

NPDES Permitting Requirements for
Petroleum Bulk-Storage
Surface Storage Greater than One Million Gallons
2005 -- Permitting Strategy

Introduction / Background

North Carolina's Division of Water Quality issues individual, point-source NPDES permits for stormwater to all vehicle-fuel and petroleum terminals with above ground storage capacities exceeding one million gallons. Storages exceeding this volume are specifically excluded from Stormwater General Permit NCG080000, and therefore require a point-source discharge permit.

This document is intended to update the 2001 strategy for up-coming permit cycles. (For a history of this permitting strategy, see the Division's 2001 Permitting Strategy: *Permit Requirements for Discharges from Oil and Petroleum Storage Facilities, version. 30Jul2001.*)

Bulk-storage facilities typically retain and manage stormwater behind secondary-containment dikes. Diked areas are designed with sufficient volume to confine product in the event of a tank failure. Stormwater, often comprising several storm events, is held behind these dikes in proximity to the tanks and appurtenant piping. The permittee typically holds this stormwater for controlled release.

Permitting Requirements

1. Flow -- Discharge Rate and Duration

[Instructions to Permit Writer](#): Establish average and maximum flows for the previous cycle for the purpose of calculating limits for various parameters of concern. These should be noted in the Fact Sheet.

Stormwater flow in bulk-storage permits is not limited. Flow measurements are required, however, and methods shall reflect a typical controlled release discharge event. Flow shall be monitored, reported, and recorded using one of four approved methods. The following instructions shall appear as a footnote in permit section *A.(1.) Effluent Limits and Monitoring Conditions*:

“Flow shall be monitored with each discharge event – During periods of no flow, the Permittee shall submit a signed, monthly Discharge Monitoring Report (DMR) indicating "No discharge." Flow may be monitored using any one of four methods:

- a) measure flow continuously;
- b) calculate flow (see *Rational Equation* below) based on total rainfall per unit area draining to the outfall; exclude built-upon areas (best method for facilities with large runoff-collection ponds);
- c) estimate flow at 20-minute intervals during the entire discharge event; or
- d) report flow based on discharge pump logs.”

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The Rational Equation:

Q=K_uCIA, where:

- Q = flow (peak flow rate (cfs or m³/sec)
- K_u = units conversion factor = 1.008 for U.S. standard units (usually ignored because it is so close to 1), or 0.278 for SI units
- C = dimensionless runoff coefficient for the watershed, loosely defined as the ratio of runoff to rainfall
- I = intensity of rainfall taken from the intensity-duration-frequency curves for the specified design return period at the *time of concentration*, t_c (in/h or mm/h). t_c = time of concentration (time after the beginning of rainfall excess when all portions of the drainage basin are contributing simultaneously to flow at the outlet).
- A = area of tributary watershed (acres or km²)

The rational equation is used to calculate the runoff from a region, given:

- the runoff coefficient which accounts for infiltration and other potential losses in the region,
- the rainfall intensity to the region,
- the time it takes for runoff to travel from the region's upper reaches to its outlet, and
- the region's drainage area.

2. Acute Toxicity.

Instructions to Permit Writer: Evaluate toxicity compliance. **Replace toxicity test method if different** from: Fathead Minnow (*Pimephales promelas*), 24-hr definitive, LC-50>100% (**TAE6C**). Concerning monitoring frequency:

- If any annual WET test demonstrates toxicity [failure for pass/fail or LC-50 reported less than 100 %], then increase WET testing to *quarterly*.
- If Permittee tests *annually* with no demonstration of toxicity, continue annual monitoring.
- If Permittee tests *quarterly* with no demonstration of toxicity (i.e., the last 5 consecutive tests have “passed” or demonstrate LC-50 > 100%), then reduce monitoring to annually.

