

# **Economic Impact Assessment of the Proposed Commercial Vertical Launch Complex at Kennedy Space Center**

## **Final Project Report**

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for Dynamac Corporation, Kennedy Space Center, Florida

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## **Executive Summary**

The purpose of this study is to evaluate certain economic impacts associated with the proposed construction and operation of a Commercial Vertical Launch Complex (CVLC) at Kennedy Space Center, Florida, from 2008 through 2020. Kennedy Space Center (KSC) is located in Brevard County, on the east coast of central Florida. The study-area used for this analysis includes Brevard, Orange and Volusia Counties.

The estimated economic impacts for this analysis were generated using an input-output model of the study area constructed with IMPLAN Professional® software and databases. The budget for construction and ground operations associated with the CVLC was developed by Reynolds, Smith & Hill, Inc., and totaled approximately \$949.1 million. It was assumed that 100 percent of the funding for these expenditures would originate from outside the study area, thus representing new dollars to the local economy and generating multiplier effects. Spending estimates from this budget were allocated to various IMPLAN industry sectors to estimate the positive economic impacts of the project. Negative economic impacts associated with possible temporary closures of the Canaveral National Seashore and the Merritt Island National Wildlife Refuge during CVLC launch operations were also evaluated.

The net total (sum of positive and negative) economic impacts from the development of the CVLC are shown in table ES1 below. All impacts are given in 2008 dollars. Impacts for output, value-added, labor income, other property type income, indirect business taxes, and employment are shown in the individual columns. The direct, indirect, induced, and total economic impacts are reported in separate table rows. Direct impacts are the regional changes in revenues, income, taxes and jobs that result from the initial round of spending and employment activities associated with the CVLC project. Indirect effects occur when directly impacted businesses alter their purchases of intermediate inputs from the local supply chain. Induced impacts occur as employees and proprietors of directly and indirectly impacted businesses adjust their spending for personal consumption as earnings increase or decline. Total impacts are the sum of these direct, indirect and induced effects, and measure the full economic impacts of an activity as it ripples through a regional economy.

The net output impacts associated with the CVLC project are estimated to total \$1.881 million from 2008 through 2020. Value-added impacts, which represent the sum of labor income, other property type income and indirect business taxes, totaled \$1,107 million. Labor income, which represents employee and proprietor earnings, totaled \$848.5 million. Other property type income, which includes corporate profits, rents, dividends, and interest, totaled \$202.5 million. Indirect business taxes, which includes sales, excise and property taxes (but not taxes on income or profits), totaled \$55.8 million. The net number of job-years (full and part-time) created as a result of the CVLC project are estimated to total 16,340.

The most direct way to compare the economic impacts of the proposed CVLC to the economic activity in the study area, or to current NASA activities at Kennedy Space Center, is in terms of jobs. In 2006 the Bureau of Economic Analysis estimated that there were 1.36 million jobs in the three-county region of east central Florida. The total employment impact of NASA at KSC for 2007 was estimated at 35,960 jobs. The total net employment impact of 16,340 job-years for the CVLC project, represents about 1,257 continuous jobs over the project's 13 year duration. This is equivalent to about 3.5 percent (on average) of the employment created by NASA in 2007, and about 0.09 percent of the total employment in the three-county study area.

The estimated economic impacts resulting from possible reductions in recreational visitors to the Merritt Island National Wildlife Refuge and the Canaveral National Seashore were relatively minor compared to the positive impacts generated by spending and employment generated by the CVLC project. The relative size of the maximum anticipated impacts from the closure of recreational areas ranged from 3.2 to 6.9 percent of the respective positive impacts from CVLC construction and ground operations. In percentage terms, the most affected measure of economic impact from reduced visitor spending was in the form of indirect business taxes, which were estimated to be 6.9 percent as large as the positive impacts of the CVLC project.

Table ES1. Net economic impacts associated with the construction and operation of a Commercial Vertical Launch Complex at Kennedy Space Center, 2008 – 2020.

Effect Level	Output (Mn\$)	Value-added (Mn\$)	Labor Income (Mn\$)	Other Property Income (Mn\$)	Indirect Business Taxes (Mn\$)	Employment (jobs)
Direct	911.3	531.0	471.1	49.5	10.5	8,086
Indirect	229.5	124.0	90.9	24.7	8.5	1,793
Induced	740.4	451.7	286.5	128.3	36.8	6,462
Total	1,881.1	1,106.7	848.5	202.5	55.8	16,340

All values in 2008 dollars. Totals may not sum exactly due to rounding.

Employment impacts include fulltime and part-time positions.

