eliminate 1.1 to 4.3 annual cancer cases and the monetized benefits from cancer cases avoidance are projected to range from $2.3 to $43 million. Using the modelling approach, the proposed BAT is projected to eliminate 1.2 to 4.6 cancer cases per year, resulting in monetized benefits in $ 2.4 to $46 million per year.

The temporal dynamics of both impacts and benefits assessments is relevant to the human health risk assessment. For the assessments of cancer reduction benefits, the methodology is consistent with estimating costs for the rule, using a one-year ''snap-shot'' approach. Allocating the full value of annual benefits within one year following cessation of produced water discharges may appear to over-estimate potential annual benefits in cases where incomplete recovery has occurred. However, in such cases where impacts are incompletely recovered, a consideration of total impact would need to include any impacts expected to occur beyond that year. This analysis does not attempt to identify or allocate benefits on a yearly basis, but merely averages total benefits so that monetized benefits may be compared to costs that are developed using the same approach.

(ii) Projected Ecological Benefits for Texas and Louisiana Bays. A potential ecological benefit of zero discharge of produced water in Texas and Louisiana coastal areas is projected from a Trinity Bay case study. This study shows that measures of total benthic abundance and species richness are depressed by discharges, up to distances between 1.7 kilometers and 4 kilometers from the point of discharge. (Data on abundance of other species, such as waterfowl were not collected.) Taking into account the severity of these impacts at different distances, the equivalent acreage affected in this case study ranges from 200 to 2,817 acres. Extrapolating from this case study to the other sites that would be affected by this rule, EPA estimates that the total Texas and Louisiana acreage affected ranges from 14,607 acres to 195,488 acres. EPA identified numerous values for an acre of wetland but none were marginal estimates for Texas or Louisiana, and some did not net out the cost of recreational use. A literature review for wetland value estimates conducted for Mineral Management Services (MMS) in 1991, reports that different studies have estimated recreational and commercial wetland values for coastal Louisiana ranging from $57 to $940 per acre per year (with a median value of $410 per acre per year) in 1990 dollars. Using this range of values, the estimated increase of Texas and Louisiana Bay recreational values ranges from $0.8 million to $184 million per year in 1990 dollars ($1.0 million to $210 million in 1994 dollars). These per acre estimates are consistent with the estimated average recreational value of the acreage of Galveston Bay, which ranges from $336 to $730 per acre. (The Galveston Bay estimates do not net out the cost to recreational users of using the resource.) These estimates may not be marginal values as they are calculated from the total recreational value of Galveston Bay and total acreage of the Bay. There may be concern that the value of wetland recovery diminishes as the amount of recovered acreage increases and therefore these average values would overstate the relevant marginal values by an unknown amount. As these studies use different estimation methods, cover different types of wetlands, marshes and coastal waters which may differ from those affected by this rule, and generally reflect average values rather than the social valuation of small (marginal) changes in acreage, EPA solicits comments on the appropriateness of this benefit analysis and requests data on marginal values of wetlands, in particular in Texas and Louisiana.

(iii) Total Monetized Benefits. EPA estimates that total monetized benefits (*i.e.* combining cancer risk reduction and ecological benefits) resulting from proposed zero discharge of produced water range from approximately $3.2 to $230 million per year in 1990 dollars ($3.7 million to $263 million in 1994 dollars).

(2) Cook Inlet. Quantified benefits analyzed in Cook Inlet include non-monetized quantified benefits associated with proposed regulations of produced water and drilling fluids and drill cuttings. These benefits include modeled water quality benefits expressed: (a) as a reduction of mixing zone needed for produced water discharges to meet Alaska state water quality standards, and (b) as a reduction or elimination in exceedances of Alaska state water quality standards at the edge of mixing zone from drilling fluids and drill cutting discharges.

(a) Produced Water. The effects of toxic pollutants in current (BPT) produced water discharges on receiving water quality and benefits of proposed effluent guidelines are evaluated. Plume dispersion modeling is performed to project in-stream concentration of 21 pollutants at the edge of the mixing zones from eight outfalls representing Cook Inlet produced water discharge; the in-stream concentrations are then compared to the Alaska's state limitations. Unlike the Gulf of Mexico, Alaska state requirements do not have spatially-defined mixing zones. (Alaska determines the extent of the mixing zone needed to achieve compliance with water quality standards and evaluates reasonableness of this calculated mixing zone). The water quality assessment for Cook Inlet therefore determines the spatial extent of mixing zones needed for each evaluated outfall to meet all state standards at current discharge and at the proposed BAT. For the eight outfalls modeled, the distance from each facility where all state standards are met ranges from within 50 feet to 2,500 meters at current (BPT) level, and from within 50 feet to 2,000 meters at proposed BAT.

(b) Drilling Fluids and Drill Cuttings. Discharges of drilling fluids and drill cuttings are modelled using Offshore Operator's Committee (OOC) Mud Discharge Model to project in-stream concentrations of 19 pollutants in water column at the edge of a 100 meter mixing zone. The projected pollutant concentrations are then compared to the Alaska state water quality standards. The discharge rates are modeled in accordance with the maximum discharge rates allowable under the existing NPDES general permit for Cook Inlet (1,000 bph in water depths exceeding 40 meters; 750 bph in water depths from 20 to 40 meters; and 500 bph in water depths from 5 to 20 meters). Discharges are prohibited in waters between the shore and the 5 meter isobath. The modeling results show four standards are exceeded (human health standards for beryllium and fluorene and the drinking water standards for aluminum and iron) at 40 meter water depth; at 20 meters water depth five standards are exceeded (human health standards for beryllium, fluorene, and phenanthrene, and drinking water standards for aluminum and iron); and six standards are exceeded at the 10 meters water depth (human health standards for beryllium, fluorene, and phenanthrene, and drinking water standards for aluminum, antimony, and iron) at both current BPT discharge and the alternative BAT Option 2 which would allow discharge of drilling fluids and drill cuttings with certain limitations. The zero discharge option (Option 3) would eliminate all projected exceedances.

### *C. Description of Non-Quantified Benefits*

The Benefit Analysis attempts to quantify, and whenever appropriate, to monetize specific environmental benefits that may result from the options proposed for this rule. However, some of the potential benefits could not be