Rationale: Acute toxicity testing (as opposed to chronic testing) is deemed appropriate to evaluate the end-of-pipe immediate impact of short-term, episodic discharges. All Permit *Effluent Limitations and Monitoring Conditions* shall include the following Wet Testing footnote:

“The Permittee shall collect Acute Toxicity samples concurrently with BTEX sampling.”
[Reference item 4. below]:

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3. Total Suspended Solids (TSS) / Oil and Grease

Instructions to Permit Writer: Oil and Grease - Monitor *monthly* - *No Limit*

Instructions to Permit Writer: TSS - Monitor *monthly*; *Daily Maximum Limit, 45.0 mg/l.*

Monitoring Footnote: “Where possible, the grab sample for Oil and Grease should be skimmed from the water surface of a quiescent (calm water) zone.”

Rationale: A daily maximum TSS limit of 45 mg/L is recommended as a minimum stormwater management practice. Although historically, TSS and Oil and Grease have not been significant problems in oil-terminal stormwater discharges. TSS and Oil and Grease are deemed good general indicators of effluent stormwater quality for these facilities.

4. BTEX

Instructions to Permit Writer: Monitor *monthly*. If data indicate RP, add limit and monitor *monthly*.

Rationale: Benzene, toluene, ethylbenzene and xylene (BTEX) are common toxicants found in fuel petroleum. Previous scans for volatile and semi-volatile compounds included BTEX (methods EPA 624/625). A review of these scans revealed BTEX frequently in stormwater, while other 624/625 parameters were uncommon or never detected. Therefore, future permits shall require BTEX monitoring for lighter fuels and naphthalene for diesel fuel (see 6.).

5. Naphthalene (for Diesel)

Instructions to Permit Writer: Monitor *monthly* – No limit

Rationale: Naphthalene is commonly found in heavier fuels, such as fuel oil or diesel. Most bulk-terminals store heavier fuels. (NOTE: If the permittee can demonstrate to the Division that its facility does not now, nor has ever, stored diesel fuel or other heavy fuels, it may petition to remove this requirement from the permit.) The Division recommends no permit limit because EPA has established no criteria for naphthalene.

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6. EPA Methods 624/625 (as applicable)

Instructions to Permit Writer: Conduct RPA on parameter “hits,” but only those with NC stream standards and /or federal criteria*.

- if RP, monitor monthly and add permit limit.
- if detected (but no RP), Monitor semi-annually.
- if no parameters detected other than BTEX, delete 624/625 from permit.

Rationale: This strategy serves to resolve previous investigations into the need to conduct EPA screening by test Methods 624/625. For Permittees assigned to conduct volatile and semi-volatile scans who did not comply with the permit, assessment will be considered. RPA will be restricted to parameters of concern (POC) with North Carolina State water quality standards and federal criteria.

*NOTE: the Permit Writer shall use *aquatic life* or *Human Health* standards as appropriate.

7. Tank Solids, Tank Bottom Water, and Rag Layer

Instructions to Permit Writer: Keep the footnote:

“Direct discharge of tank solids, tank bottom water, or the rag layer is not permitted.”

Rationale: Tank-bottom sediments accumulate over 4-5 years (typically ½- to 1-inch thick) and invasive rainwater (1-6 inches thick) regularly settles to the bottom of any bulk-storage container. These layers typically mix at the interface with overlying fuel to form a ¾-inch-thick foamy waste called a “rag layer.” Because of the relatively high levels of hydrocarbon compounds contained in these three wastes layers, their untreated discharge is not permitted.

8. Hydrostatic Tank Testing

Instructions to Permit Writer: Keep the footnote:

The permittee shall not discharge tank solids, tank bottom water, or the tank rag layer. The permittee shall not discharge tank (or pipe) contents following hydrostatic testing unless benzene concentration is less than 1.19 µg/L and toluene concentration is less than 11 µg/L.

Rationale: As routine container maintenance, bulk-storage Permittees typically conduct hydrostatic tank testing every five to six years. Prior to testing, the Permittee empties the tank of product, and properly disposes of tank-bottom wastes (see 7. above). Tanks are cleaned, coated, and welded (as necessary), then refilled with water for hydrostatic pressure testing. Some facilities use stream or lake water, while others use potable city water. Testing water is then drained from the tank.

