

projected drilling schedules. Three alternatives were evaluated by the operators in terms of technological achievability and costs: discharge to Cook Inlet surface water, land-based disposal, and disposal by injection. EPA considered this information during its development of regulatory options and estimation of costs for disposal of drilling wastes in Cook Inlet. These same Cook Inlet operators also submitted to EPA information on the technological and economic feasibility of zero discharge of produced water from the largest shore-based production facility in the Inlet. This information presented the costs and technological achievability for three produced water injection alternatives including (1) Treatment and injection at the platforms, (2) treatment at onshore treatment facilities (for some platform operations) and onshore injection, and (3) treatment at onshore treatment facilities and injection back at the platforms. EPA considered this information during its development of zero discharge option for produced water and cost estimations in Cook Inlet.

I. Region X Drilling Fluid Toxicity Data Study

EPA evaluated a summary data base containing Region X permit compliance monitoring information including toxicity measurements of drilling fluids used in Alaska. The database contains 161 records of 96-hour LC50 data from coastal and offshore oil and gas wells in Alaska from 1985 to 1994. Drilling fluid toxicity levels were characterized for Alaska drilling activities, and particularly for activities in Cook Inlet. This data indicated that drilling fluids and cuttings being discharged in Cook Inlet may be able to meet a toxicity limitation of between 100,000 ppm (SPP) and 1,000,000 ppm (SPP).

EPA measures toxicity using a standard bioassay test known as the "Drilling Fluids Toxicity Test" (See 40 CFR 435 Subpart A, Appendix 2). Under this test, the species *mysidopsis bahia* is exposed to different concentrations of the drilling fluids and cuttings for a set time, 96 hours. An LC-50 toxicity test is performed by mixing a solution of seawater and drilling fluids and cuttings, allowing the solution to settle for one hour, decanting the liquid off from the settled solids, and then adding to the decant, or suspended particulate phase (SPP), the test organisms and determining the number of organisms alive after 96 hours. Then, by observing mortality rates and by calculation, the concentration required to kill 50 percent of the test animals in 96 hours is

determined. The "96-hour LC-50" is defined as the lethal concentration of a toxicant that will kill 50 percent of the test organisms after a 96-hour exposure. Thus, the lower the LC-50 value, the higher the relative toxicity.

J. California Operations

EPA visited coastal oil and gas operations in Long Beach Harbor, California in February 1992. The visit was to one of the four man-made islands that have been constructed in the Harbor for the purpose of oil and gas extraction. The facilities on these islands are operated by THUMS, a consortium of five oil and gas operating companies (Texaco, Humble (now Exxon), Union, Mobil and Shell). EPA met with state regulatory officials and was given a tour of one of the islands by THUMS personnel. Both drilling and production were occurring at the time of the visit.

Information regarding waste generation, treatment, disposal, and costs were obtained during the visit. No discharges are occurring from the THUMS operations. The information provided EPA with specific waste disposal technology and cost information which has, where appropriate, been incorporated into cost analyses, and enabled EPA to characterize California coastal oil and gas operations.

K. OSW Sampling Program

EPA's Office of Solid Waste conducted a sampling program on associated oil and gas wastes in 1992. As part of this effort, samples were obtained for completion, workover, and treatment fluids. The parameters analyzed for were the same as those for produced water samples listed previously in Section V.D. EPA has used this data base to characterize the discharges of these fluids. Seven samples of treatment, workover and completion fluids were collected from operations in Texas, New Mexico and Oklahoma. The samples were analyzed for conventional, nonconventional and priority pollutants.

L. Estimation of the Inner Boundary of the Territorial Seas

As part of the Coastal Guidelines development effort, EPA specifically delineated the seaward boundary of the coastal subcategory (which is the inner boundary of the Territorial Seas). The purpose of this effort was to define an area in order to estimate the number of coastal wells and production facilities operating in that area. The purpose was not to determine a well's subcategory for regulatory permit writers. This

delineation is in the form of latitude and longitude coordinates covering that part of the inner boundary of the Territorial Seas along Alaska's North Slope and Cook Inlet, Texas, Louisiana, Alabama and Southern California. Much of this boundary has been delineated on nautical charts published by the National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA). In some locations however, this boundary has not previously been delineated by NOAA, and EPA completed the coordinates using established procedures described in the Convention of the Territorial Seas and the Contiguous Zone, Articles 3-13. The digital coordinates of the inner boundary of the Territorial Seas, for the above mentioned locations and a description of its derivation is included in the record for this rule. This digital boundary assisted EPA in its determination of the number of wells and production facilities that exist in this subcategory.

VI. Development of Effluent Limitations Guidelines and Standards

A. Drilling Fluids and Drill Cuttings (Drilling Wastes)

1. Waste Characterization

Drilling fluid and cuttings discharges are typically generated in bulk form and occur intermittently during well drilling and at the end of the drilling phase.

There are currently no drilling fluids and cuttings discharges in any coastal area except Cook Inlet. In Cook Inlet, operators do not currently practice zero discharge, except for a small volume of drilling fluids and cuttings wastes (approximately one percent) which are not discharged because they do not meet current permit limits. Generally, drilling fluids and cuttings volumes average approximately 14,000 barrels (bbl) per new well drilled in Cook Inlet. (NOTE: The barrel is a standard oil and gas measurement and is equal in volume to 42 gallons). Based on industry projections given to EPA, an average of 79,000 bbls drilling fluids and cuttings are generated each year (bpy) in the Inlet. Significant pollutants in these wastes include chromium, copper, lead, nickel, selenium, silver, beryllium and arsenic among the toxic metals. Toxic organics present include naphthalene, fluorene, and phenanthrene.

TSS makes up the bulk of the pollutant loadings, part of which is comprised of the toxic pollutants. TSS concentrations are very high due to the nature of the wastes. And because its TSS concentration is so high, discharges of drilling fluids and cuttings can cause