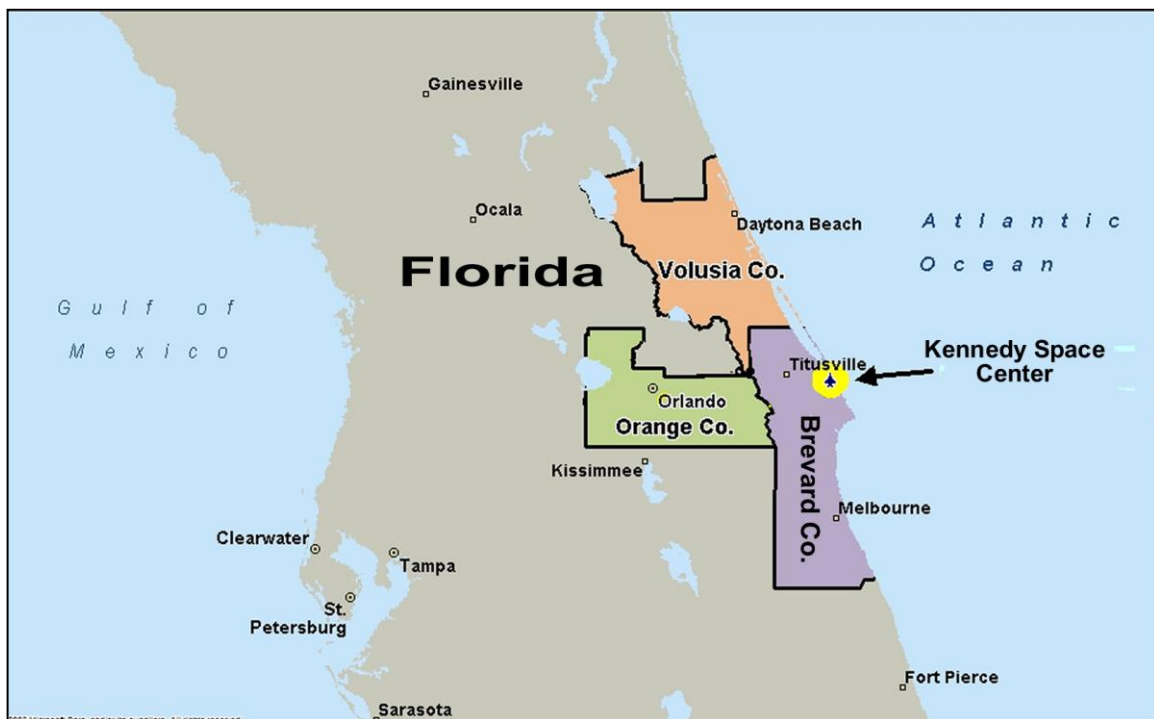
# Economic Impact Assessment of the Proposed Commercial Vertical Launch Complex at Kennedy Space Center

## Introduction

The purpose of this study is to evaluate certain economic impacts associated with the proposed development and operation of a Commercial Vertical Launch Complex (CVLC) at Kennedy Space Center, Florida, from 2008 through 2020.<sup>1</sup> Kennedy Space Center (KSC) is located in Brevard County, on the east coast of central Florida, just east of Titusville (Figure 1). It is envisioned that the proposed CVLC would include two separate launch pads along with associated facilities for vehicle assembly, processing and testing, propellant storage, and possibly, launch control.

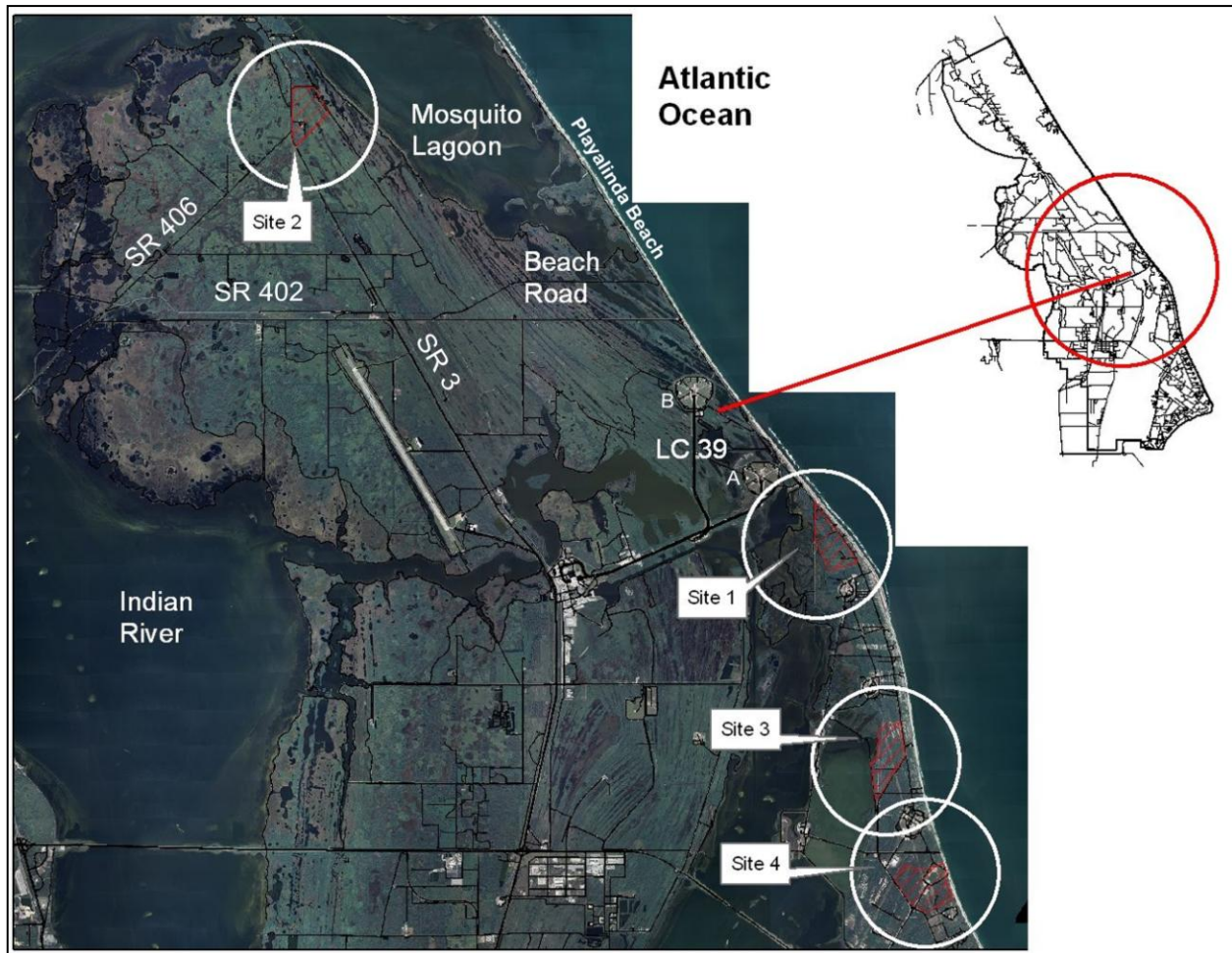
There are four proposed sites for the CVLC (Figure 2). One of these sites is located within the traditional operational area of Kennedy Space Center, just south of Launch Complex (LC) 39A, on the north end of the Banana River (Site 1). Another proposed site (Site 2) is located near the intersection of the A. Max Brewer Memorial Parkway (State Road 406) and Kennedy Parkway (State Road 3), on the southwest

Figure 1. Study area for proposed Commercial Launch Facility at Kennedy Space Center, Florida.



