

## **Management of Exploration and Production (E&P) Waste Management: Wastewater**

### **Items for Committee to Consider:**

- Onsite management and use/reuse of wastewater (DEMLR) vs. offsite disposal of wastewater (DWQ) vs. land application of wastewater (DWQ & DWM)
  - Will need to consider solids, residuals, and wastewater for treatment and disposal.
- Management of water and oil based drilling fluids onsite.
- Without knowing how the produced water and drilling fluids will be altered from the original composition, it may be difficult at this time to determine if pretreatment is needed and what methods/practices are most appropriate for fluids recovered from exploration and production.
  - Other state agencies require site specific characterization for wastewater treatment, disposal and land application plans.
- **Additional Area to be Investigated & Other Wastes to be Managed:**
  - How will the Drill Cuttings from drilling and other solid waste(s) produced onsite be managed?
    - Reuse of “clean” cuttings as rock chips/gravel may create potential for sediment runoff if cuttings are too pulverized from the drilling process.
  - How will operators manage any gases that are not sold or used as fuel?
    - The EPA “green completion” rules effective January 1, 2015 will no longer allow for the flaring of surplus gases.
  - Other wastes associated gas production plants beyond surplus gas, such as water from pipeline drips/compressor stations may require separate/different treatment.
  - NPDES (National Pollutant Discharge Elimination System) permitting vs. land farming/land application permitting- will the respective departments retain permitting responsibilities or will the MEC obtain authority for those permits?

### **DEFINITIONS:**

"Waste" in addition to its ordinary meaning, shall mean "physical waste" as that term is generally understood in the oil and gas industry. It shall include:

- a. The inefficient, excessive or improper use or dissipation of reservoir energy; and the locating, spacing, drilling, equipping, operating or producing of any oil or gas well or wells in a manner which results, or tends to result, in reducing inefficiently the quantity of oil or gas ultimately to be recovered from any pool in this State.

- b. The inefficient storing of oil, and the locating, spacing, drilling, equipping, operating or producing of any oil or gas well or wells in a manner causing, or tending to cause, unnecessary or excessive surface loss or destruction of oil or gas.
- c. Abuse of the correlative rights and opportunities of each owner of oil and gas in a common reservoir due to nonuniform, disproportionate, and unratable withdrawals causing undue drainage between tracts of land.
- d. Producing oil or gas in such manner as to cause unnecessary water channelling or coning.
- e. The operation of any oil well or wells with an inefficient gas-oil ratio.
- f. The drowning with water of any stratum or part thereof capable of producing oil or gas.
- g. Underground waste however caused and whether or not defined.
- h. The creation of unnecessary fire hazards.
- i. The escape into the open air, from a well producing both oil and gas, of gas in excess of the amount which is necessary in the efficient drilling or operation of the well.
- j. Permitting gas produced from a gas well to escape into the air.

“Discharge” shall mean the release, overflow, leakage or seepage of any fluids associated with the drilling and operation of an oil or gas well covered by this Rule.

“Effluent” shall mean wastewater discharged following all treatment processes from a water pollution control facility or other point source whether treated or untreated (O2T.0100).

“Encountered Water” shall mean water encountered during brine, oil, or gas drilling operations, which is of sufficient quantity to require disposal, and which is not Produced Water.

“Flow-Back Fluid” shall mean any of a number of liquid and gaseous fluids and mixtures of fluids, chemicals and or solids consisting of Drilling Fluid, silt, sand and other proppants (resin or ceramic grains), debris, water, brine, oil scum, paraffin, or other materials which are removed from the well bore during the subsequent or recompletion of a well, or other additives that flow from a well following hydraulic fracturing of a well.

“Pits” shall include:

A) Circulation Pit: A pit used during drilling where Drilling Fluids are circulated during drilling operations. The Circulation Pit may be part of the Mud Pit. Circulation Pits may also refer to a series of open, above-ground tanks usually made of steel.

B) Completion Pit: A pit used for storage of Completion Flow-Back Fluid and Drilling Fluids or other materials which have been cleaned out of the well bore during the initial completion of a

well. Circulation or Mud Pits may be used as a Completion Pits when drilling operations conclude.

