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# **Coastal Texas Protection and Restoration Feasibility Study**

*Appendix E-4:  
Regional Economic Development (RED) Analysis*

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# 1 REGIONAL ECONOMIC DEVELOPMENT (RED) ACCOUNT

## 1.1 GENERAL

The Regional Economic Development (RED) account addresses the impacts that the USACE expenditures associated with the construction of a coastal storm risk management system will have on the levels of income, output and employment throughout the region. These impacts are not included in the NED analysis, but can still be used by decision makers as part of their investment decision process. The RED analysis does not address the indirect losses, or nonphysical impacts, to the national economy that were calculated as part of the REMI analysis discussed in the Other Benefit Categories section of the Economic Appendix.

## 1.2 EXPENDITURES FOR THE RECOMMENDED PLAN

The expenditures associated with the construction of coastal storm risk management systems include construction costs, lands and damages costs, planning, engineering and design (PED) costs and construction management costs. The following cost estimates were provided by USACE Cost Engineering for the various components of the Recommended Plan for Region 1: the storm surge gate at Bolivar Roads (approximately \$13.3 billion); the Galveston ring barrier system, seawall raising and mitigation for West Point/Channelview neighborhood (approximately \$3.3 billion), the Clear Creek gate (approximately \$1.5 billion), the Dickinson Bayou gate (approximately \$900 million), nonstructural measures for the west bank of Galveston Bay (approximately \$59 million), other mitigation measures (approximately \$101 million) and National Ecosystem Restoration (NER) features throughout Region 1 (approximately \$2.5 billion). The construction expenditures for these features total approximately \$21.6 billion.

Cost estimates were also provided by USACE Cost Engineering for the following beach and dune improvements: the initial construction of dune and berm segments at Bolivar Beach (approximately \$1.3 billion); the initial construction of dune and berm segments at West Galveston Island (approximately \$1.2 billion); and periodic beach replenishments at Bolivar Beach, West Galveston Island and San Padre Island (approximately \$1.2 billion). It should be noted that there were no initial construction costs for the San Padre Island beach. The costs for the beach nourishment component total approximately \$3.7 billion. The total construction cost expenditures for the Recommended Plan was \$25.3 billion.

The total Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R, or more commonly O&M) costs for the various features of the Recommended Plan during the 50-year period of analysis were estimated to be approximately \$7.4 billion. It should be noted that OMRR&R expenditures were not provided for San Padre Island.

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## **2 METHODOLOGY**

This Regional Economic Development (RED) analysis employs input-output economic analysis, which measures the interdependence among industries and workers in an economy. This analysis uses a matrix representation of a regional economy to predict the effect that changes in one industry will have on other industries. The greater the interdependence among industry sectors, the larger the multiplier effect on the economy. Changes to government spending drive the input-output model to project new levels of sales (output), value added Gross Regional Product (GRP), employment, and income for each industry.

RECONS Version 2 was the specific input-output model used to estimate the regional economic development impacts of the Recommended Plan. The USACE Institute for Water Resources (IWR), Louis Berger, and Michigan State University developed the regional economic impact modeling tool, RECONS (Regional Economic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities. This modeling tool automates calculations and generates estimates of jobs, labor income, value added, and sales through the use of IMPLAN® multipliers and ratios, customized impact areas for USACE project locations, and customized spending profiles for USACE projects, business lines, and work activities. RECONS allows the USACE to evaluate the regional economic impact and contribution associated with USACE expenditures, activities, and infrastructure.

### **2.1 DESCRIPTION OF METRICS**

“Output” is the sum total of transactions that take place as a result of the construction project, including both value added and intermediate goods purchased in the economy. “Labor Income” includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income. “Gross Regional Product (GRP)” is the value-added output of the study regions. This metric captures all final goods and services produced in the study areas because of the existence of the project. It is different from output in the sense that one dollar of a final good or service may have multiple transactions associated with it. “Jobs” is the estimated worker-years of labor required to build the project.

### **2.2 ASSUMPTIONS**

Input-output analysis rests on the following assumptions. The production functions of industries have constant returns to scale, so if output is to increase, inputs will increase in the same proportion. Industries face no supply constraints; they have access to all the materials they can use. Industries have a fixed commodity input structure; they will not substitute any commodities or services used in the production of output in response to price changes. Industries produce their commodities in fixed proportions, so an industry will not increase production of a commodity without increasing production in every other commodity it produces. Furthermore, it is assumed that industries use the same technology to produce all of its commodities.

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## 2.3 RESULTS

The expenditures associated with the Coastal Storm Risk Management System component of the NED are estimated to be \$21.6 billion. Of this total expenditure, \$19.8 billion will be captured within the local impact area, the Houston-Sugar Land-Baytown MSA, which includes Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller counties. The remainder of the expenditures will be captured within the state impact area of Texas, and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures \$21.6 billion support a total of approximately 118,000 full-time equivalent jobs, \$9.7 billion in labor income, \$15 billion in the gross regional product, and \$29.3 billion in economic output in the local impact area. More broadly, these expenditures support approximately 203,000 full-time equivalent jobs, \$14.4 billion in labor income, \$22.7 billion in the gross regional product, and \$44.6 billion in economic output in the nation.

The expenditures associated with the Initial Construction of the Beach Nourishment component of the NED plan are estimated to be \$2.5 billion. Of this total expenditure, \$2.3 billion will be captured within the local impact area. The remainder of the expenditures will be captured within the state impact area and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures of \$2.5 billion support a total of 22 thousand full-time equivalent jobs, \$1.7 billion in labor income, \$2.48 billion in gross regional product, and \$4.27 billion in economic output in the local impact area. More broadly, these expenditures support 36 thousand full-time equivalent jobs, \$2.4 billion in labor income, \$3.7 billion in gross regional product, and \$6.6 billion in economic output in the nation.