<sup>1</sup> The CLVC project was initially scheduled to begin in the fourth quarter of 2008. By the time this report was in its final draft form, it no longer appeared certain that the project would begin before 2009.

Figure 2. Location of proposed sites for Commercial Vertical Launch Complex at Kennedy Space Center, Florida.



Source: Dynamac Corporation.

side of Mosquito Lagoon. Site 3 is on the Cape Canaveral Air Force Station (CCAFS), south of LC 40 and north of LC 37 on Phillips Parkway. Site 4, also on CCAFS, is the former site of LC 34, east of the intersection of Phillips Parkway and ICBM Road.

Positive economic impacts of the commercial launch facility are anticipated from spending and employment for the construction and operation of the space vehicle processing and launch facilities to be located at the KSC. Some negative economic impacts from this project may take place due to recurring temporary closures of certain recreational areas located within the Merritt Island National Wildlife Refuge (MINWR) and the Canaveral National Seashore (CNS). These two areas are major recreational attractions on Florida's east coast. Both are located mostly within the boundaries of the Kennedy Space Center, and are jointly managed by the National Aeronautics and

Space Administration (NASA), the National Park Service (NPS), and the U.S. Fish and Wildlife Service (USFWS).

Since the late 1950s, the development and operation of the NASA space program at KSC has provided a significant stimulus to the economy of east-central Florida. In fiscal year 2007, direct spending by NASA at the KSC totaled \$1.66 billion (Bn) for Brevard County alone (NASA and W. Warren McHone). Another \$123 million in direct spending by the KSC took place in the remaining counties of Florida. In 2007, approximately 14,500 jobs were based at KSC and approximately ninety-four percent of those employees resided in Brevard County, with the remaining six percent living in other counties in Florida. These jobs generated approximately \$1.1 Bn in gross earnings for the State of Florida in 2007. The total economic impact of the KSC for 2007 was estimated at \$4 Bn in output, \$2 Bn in household income and 35,960 jobs (NASA and W. Warren McHone).

In 2004 it was decided that the NASA Space Shuttle program would be retired in 2010. It is anticipated that there will be a substantial reduction in KSC related economic activity in the area when this occurs. The proposed commercial vertical launch program may help soften some of these losses. Expenditures for the CVLC are projected to total nearly \$950 million in 2008 dollars through the year 2020.

In order to maintain both public safety and operational security, the Federal government acquired additional lands adjacent to the operational areas of the KSC and gave them special designations that would preclude commercial and residential development, and preserve their exiting natural ecosystems into perpetuity. These areas now comprise the MINWR and the CNS.

The MINWR overlies the KSC and encompasses about 140,000 acres, consisting of brackish estuaries and marshes, coastal dunes, and native forests. MINWR is an internationally recognized wildlife, fishing, boating and bird watching attraction for locals and tourist alike, that received an estimated 690,000 recreational visitors in 2007 (Whitmore, MINWR). Public use activities include hiking on back-country trails, wildlife observation and photography, manatee viewing, a self-guided auto-tour at Black Point Wildlife Drive, fishing, waterfowl hunting, boating, canoeing/kayaking, camping and environmental education. Certain sections of MINWR are permanently closed to the public. Other sections are closed temporarily during Shuttle launch and

landing operations. It is anticipated that launch operations associated with the CVLC may result in closures for MINWR ranging from zero to forty days per year, depending on which site is chosen for development and the number of scheduled launches. At the time of this report, it was anticipated that there would be no more than 18 launches per year at the CVLC, once launch operations began.

The CNS consists primarily of 24 miles of undeveloped Atlantic coastline immediately north of the operations area of KSC. It covers approximately 57,000 acres. All but the north end of CNS (Apollo Beach) lies within MINWR and KSC. CNS is accessible by State Road A1A from the north, to Apollo Beach, and by State Road 402 from the south, to Playalinda Beach. A large middle section, Klondike Beach, is managed as a “back-county” area, where no vehicles are allowed and only a small number of hikers are permitted each day. Nearly 538,000 visitors are estimated to have recreated at Playalinda Beach in 2007 (U.S. Dept. of the Interior, National Parks Service). This is despite it being closed during Space Shuttle launch operations for 20 days. When launch operations begin at the CVLC, it is estimated that Playalinda Beach may be closed for as many as 40 days each year.

The extent of recreational closures at the MINWR and CNS will be dependent on which of the four sites is chosen for the CVLC, and on the future schedule of launch activities by commercial vendors. It is anticipated that if Site 2 is selected for development, then closures of up to 40 days per year may take place, due to its relative proximity to the CNS and Mosquito Lagoon in the MINWR. There would likely be no closures, if sites 1, 3, or 4 are developed instead.

The Space Shuttle and other space related programs at the KSC also draw visitors to east-central Florida for business and recreational purposes. This would include recreational visitors to the Kennedy Space Center Visitor Complex, and individuals who travel to the area to observe launches and landings. A 2002 study by PMG Associates, Inc., for the Florida Space Coast Office of Tourism documented some of the impacts from these types of visitors. Since it was not known how the development of the CVLC would affect this type of visitation to the study area, it was not evaluated in this analysis.

