

Oil Based Mud – Waste Management

Scenario 1

Waste oil-based mud that exhibits any of the following characteristics prior to use is regulated under Resource Conservation Recovery Act (RCRA):

- 1) exhibits hazardous waste characteristics (ignitable, corrosive, reactive or toxic based on the TCLP test)
- 2) contains a listed hazardous substance or substances under RCRA

This does not apply to properly stored oil-based mud maintained in good condition for its intended use in appropriate containers.

For example, if the oil-based mud is mixed on location and is spilled on location prior to use downhole in drilling operations, it is regulated under RCRA. The waste must then be characterized as hazardous or non-hazardous and must be disposed in accordance with RCRA regulations.

Scenario 2

After an oil-based drilling mud is used in drilling operations, and comes out of the wellbore, the oil-based mud is exempt from RCRA regulation as an oil and gas exploration and production (E&P) waste.

RCRA Subtitle C, §261.4 provides an interim statutory exemption for “drilling fluids, produced waters, and other wastes related with the exploration, development, production of crude oil, or with natural gas or geothermal energy” and is commonly referred to as the “E&P Subtitle C RCRA exemption” and are treated as “special wastes” even though they may contain constituents, such as benzene, toluene, ethylbenzene, and xylenes (BTEX), RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, or silver), other listed organic or inorganic hazardous constituents, or characteristics that would otherwise make them hazardous as defined under RCRA.

In Colorado, oily E&P wastes are regulated by the Colorado Oil and Gas Conservation Commission (COGCC) under the 900 Series Rules. Under COGCC Rule 907 operators are to ensure that an 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 (attached), with consideration to the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Commission (WQCC) groundwater standards and classifications. E&P waste management activities must be conducted, and facilities constructed and operated, to protect waters of the state from significant adverse environmental impacts from the E&P waste, except as permitted by applicable laws and regulations.

An E&P waste may be left onsite without further treatment if it is sampled and then analyzed by an accredited environmental laboratory using appropriate methods for the parameters listed in COGCC Table 910-1 and the constituents are not detected at concentrations or levels above

the Table 910-1 criteria.

The COGCC encourages reuse and recycling of E&P waste, so operators may propose plans for managing E&P waste through beneficial use, reuse, and recycling by submitting a written management plan to the COGCC Director for approval on a Sundry Notice, Form 4, if applicable. Such plans must 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.

Oily E&P waste may be treated or disposed as follows:

- A. Disposed at a commercial solid waste disposal facility
- B. Land treatment onsite
- C. Land treatment at a centralized E&P Waste Management facility that is permitted with the COGCC in accordance with Rule 908.

Land treatment requirements include:

1. Operators shall submit a Site Investigation and Remediation Workplan (Form 27), for prior approval by the Director. Treatment should be completed in accordance with the approved workplan and Rules 909 and 910.
2. Free oil shall be removed from the oily waste prior to land treatment.
3. Oily waste shall be spread evenly to prevent pooling, ponding, or runoff,
4. Contamination of stormwater runoff, groundwater, or surface water shall be prevented.
5. Biodegradation shall be enhanced by disking, tilling, aerating, or through the addition of nutrients, microbes, water, or other amendments, as appropriate.
6. Land-treated oily waste incorporated in place or beneficially reused shall not exceed the concentrations in Table 910-1.
7. When land treatment occurs in an area not used for oil and gas operations, operators shall obtain prior written surface owner approval. When land treatment occurs on an approved COGCC 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.
8. Land treatment shall be conducted in a manner that does not preclude compliance with reclamation rules 1003 and 1004.

- (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.