The expenditures associated with the Periodic Beach Nourishment component of the NED plan are estimated to be \$1.1 billion. Of this total expenditure, \$1 billion will be captured within the local impact area, the Houston-Sugar Land-Baytown MSA. The remainder of the expenditures will be captured within the state impact area of Texas and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures \$1.1 billion support a total of over 10,000 full-time equivalent jobs, \$795 million in labor income, \$1.1 billion in the gross regional product, and \$1.9 billion in economic output in the local impact area. More broadly, these expenditures support over 16,000 full-time equivalent jobs, \$1.1 billion in labor income, \$1.7 billion in the gross regional product, and \$3 billion in economic output in the nation.

The expenditures associated with the Operations and Maintenance tasks are estimated to be an average of \$148 million annually. Of this total expenditure, \$143 million will be captured within the local impact area, the Houston-Sugar Land-Baytown MSA. The remainder of the expenditures will be captured within the state impact area of Texas and the nation. These direct expenditures

generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures support a total of 1,300 full-time equivalent jobs, \$104.3 million in labor income, \$147 million in the gross regional product, and \$250.3 million in economic output in the local impact area. More broadly, these expenditures support 2,200 full-time equivalent jobs, \$147.7 million in labor income, \$220.9 million in gross regional product, and \$404 million in economic output in the nation.

**Table 1. Levees and floodwalls.**

<b>Area</b>	<b>Output (\$000)</b>	<b>Jobs*</b>	<b>Labor Income (\$000)</b>	<b>GRP (\$000)</b>
<b>Local</b>				
Direct Impact	\$19,790,000	64,000	\$6,266,000	\$9,293,000
Secondary Impact	\$9,516,000	54,000	\$3,439,000	\$5,715,000
Total Impact	\$29,306,000	118,000	\$9,705,000	\$15,008,000
<b>State</b>				
Direct Impact	\$21,038,000	79,000	\$7,080,000	\$10,251,000
Secondary Impact	\$13,301,000	75,000	\$4,455,000	\$7,497,000
Total Impact	\$34,339,000	154,000	\$11,535,000	\$17,749,000
<b>US</b>				
Direct Impact	\$21,334,000	83,000	\$7,143,000	\$10,342,000
Secondary Impact	\$23,296,000	120,000	\$7,246,000	\$12,359,000
Total Impact	\$44,630,000	203,000	\$14,389,000	\$22,701,000
<i>* Jobs are presented in full-time equivalence (FTE)</i>				

**Table 2. Beach nourishment – initial construction.**

<b>Area</b>	<b>Output (\$000)</b>	<b>Jobs*</b>	<b>Labor Income (\$000)</b>	<b>GRP (\$000)</b>
<b>Local</b>				
Direct Impact	\$2,322,000	12,000	\$1,049,000	\$1,328,000
Secondary Impact	\$1,945,000	10,000	\$700,000	\$1,159,000
Total Impact	\$4,267,000	22,000	\$1,749,000	\$2,488,000
<b>State</b>				
Direct Impact	\$2,477,000	14,000	\$1,137,000	\$1,451,000
Secondary Impact	\$2,570,000	14,000	\$858,000	\$1,441,000
Total Impact	\$5,048,000	28,000	\$1,995,000	\$2,892,000
<b>US</b>				
Direct Impact	\$2,503,000	14,000	\$1,144,000	\$1,470,000
Secondary Impact	\$4,140,000	21,000	\$1,299,000	\$2,209,000
Total Impact	\$6,643,000	36,000	\$2,443,000	\$3,679,000
<i>* Jobs are presented in full-time equivalence (FTE)</i>				

**Table 3. Beach nourishment – periodic nourishment.**

<b>Area</b>	<b>Output (\$000)</b>	<b>Jobs*</b>	<b>Labor Income (\$000)</b>	<b>GRP (\$000)</b>
<b>Local</b>				
Direct Impact	\$1,056,000	5,000	\$477,000	\$604,000
Secondary Impact	\$884,000	5,000	\$318,000	\$527,000
Total Impact	\$1,940,000	10,000	\$795,000	\$1,131,000
<b>State</b>				
Direct Impact	\$1,126,000	6,000	\$517,000	\$659,000
Secondary Impact	\$1,168,000	6,000	\$390,000	\$655,000
Total Impact	\$2,294,000	12,000	\$907,000	\$1,314,000
<b>US</b>				
Direct Impact	\$1,138,000	8,000	\$520,000	\$668,000
Secondary Impact	\$1,882,000	8,000	\$590,000	\$1,004,000
Total Impact	\$3,020,000	16,000	\$1,110,000	\$1,672,000
* Jobs are presented in full-time equivalence (FTE)				

**Table 4. Operation, maintenance, repair, replacement, and rehabilitation.**

<b>Area</b>	<b>Output (\$000)</b>	<b>Jobs*</b>	<b>Labor Income (\$000)</b>	<b>GRP (\$000)</b>
<b>Local</b>				
Direct Impact	\$143,000	700	\$66,000	\$84,000
Secondary Impact	\$107,000	600	\$38,000	\$63,000
Total Impact	\$250,000	1,300	\$104,000	\$147,000
<b>State</b>				
Direct Impact	\$148,000	900	\$70,000	\$88,000
Secondary Impact	\$145,000	800	\$48,000	\$81,000
Total Impact	\$293,000	1,700	\$118,000	\$169,000
<b>US</b>				
Direct Impact	\$148,000	900	\$70,000	\$88,000
Secondary Impact	\$256,000	1,300	\$78,000	\$133,000
Total Impact	\$404,000	2,200	\$148,000	\$221,000
<i>* Jobs are presented in full-time equivalence (FTE)</i>				