## Analysis Methodology

### Study Area Definition and Description

Economic impacts of the CVLC project were evaluated for the regional economy of east central Florida, consisting of Brevard, Orange, and Volusia counties (Figure 1). County-to-County Worker Flow Files from the 2000 Census indicate that 97.6 percent of workers in Brevard County reside within these three counties (U.S. Dept. of Commerce, Bureau of Census). The economy of the study area is dominated by Orange County, which has over 850,000 (62.6 percent) of the area's 1.36 million jobs (Table 1). Twenty-one percent, or 288,676, of the area's remaining jobs are located in Brevard County, and 16.2 percent, (220,375) are located in Volusia County. The total number of jobs in the study area grew by 16.7 percent from 2000 to 2006 (US Dept. of Commerce, Bureau of Economic Analysis). In 2006, personal income for the study area totaled nearly \$74 Bn, in 2008 dollars. Nearly 53 percent, or \$38 Bn, of that income went to residents of Orange County. Brevard County garnered nearly \$20 Bn, or 26.7 percent, of the area's total personal income. In real terms, personal income in the study area grew by nearly 22 percent from 2000 to 2006. The three-county region accounted for 10.3 percent of Florida's total personal income for 2006.

Table 1. Employment and personal income statistics for Brevard, Orange, and Volusia Counties in Florida, 2006.

Region	Employment 2006		Change since 2000 Percent	Personal Income 2006		Change since 2000 Percent
	Jobs	Percent		\$million	Percent	
Brevard	288,676	21.2%	18.6%	19,678	26.7%	20.4%
Orange	851,093	62.6%	14.6%	38,188	51.7%	23.0%
Volusia	220,375	16.2%	23.0%	15,937	21.6%	20.8%
Area Total	1,360,144	100.0%	16.7%	73,803	100.0%	21.8%
Florida	10,521,966		17.8%	719,699		23.8%

Source: Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce. <http://www.bea.gov/beat/regional/reis/default.cfm?catable=Single%20Line>

Personal Income values were adjusted to 2008 dollar equivalents using the Bureau of Labor Statistics, Consumer Price Index - All Urban Consumers, for June, 2008.

## **Regional Economic Impact Analysis**

The economic impacts estimated in this study are based on input-output (I-O) analysis and models. I-O analysis is a standard technique for estimating the secondary (indirect and induced) economic consequences, or impacts, that occur when there is a change in the flow of dollars and jobs into or out of a regional economy. I-O models are mathematical representations of an economy formulated in terms of transactions between industries, governments, employees, and households (Schaffer, 1999). These models are based on detailed business and demographic data collected by agencies of the Federal and State governments. From these models, industry level and aggregate economic multipliers are calculated, and then used to estimate indirect and induced impacts or effects. Indirect effects occur as businesses change the amount of inputs purchased through the supply chain to produce the goods and services purchased in the initial (direct) transactions. Additional induced effects occur as household spending responds to changes in employee and proprietor earnings.

The types of economic impacts typically estimated with I-O models include output or gross revenues, value-added (which includes labor income, other property type, and indirect business taxes), and employment or jobs. Each of these measures represents a different way of assessing the size or contribution of a particular activity or event to a regional or national economy. Detailed definitions of these types of impacts or effects can be found in the glossary (Appendix B) at the end of this report.

The economic impacts of the CVLC were evaluated using the IMPLAN Professional® software system, which is an I-O modeling system comprised of software tools and regional economic databases (Minnesota IMPLAN Group). It includes data on U.S. economic activity at the county level for 509 different industry sectors, as well as for employment, households, governments, commodity production, trade, transfer payments, and capital investments.<sup>2</sup> For this analysis, the IMPLAN model constructed to represent the economy of east-central Florida was based on 2006 data using the software's default modeling parameters.

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<sup>2</sup> IMPLAN uses a sectoring scheme similar to North American Industry Classification System (NAICS): For details see [http://www.implan.com/library/pdf\\_files/implan\\_sectoring\\_2001.pdf](http://www.implan.com/library/pdf_files/implan_sectoring_2001.pdf) .

The first step in assessing economic impacts of the CVLC project was determining the level and type of changes (positive and negative) in spending and/or employment that would occur as a result of the project. Once these values were estimated, they were allocated to the appropriate industrial or institutional sectors within the IMPLAN model. Consideration was given to how much of the spending would take place inside the study area, and how much of the spending would occur at the retail, wholesale or producer levels.

### **Construction and Ground Operations Expenditures**

This assessment is for the first three phases of development and operations of the CVLC project, initially scheduled from 2008 through 2020. The budget for these activities was developed by Reynolds, Smith & Hills, Inc., and provided to FRED by the Dynamac Corporation for this purpose. This budget is summarized below in Table 2. At the time of this analysis, expenditure and employment data for launch and payload operations associated with the CVLC project were not available. Thus the economic impacts for these aspects of the project were not evaluated.

Project activities in Table 2 are categorized by phase and type of activity (construction or ground operations). Proposed expenditures on construction could begin in 2008 and continue through 2018, totaling \$709 million (Mn), or 74.7 percent of the project's total budget. Significant expenditures would not begin until 2010 with the start of construction on the horizontal vehicle processing facility and vertical launch pad, in Phase 2A. Ground operations would begin in 2009 and continue through 2020. Proposed expenditures for these activities total \$240 Mn (25.3 percent of total) over the life of the project. Altogether, expenditures for construction and ground operations sum to slightly over \$949 Mn, in 2008 dollars (Table 2).