C) Emergency Pit: A pit used for containing fluids at an operating well during an actual emergency and for a temporary period of time. Use of the Emergency Pit is necessitated due to unplanned operational issues, which may include but is not limited to, a temporary shutdown of a disposal well or fluid injection well or associated equipment, temporary overflow of saltwater storage tanks on a producing lease, gas flaring, cement circulation, or a producing well loading up with formation fluids.

D) Mud Pit: A pit or series of pits used during drilling where fluids are mixed and circulated during drilling operations. Mud Pits may also refer to a series of open, above-ground tanks, usually made of steel.

E) Reserve Pit: A pit not part of the active circulation system, used to store Drilling Fluids or to contain fluids generated during drilling operations. Such fluids would include, but not be limited to, Cuttings, Drilling Fluids, and Encountered Water.

F) Test Pit: A pit constructed for use during a well test.

G) Workover Pit: A pit used to contain fluids during the performance of remedial operations on a producing well in an effort to increase production.

“Pollution” shall mean such contamination or other alteration of the physical, chemical, or biological properties of any land or waters of the state, or such discharge of any liquid, gaseous, or solid substance on land or in any waters of the state as will, or is likely to, render the land or waters harmful, detrimental, or injurious to public health, safety, or welfare; to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish, or other terrestrial or aquatic life.

“Produced water” shall mean the water that exists in subsurface formations and is brought to the surface during oil and gas production

“Residuals” shall mean any solid, semi-solid, or liquid waste, other than effluent or residues from agricultural products and processing, generated from a wastewater treatment facility, water supply treatment facility or air pollution control facility permitted under the authority of the Environmental Management Commission (02T.0100).

**General Requirements of E&P Waste Management Plan:**

- The operator shall control and dispose of fluids, residual waste, and drill cuttings, including brines, drilling fluids, stimulation fluids, well servicing fluids, oil, production fluids, produced

water, and encountered water in a manner that prevents pollution to the land and the waters of the state in accordance with G.S. § 113-390.

**Basic Construction Guidelines and Requirements:** *(to be addressed by Admin of Oil and Gas Committee for construction standards.)*

- The siting of pits/tanks for the storage of liquid and solid waste onsite should be done to maximize distance between pit/tank and nearby surface water(s);
  - Mississippi also requires that “well test pits” to be located at least 100 ft from well pad area and equipment.
  - Construction of a pit within a wetland will require permitting and approval from Army Corps of Engineers (ACOE) (404 permit) and Water Quality (401 permit).
- Bottom of any pit must be at least 10 feet above the seasonal high water table, or pit must be constructed above ground so that bottom of the pit is at least 10 feet above the seasonal high water table.
- Pits and tanks shall be constructed in a manner that does not promote any discharges or leakage. If site is not practical for construction of pits, then use of impervious tanks should be used.
  - Secondary containment may be needed at tanks.
- Pit and Berm general details:
  - At least 2 feet of freeboard must be maintained- pit must handle 10yr-24hr storm without overtopping.
    - These pits ARE NOT to receive storm-water runoff, other than what directly falls in them during a rain event.
    - May need to have emergency or overflow tanks/pits onsite to address elevated fluid levels in pits/pond.
      - Capacity of pit/pond will decrease as it is filled in with mud and cuttings.
  - Slopes must be at least 2:1, with a crest width of at least 2 feet wide.
  - Adequate groundcover must be established on berm (Sediment Erosion Control- temporary groundcover within 7 days).
  - Lining: clay lined, synthetic (AK= 20-40 mils; CO=24-60 mils), bentonite slurry, concrete.
    - Synthetic Lining must be secured to prevent liner from slipping down into pit-trenched in along the crest of the berm.
  - No siphons or openings can be placed in the walls/dikes that would permit escape of pit contents.
- Appropriate security fencing and safety netting should be installed to prevent access to pit by people and wildlife.
  - Chain link around pits with a buffer area; netting/fencing around pit crest capable of supporting a person in case of a slip/fall.

