditory, Visual, and Olfactory Monitoring (AVO) inspections are performed on equipment containing hydrocarbons, fluids, or associated chemicals. AVO inspections include taking the time to look, smell and listen for leaks.
2. Operator utilizes a polyethylene liner beneath the drilling rig during drilling operations and beneath the areas where completions equipment (including pump trucks and other heavy equipment) during completion operations to ensure there is an impermeable layer between the rig and the earth. The use of this liner prevents hydrocarbons and other fluids from reaching the soil in the unlikely event a leak does occur. The liner is inspected for integrity throughout drilling operations and maintenance/repair to the liner occurs as needed.
3. Tanks will be designed, constructed, and maintained in accordance with NFPA Code 30 (2008 version). Inspection and record retention of tank inspections will be in accordance per SPCC regulation. All records will be made available to the COGCC upon request.
4. Operator will install an engineered containment system around and beneath the tank battery. The containment system is constructed of a perimeter of walls that are post driven into the ground around a flexible geotextile base. All components including the underlayment are sprayed with a polyurea liner technology. This liner technology maintains impermeability and puncture resistance under exposure to UV rays, weather extremes, and chemicals commonly encountered in oil and natural gas production and provides seamless protection.
5. During truck loadout, additional inspection protocols include the inspection of loading equipment including the hoses, couplings, and valves to ensure no dripping, leaking, or other liquid or vapor loss occurs during liquid loadout events.
6. Routine SPCC inspections will be conducted and documented pursuant U.S. EPA requirements. The location will be equipped with a SCADA system that allows for remote monitoring and shut-in capabilities.
7. Operator has developed a robust Leak Detection and Repair (LDAR) program, which utilizes Forward Looking Infrared (FLIR®) cameras to identify and fix leaks. These inspections will begin during the drilling phase and continue throughout the life of the Oil & Gas Location.