Table 2. Projected expenditures for construction and ground operations for the Commercial Vertical Launch Complex at Kennedy Space Center.

Phase	Type of Activity	Years	Expenditure (\$)
1-A. Relocation of Advanced Technology Development Center (ATDC) facilities.			
	Construction	2008-09	\$1,200,000
	Ground Operations	2009-11	\$2,106,203
1-B. Construction and operation of maintenance and storage facility for the anchor tenant.			
	Construction	2010	\$11,699,000
	Ground Operations	2011-12	\$3,276,315
1-C. Construction and operation of administration and control facility for the anchor tenant.			
	Construction	2010-11	\$10,686,000
	Ground Operations	2012-20	\$33,699,240
Phase 1 Total			\$62,666,758
2-A. Construction and operation of horizontal vehicle processing facility and vertical launch pad.			
	Construction	2010-12	\$204,230,000
	Ground Operations	2013-20	\$59,909,760
2-B. Construction and operation of a second bay to the horizontal processing facility with equipment and infrastructure to accommodate a second horizontal provider			
	Construction	2012-14	\$40,569,000
	Ground Operations	2014-20	\$51,172,920
2-C. Construction and operation of a third bay to the processing facility along with further accommodations for a third horizontal launch provider			
	Construction	2014-15	\$39,884,000
	Ground Operations	2015-20	\$41,188,960
Phase 2 Total			\$436,953,640
3-A. Construction and operation of a new launch pad and vertical vehicle integration facility for a fourth horizontal launch provider			
	Construction	2014-16	\$284,315,000
	Ground Operations	2016-20	\$32,451,120
3-B. Construction and operation of an additional bay to vertical processing facility with equipment and infrastructure to accommodate a second vertical launch provider.			
	Construction	2017-18	\$116,472,000
	Ground Operations	2018-20	\$16,226,560
Phase 3 Total			\$449,463,680
Construction Total			\$709,055,000
Ground Operations Total			\$240,029,078
Grand Total			\$949,084,078

All values in 2008 dollars.

In Table 3, a summary of the allocation of construction and ground operation expenditures to IMPLAN industry sectors is shown. Construction expenditures are split three ways between IMPLAN sectors for “Manufacturing and Industrial Buildings”, “Highways, Streets, Bridges and Tunnels”, and “Other New Construction”. Other New Construction includes activities like non-water or sewer pipeline construction, construction of power and communication transmission lines, and construction of tank storage facilities for water and other liquids or gases. A minor share of construction expenditures were allocated to Commercial and Institutional Buildings, which occurs in Phase 1 of the project for administration, maintenance and storage buildings (Table 3).

The largest share of ground operation expenditures (31.2%) in Table 3 were allocated to Facilities Support activities, which includes maintenance, janitorial, trash disposal, security, mail routing, and reception services for buildings and facilities developed by the project (IMPLAN sector 453). The next largest sector allocation (28.1%) went to Support Activities for Air Transportation (sector 397). This involves the fueling, ferrying, inspection, testing, and maintenance and repair of aircraft, or in this case, spacecraft. Another 28 percent of ground operations expenditures were divided equally between IMPLAN sectors 354 (Missile and Space Vehicle Manufacturing), and 355 (Parts for Space Vehicles and Missiles). The remaining 12.5 percent of ground operation expenditures were allocated to Telecommunications, Data Processing Services, Scientific Research, Management, Office Administration, Warehousing and Storage, and Wholesale Trade (Table 3). All expenditures for construction and ground operation activities associated with the CVLC were treated as “new” dollars entering the regional economy of east central Florida. As a result, all of these expenditures will generate multiplier effects that will contribute to the overall impacts of the project.

Table 3. Summary of Commercial Vertical Launch Complex expenditures by IMPLAN sector.

IMPLAN Sector Name (number)	Expenditure (\$)	Percentage
<b>Construction</b>		
Manufacturing and industrial buildings (37)	241,618,333	34.1%
Commercial and institutional buildings (38)	22,385,000	3.2%
Highways, streets, bridges, and tunnels (39)	202,233,333	28.5%
Other new construction. (41)	242,818,333	34.2%
Total Construction	\$709,055,000	100.0%
<b>Ground Operations</b>		
Missile and space vehicle manufacturing (354)	33,491,220	14.0%
Parts for space vehicles & missiles (355)	33,491,220	14.0%
Wholesale trade (390)	526,551	0.2%
Support activities for air transportation (397)	67,508,991	28.1%
Warehousing and storage (400)	2,621,052	1.1%
Telecommunications (422)	6,739,848	2.8%
Data processing services (424)	6,739,848	2.8%
Scientific research and development (446)	526,551	0.2%
Management of companies and enterprises (451)	6,739,848	2.8%
Office administrative services (452)	6,739,848	2.8%
Facilities support (453)	74,904,102	31.2%
Total Ground Operations	\$240,029,078	100.0%
<b>Grand Total</b>	<b>\$949,084,078</b>	

All values in 2008 dollars

### Recreation and Tourism Expenditures

The maximum anticipated reductions in recreational spending in the study-area due to temporary closures of the MINWR and Playalinda Beach at CNS are estimated in Tables 4 and 5. These reductions are based on annual visitation counts and estimates provided by the NPS and the USFWS (Table 4). Since visitor counts were obtained independently from CNS and MINWR, it is possible some double counting occurred. This would occur when an individual or group visited both CNS and MINWR on the same day. To estimate the average total spending for each activity per day, annual visitation numbers were multiplied by estimates of the average daily expenditures per person per day for each activity, which were obtained from the USFWS, and Hazen and Sawyer, P.C. (Table 5). Multiplying the total daily spending estimates by the maximum anticipated number of closure days per year (40) provided estimates of annual spending reductions for each activity (Table 5). The maximum total reductions in recreational expenditures over all

MINWR and CNS activities by non- residents as a result of the closures is estimated at \$6.6 Mn per year, in 2008 dollars. For resident visitor spending, the estimated reduction is \$2.5 Mn per year (Table 5).