### **Operating Requirements:**

- Operators shall ensure E&P waste is properly stored, handled, transported, treated, recycled, or disposed of to prevent threatened or significant adverse environmental impacts. All waste management activities must be conducted in a manner that protects waters of the state, except as permitted by applicable laws and regulations.
- All oil-based drilling fluids should be segregated from water based drilling fluids and encountered/produced water.
- Record keeping: records related to hauling and disposal of any oil and gas waste generated onsite must be retained for 3 yrs (TX).
- Site may need to have a pretreatment system prior to transport to a wastewater treatment facility.
  - Total suspended solids (TSS), metals, characterization for PEL and STEL (from DENR report, pg. 134).
    - Onsite treatment- membrane filtration, reverse osmosis, thermal distillation, other treatments.
- *Reuse and Recycling*: for beneficial use, reuse, and recycling of fluids used, produced and recovered onsite.
  - Identify types of waste, proposed use of the waste, method of treatment, quality assurance, and any additional certifications or permits required by other laws and regulations.
  - Onsite treatment- membrane filtration, reverse osmosis, thermal distillation, other treatments.

**Treatment:** If/when wastewater or residuals are transported off-site for treatment, the receiving facility must be an authorized treatment facility by this state or by the state in which it is located. Operator must report name of facility and permit identification numbers.

- *Produced water*: should be treated prior to placement in a pit to prevent crude oil and condensate from entering the pit. Depending on water quality the produced water may then be available for reuse.
- *Drilling fluids (muds)*: may be disposed of at a commercial solid waste disposal facility; land treatment/land application at a permitted centralized E&P Waste facility.
  - Bentonitic Drilling Fluids(muds): drying and burial on non-crop land; land application as follows:
    - Must have surface land owner approval, operator retain records of location, thickness (volume), and must respond to any requests for information or complaints about the land applied bentonite.
- *Reclaimed Water*: (15NCAC 02U) meet tertiary quality effluent standards prior to storage or use.

### **Reuse/Recycling:**

- Drill cuttings that do not have any oily residue can be utilized as aggregate material onsite for roadways.
  - Size of cuttings may be a factor in controlling dust and clay runoff onsite.
- *Produced water:* may be used for enhanced recovery, drilling and other approved uses in consideration of water quality standards and classifications.
- *Drilling Fluids:* may be recycled to another drilling pit for reuse. Operator would be responsible for determining if the drilling fluids require and treatment prior to reuse.

**Disposal:** when wastewater or residuals are transported off-site for disposal, the receiving facility must be an authorized disposal facility by this state or by the state in which it is located. Receiving facility may require a transport and disposal docket. This docket must also be retained by the operator.

Disposal dockets must include: copy of invoice/bill/ticket showing the date of transport, identity of the generator, identity of the transporter, location of pick up site, type and volume of waste, name and location of disposal site. These records must be signed by transporter and retained onsite.

- *Solid waste (residuals):* should be disposed of at a permitted solid waste facility or industrial waste facility.
- *Fluids:* includes produced water, encountered water, drilling fluids (muds)
  - *Produced water:* evaporation/percolation in a permitted pit onsite; disposal at a permitted commercial facility;
    - Colorado allows for road spreading if TDS is below 3500 mg/l; or discharge into waters of the state in accordance with rules and regulations (NPDES permit); evaporation or treatment at a centralized waste management facility (Co).
  - Mississippi allows for land or water discharge of pit fluids as long as certain criteria are met.
- *NORMs:* NC Radiation Protection Section- systems in places and methods available of NORMs are a waste product. Currently it is not known if the produced waters will contain quantities of NORMs that would be subject to 49 CFR 173.
  - *In the Triassic Basin, NORMs are not anticipated to pose any disposal problems.*
- Burial onsite of inert and non-recyclable materials- water based muds and cuttings are usually dewatered and solidified prior to burial.
- *Land application (water):* 15A NCAC 02T rules (0500-land application, 0700-infiltration systems).
  - Require site specific characterization; size requirements range from an estimated 2 to over 9 acres for disposal by land application; may require pretreatment of wastewater prior to disposal.
  - Surface irrigation- controlled release of effluent on vegetated land surface