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Because this test-water may contain hydrocarbons or other toxicants, the Permittee shall sample and analyze this waste prior to direct discharge. Should benzene, toluene, and/or other parameter levels exceed their respective water quality standard, direct discharge of this waste is not permitted.

Permitting Special Considerations

9. Methyl Tertiary Butyl Ether (MTBE) in Water Supply (WS) Waters

Instructions to Permit Writer: Evaluate compliance and document analyte database in Fact Sheet.

- If not detected, lower monitoring frequency to *quarterly*.
- If detected, continue *monthly* monitoring and require Permittee to submit an Action Plan within 12 months of the permit effective date.

Rationale: In 2001, the EPA tagged MTBE as a potential human carcinogen. North Carolina responded to EPA's ongoing evaluations of this "anti-knock" additive by implementing efforts to limit MTBE in discharges to water supply (WS) waters. Although North Carolina has not yet adopted a water quality standard for MTBE, monitoring of this potential human health risk will continue in order to provide data for future evaluation.

10. Benzene in Water Supply (WS) Waters

Instructions to Permit Writer: Evaluate RP using Human Health Standard ($1.19 \mu\text{g/L}$).

- If RP, keep/add permit limit: *Daily Max* = $1.19 \mu\text{g/L}$ (allow dilution using "annual average" flow).
- If no RP, delete limit; continue monitoring *monthly* – all permits.

Rationale: Benzene is identified as a human carcinogen and therefore poses potential health risk to drinking water. Therefore, a limit of $1.19 \mu\text{g/L}$ (Water Quality Standard) shall apply to all WS-classified waters. The Division shall consider dilution (i.e., multiply the *standard* x dilution under "average annual flow" conditions to calculate the permit limit). If the permittee discharges under "zero-flow" conditions, the *standard* shall become the permit limit.

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11. Phenol in Water Supply (WS) Waters

Instructions to Permit Writer: Monitor: *monthly*. Evaluate “drainage-specific” RP. [See attached Memorandum from Joe Corporon, September 08, 2005, for revised guidance calculations for the Paw Creek area (total: 8 dischargers).]

- If RP, add limit: *Daily Maximum* distributed equally among all outfalls.
- If no RP, delete limit; continue monitoring *monthly*.

The Division shall determine permit limits based on a NC State standard for *chlorinated phenolic compounds* of **1 µg/L**. The Division shall evaluate each permittee’s limit using drainage-specific calculations for allowable phenol loading. This strategy dates from the 1980s [see Division memos for Guilford County (1983); updated calculations governing dischargers to the Catawba River Basin (2001) and Cape Fear River Basin (2003)].

Rationale: Discharges from fuel hydrocarbon bulk-storage facilities have a potential to contain phenol, based on previous data statewide. Phenol, when combined with chlorine, forms chlorinated phenolic compounds with potential to taint fish tissue and drinking water, thus degrading taste and odor (organoleptic concerns).

12. Turbidity Monitoring

Instructions to Permit Writer:

- if detected, Monitor *Quarterly*
- if not detected, delete from permit.
- If RP exists (based on 50 NTU) - add limit and monitor *Monthly*.

Rationale: EPA questioned the potential of these facilities to violate stream standards because little data were available. Sufficient data now exist to evaluate “reasonable potential” for a facility to exceed 50 NTU. The Permit writer shall use the entire permit cycle database (for those monitoring quarterly), and the most recent two years of data (for those monitoring monthly). For all facilities, the following shall appear on the *Effluent Limitations and Monitoring* page as a footnote:

“Turbidity – Effluent shall not cause receiving stream turbidity to exceed 50 NTU. If receiving stream background turbidity exceeds 50 NTU, effluent shall not cause this background value to increase.”