If launch operations begin in 2013 (after completion of Phase 2A), then these spending reductions will occur for eight successive years (2013 – 2020) over the timeline of the budget. In this case, the maximum total estimated recreational spending reductions over the project budget time-line will equal \$52.8 Mn for non-resident visitors, and \$20.1 Mn for resident visitors (in 2008 dollars). The reduced spending by non-residents will have negative multiplier effects for the region’s economy in addition to its direct impact, because this reduction represents lost “new” dollars that no longer enter the regional economy. In contrast, the negative impacts from reduced resident spending are limited to their direct effects (\$20.1 Mn).

Table 4. Annual and estimated daily recreational visitor counts and share of user-days by non-resident visitors for Merritt Island National Wildlife Refuge and Canaveral National Seashore, Florida, in 2007.

Activity (Area)	Total Annual Visitors in 2007	Average number of Visitors per Day <sup>1</sup>	Share of User Days by Non-Residents
	Column A	Column B	Column C
Fishing/boating (Southern Mosquito Lagoon)	48,000	161	25%
Waterfowl hunting (Southern Mosquito Lagoon & other)	8,032	27	60%
Wildlife viewing/photography (Black Point Drive, etc.)	477,500	1,602	40%
Hiking	150,000	503	33%
Canoeing/Kayaking	3,000	10	25%
Bicycling	3,000	10	33%
Camping (Dummit Grove)	300	1	33%
Swimming (Playalinda Beach)	537,813	1,582	40%
<b>Total All Activities<sup>2</sup></b>	<b>1,227,645</b>	<b>3,611</b>	

Sources: Merritt Island National Wildlife Refuge (Doran Whitmore), and Canaveral National Seashore (NPS Stats website: <http://www.nature.nnps.gov/stats/park.cfm?parkid=315>).

<sup>1</sup>: Column B = column A ÷ (the number of days the respective area is open to the public each year);

<sup>2</sup>: Values may not sum exactly due to rounding.

Table 5. Estimated annual reductions in spending by recreational visitors at Merritt Island National Wildlife Refuge and Canaveral National Seashore, due to closures for commercial launches at Kennedy Space Center. <sup>1</sup>

Activity (Area)	Average Trip-Related Spending Per Person-Day		Total Trip-Related Spending Per Day			Estimated Annual Spending Reductions as a result of Closures <sup>2</sup>		
	Non-Residents	Residents	Non-Residents	Residents	Total All Users	Non-Residents	Residents	Total All Users
	Column D	Column E	Column F	Column G	Column H <sup>3</sup>	Column I	Column J	Column K <sup>3</sup>
	Units	\$s	\$s	\$s	\$s	\$1,000s	\$1,000s	\$1,000s
Fishing/boating (Southern Mosquito Lagoon)	\$144	\$34	\$5,780	\$4,080	\$9,859	\$231,182	\$163,187	\$394,369
Waterfowl hunting (Southern Mosquito Lagoon & other)	\$345	\$38	\$5,581	\$410	\$5,990	\$223,232	\$16,384	\$239,616
Wildlife viewing/photography (Black Point Drive, etc.)	\$110	\$26	\$70,346	\$24,760	\$95,106	\$2,813,845	\$990,387	\$3,804,232
Hiking	\$110	\$26	\$18,231	\$8,685	\$26,916	\$729,243	\$347,413	\$1,076,656
Canoeing/Kayaking	\$125	\$26	\$314	\$194	\$508	\$12,541	\$7,778	\$20,319
Bicycling	\$110	\$26	\$365	\$174	\$538	\$14,585	\$6,948	\$21,533
Camping (Dummit Grove)	\$110	\$26	\$36	\$17	\$54	\$1,458	\$695	\$2,153
Swimming (Playalinda Beach)	\$102	\$26	\$64,483	\$24,442	\$88,925	\$2,579,315	\$977,688	\$3,557,003
Total All Activities <sup>3</sup>			\$165,135	\$62,762	\$227,897	\$6,605,401	\$2,510,480	\$9,115,881

Source for per-person-day spending: US Fish and Wildlife Service, 2008; and, Hazen & Sawyer, P.C., 2008.

<sup>1</sup> Spending values were converted from 2007 to 2008 dollars using the Consumer Price Index (for all Urban Consumers) for June 2008, divided by the annual CPI for 2007 (or a factor of 1.0553).

<sup>2</sup> Represents closure of 40 days annually based on 18 launches per year.

<sup>3</sup> Values may not sum exactly due to rounding.

The computations used to derive the estimates in the columns of Tables 4 and 5 are as follows: B = A ÷ (the number of days the respective area is open to the public each year); F = B × C × D; G = B × (1 - C) × E; H = F + G; I = F × 40 ÷ 1,000; J = G × 40 ÷ 1,000; K = I + J.

The breakout of visitor expenditures by expense item and IMPLAN industry sectors, as shown in Table 6, was derived from Table 2.11 in the Hazen and Sawyer, P.C. study entitled “Indian River Lagoon Economic Assessment and Analysis Update”, (Aug. 2008). Expenditure data in the Hazen and Sawyer study were developed from a survey of nearly 400 visitors to the Indian River Lagoon (which includes MINWR). The largest expense category (at over 30 percent of total spending) was for “Shopping and Sundries”, which was allocated to IMPLAN Sector 410 (General Merchandise Stores) (see Table 6). Boat and Auto Fuel (Gasoline Stations) was the next largest visitor expenditure category at nearly 21 percent of total spending. Other sectors which captured double digit percentages of total visitor expenditures include Food Service and Drinking Places (14.1 percent), and Boat and Equipment Rental (11.2 percent). The remaining 23.5 percent of total visitor expenditures were allocated among eight additional spending categories as shown in Table 6.