- Infiltration basins- use of a basin for infiltration of water of a quality to be allowed to percolate into the ground.
- Disposal, land application, or Incineration of residual solids

**Closure Requirement:**

- Site Investigation and Remediation Work plan- identify sensitive areas, sampling and analysis to determine vertical or lateral contamination, pit excavation, remediation, and reclamation methods. A single plan can be used for multiple sites as long as it is applicable and is approved by the Department.
- The pits must be closed and filled as soon as they are no longer needed onsite, especially pits needed during drilling operations.
  - Time frame from end of use to closure ranges from 14 days (in a urban setting; OH) to 90 days (CO, TX)
    - OH uses date of when drill rig is offsite to start clock for closure of pits.
  - Surface owner can allow for pits/ponds to remain on property after fluids, solids, and liner has been properly disposed of.
- All fluids and solids in pits must be dewatered, removed and properly disposed of.
  - Colorado uses a Table 910-1 for concentration levels to determine disposal requirements (land application, discharge, or transport to treatment facility).
- Lining material(s) must be removed to the furthest extent possible and properly disposed of.
  - OH allows for residuals to be solidified and then wrapped in liner for burial onsite.
- Pits must be filled in with native materials and provided with an adequate thickness of topsoil or other soil suitable for the establishment of groundcover sufficient to restrain erosion.
  - Should encourage stockpiling of native topsoil onsite.
- Oil and/or grease content of material to be left in pit cannot exceed 3% by dry weight (AK).
  - This would require additional sampling of soils in pit prior to closure to characterize the residuals in the pits.
- Notification of Closure and completion must be sent to State (AK, CO=within 30 days)

**Spills and Releases:**

- All spills/leaks/releases should be recorded showing the cause, size of spill and action taken, and the record to be maintained at facility.
- Threshold levels for reporting based on quantity and hazard of release- above a certain quantity requires immediate notification of spill/release and measures being taken to mitigate.
  - Based on quantity released and hazard of release.
  - Verbal reporting to Department upon discovery of release, not to exceed 24 hours (Co= quantities more than 5 barrels);
  - Reporting Form to be submitted within 10 days of discovery

- Report must include how spill/release was mitigated, investigated and remediated.
  - Department can require an Investigation and Remediation Plan if spill/release has significant adverse impacts.
- Does operator notify other agencies in case of a spill/release reaching a waterway?
  - DWQ should be notified.

**Centralized E&P Waste Management Facilities:** is a non-commercial facility for the treatment, disposal, recycling, or beneficial reuse of E&P Waste. Operators cannot provide services to a third party unless there is an emergency situation or operators are part of a joint operating agreement (Colorado). Facility allows for “cradle-to-grave” type tracking of all wastes (liquid and solid) that are generated from the oil and gas exploration and production activities.

Facilities may include components for land treatment or land application sites, pits, and recycling equipment.

- Siting Requirements
- Facility design and engineering requirements
- Operating Plan- Groundwater monitoring
- Closure Plan- to include a Site Investigation and Remediation Plan prior to closure, may include soil and groundwater sampling (Co= 60 days)

**Recommendations to Committee:**

- This topic will require additional research into areas of solid waste and land application.
- Areas where construction standards are required should be under the Admin of Oil and Gas Committee.
- Site characterization for onsite treatment and disposal of wastewater should be required.
  - This should satisfy requirements under 15A NCAC 02T (land application) and 02U (reclaimed water rules).
- Notification of pit closure(s) can be tracked from the well completion report.
  - 90 days from date of well completion is typical.
  - After dewatering and waste characterization, burial of inert materials onsite.
    - Residuals solidified and then wrapped and buried.
  - What if the pits are will be used again for the drilling and completion of another well in the future?
    - Should the MEC allow for a variance for the pit to remain onsite, as long as measures are taken to ensure it will not degrade or erode over time?
- ALL spills/releases to be reported, but a threshold for immediate reporting of spills/releases should be examined.
- For pit closure- what if there was no topsoil at the beginning of the project? Do we still require a topsoil layer to be established?