For this analysis, all changes in expenditures were assumed to have occurred within the study area of Brevard, Orange and Volusia Counties, so there would be no leakage of spending for the first round of transactions. Whether subsequent rounds of spending occur within the study area is determined within the IMPLAN model by a set of econometrically estimated regional purchase coefficients. Some of the changes in retail purchases by recreational visitors were margined so that the cost of goods sold were not included in the direct impacts. This would be the case for changes in visitor expenditures with Motor Vehicle and Parts Dealers, Food and Beverage Stores, Gas Stations, Sporting Goods Stores, and General Merchandise Stores, where there would be little or no physical transformation in the goods sold by the vendor. These spending estimates and parameters were entered into the IMPLAN model and the economic impacts of the CVLC project were estimated from the model’s economic multipliers.

Table 6. Summary of recreational user spending reductions due to commercial launch closures at Kennedy Space Center, by economic sector, 2013--2020. <sup>1, 2.</sup>

Expense Item	IMPLAN Sector	Percent of Total Spending <sup>2</sup>	Non-Residents \$1,000	Residents \$1,000	Total All Users \$1,000
Boat Repairs / Purchase	401 - Motor vehicle and parts dealers	0.1%	\$34	\$13	\$46
Food and Beverages – Stores	405 - Food and beverage stores	8.6%	\$4,573	\$1,738	\$6,312
Boat and auto fuel	407 - Gasoline stations	20.7%	\$10,961	\$4,166	\$15,126
Tackle, bait, and/or ice	409 - Sporting goods stores	4.9%	\$2,605	\$990	\$3,596
Shopping and Sundries	410 - General merchandise stores	30.5%	\$16,104	\$6,121	\$22,225
Auto Rental, Taxi, Bus fares	432 – Automotive equipment rental and leasing	5.6%	\$2,950	\$1,121	\$4,071
Boat and Equipment Rental	435 - General and consumer goods rental	11.2%	\$5,918	\$2,249	\$8,168
Park Entrance Fees	475 - Museums, historical sites, zoos, and parks	0.1%	\$57	\$22	\$79
Ramp, Marina and Parking Fees	478 - Other amusement and recreation	0.1%	\$74	\$28	\$102
Camping fees	480 - Other accommodations (includes campgrounds)	1.2%	\$633	\$241	\$874
Restaurants and Bars	481 - Food services and drinking places	14.1%	\$7,461	\$2,836	\$10,297
Lodging	485 - Hotels and motels	2.8%	\$1,472	\$559	\$2,032
Total		100%	\$52,843	\$20,084	\$72,927

<sup>1.</sup> Represents closure of 40 days annually over 8 years, based on a maximum 18 launches per year.

<sup>2.</sup> Source for sector selection and expenditure share: Hazen and Sawyer, P.C., “Indian River Lagoon Economic Assessment and Analysis Update”, Table 2.12, August 2008.

## Results

### Construction and Ground Operations Impacts

Summary results of the positive economic impacts of expenditures for Phases 1A through 2A, and 2B through 3B, of the CVLC are shown in Table 7. In Table 8, the positive economic impacts of expenditures for CVLC construction and ground operations are summarized. All results are given in 2008 dollar values and no adjustment in these values was made respective to the timing of the impacts. More detailed economic impacts by two digit NAICS sectors are provided in Table A1 in Appendix A of this report.

Impacts for output, value-added, labor income, other property type income, indirect business taxes and employment are shown in the individual columns of Tables 7 and 8. The direct, indirect, induced, and total economic impacts are reported in separate table rows. Direct impacts are the revenues, income, taxes and jobs generated directly by expenditures on the CVLC project. As previously mentioned, indirect effects occur when directly impacted businesses use revenues originating from outside the region to purchase inputs (goods and services) from the local supply chain. Induced impacts from non-local revenues occur when the households of employees and business proprietors spend their income or profits for personal consumption at other regional businesses. Total impacts are the sum of these direct, indirect and induced effects, and measure the full economic impacts of an activity as it ripples through the regional economy.

The total output impact generated by Phases 1A through 2A was estimated to equal nearly \$676 Mn in 2008 dollars (Table 7). Value-added impacts represent the sum of labor income, other property type income, and indirect business taxes. The total value-added impact of the CVLC during phases 1A through 2A was estimated at \$396 Mn (Table 7). Labor income, which represents the sum of employee compensation and proprietor profits, was estimated to equal nearly \$300 Mn. Other property type income consists of rents, royalties, interest, dividends and corporate profits. This impact was estimated to equal \$76 Mn for these phases of the CVLC project. Nearly \$21 Mn in indirect business taxes, which represent excise, property, and sales taxes, as well as business and licensing fees, are estimated to result from the CVLC project. This figure does not include taxes on income or profits. Employment impacts represent the

number of full and part-time jobs created by an economic activity. A total of 5,863 job-years are estimated to result from the direct, indirect and induced effects of these first phases of the CVLC project. (Table 7). If activities of the first phase span 13 years, then this would represent 451 continuous jobs over the duration of that phase.

Table 7. Economic impacts of expenditures for the Commercial Vertical Launch Complex at Kennedy Space Center, by project phase, 2008 – 2020.

Phase and Type of Activity	Output (Mn\$)	Value-added (Mn\$)	Labor Income (Mn\$)	Other Property Income (Mn\$)	Indirect Business Taxes (Mn\$)	Employment (job years)
Phase 1A-2A (first facility, 2008-2020)						
Construction	497.9	285.5	217.1	55.0	13.3	4,395
Ground Operations	177.6	110.9	82.5	21.0	7.5	1,469
All Activities	675.5	396.4	299.6	76.0	20.8	5,863
Phase 2B-3B (second, third facilities, 2012-2020)						
Construction	939.8	540.9	418.1	97.8	25.0	8,467
Ground Operations	335.3	210.2	158.9	37.3	14.1	2,830
All Activities	1,275.1	751.2	577.0	135.1	39.1	11,297
Entire Project Life						
Construction	1,437.6	826.4	635.2	152.8	38.3	12,862
Ground Operations	513.0	321.2	241.3	58.2	21.6	4,299
All Activities	1,950.6	1,147.6	876.6	211.1	59.9	17,160

Totals may not sum exactly due to rounding.

Employment impacts include fulltime and part-time positions.

The economic impacts of Phases 2B through 3B are nearly twice as large as those for Phases 1A through 2A (Table 7). Total output impacts are estimated to equal \$1.275 Bn. Value-added impacts for these latter phases total \$751 Mn. This consists of nearly \$577 Mn in labor income, \$135 Mn in other property income, and \$39.1 Mn in indirect business taxes. An estimated 11,297 job-years are generated as a result of the economic activity in Phases 2B through 3B (Table 7). Since these phases of the project are slated to span 9 years, this would represent about 1,255 continuous jobs over that period of time.

Differences in the economic consequences of construction versus ground operations for the CVLC project are highlighted in Table 8. With the exception of indirect business taxes, the impacts from arising from the direct, indirect and induced effects of construction activities are between 2.5 and 3.0 times larger than those from

ground operations activities for the CVLC project. Output impacts from construction activities for the CVLC total nearly \$1.44 Bn compared to \$513 Mn for ground operations. For construction activities, value-added impacts are estimated to total \$826 Mn compared to \$321 Mn for ground operations. The components of value added are similarly proportional between construction and ground operations with the exception of indirect business taxes. Here, the impacts of construction activities are only about 75 percent greater than those for ground activities. The employment impact of construction activities, 12,862 job-years, is nearly three times larger than the 4,299 job-years created from expenditure for ground operations over the life of the project. In general, the induced multiplier impacts for both construction and ground activities are from three to five times greater than those created through indirect effects. This is because a much larger proportion of the labor and value-added inputs originate from within the study area compared to the material inputs used for the project.

Table 8. Economic impacts of construction and ground operations expenditures for the Commercial Vertical Launch Complex at Kennedy Space Center, 2008 – 2020.

Activity – Effect Level	Output (Mn\$)	Value- added (Mn\$)	Labor Income (Mn\$)	Other Property Income (Mn\$)	Indirect Business Taxes (Mn\$)	Employ- ment (jobs)
Construction Activities	1,437.6	826.4	635.2	152.8	38.3	12,862
Direct	709.1	394.9	352.4	38.5	4.0	6,686
Indirect	178.9	96.7	71.0	18.8	6.9	1,396
Induced	549.7	334.7	211.8	95.5	27.4	4,780
Ground Operations Activities	513.0	321.2	241.3	58.2	21.6	4,299
Direct	240.0	157.7	134.4	14.2	9.1	1,941
Indirect	59.3	32.3	22.9	7.3	2.0	468
Induced	213.7	131.2	84.1	36.7	10.5	1,889
All Activities	1,950.6	1,147.6	876.6	211.1	59.9	17,160
Direct	949.1	552.7	486.8	52.8	13.1	8,627
Indirect	238.2	129.0	93.9	26.1	8.9	1,864
Induced	763.3	465.9	295.9	132.1	37.9	6,669

Totals may not sum exactly due to rounding.  
Employment impacts include fulltime and part-time positions.

The combined impacts of all phases, and, construction and ground operations, are summarized in the bottom section of Table 8. Slightly over 1.95 Bn in total output impacts result from the CVLC project starting in 2008 and going through 2020. This averages out to \$150 Mn per year. The total value-added impacts of the project are estimated to be nearly \$1.15 Bn. At \$877 Mn, Labor income comprises about 76 percent of the total value-added impact from the project. Impacts from other property type income and indirect business taxes are estimated to total about \$211 Mn and \$60 Mn, respectively, over the life of the project.

Not surprisingly, the industries most impacted by construction and ground operations for the CVLC were Construction, Manufacturing, Government and, Administration and Waste Services (Table A1). Construction was the most impacted industry with respect to output, value-added and employment measures. Manufacturing was the second most impacted industry in terms of output, while Government, and, Administration and Waste Services, was the second most important for value-added and jobs, respectively.

### **Recreational and Tourism Industry Impacts**

The maximum anticipated negative economic consequences resulting from reduced recreational visitor expenditures at MINWR and CNS are summarized in Table 9. Changes in expenditures by resident visitors to these attractions only generate direct impacts because there is no loss of new or outside dollars to the regional economy as residents will likely spend disposable income on other purchases. In contrast, reductions in non-resident visitor expenditures generate negative indirect and induced effects, as well as direct effects. Although there are fewer non-resident visitors, their expenditures are substantially greater than resident visitors'. As a result, even the direct impacts of non-resident visitors are 2 to 3 times greater than those of residents. When including the additional indirect and induced impacts from non-resident expenditures, the total impacts from reductions in non-resident visitor spending are from 4.5 to 8.3 times greater than those by resident visitors. All together, maximum negative output impacts from reduced visitation at MINWR and CNS are estimated to total \$69.5 Mn between 2013 and 2020, or about \$8.7 Mn per year. Reductions in value-added impacts total an estimated \$41 Mn over eight years. This value-added

impact was comprised mostly from a \$28 Mn reduction in labor income, and an \$8.6 Mn reduction in other property type income. Slightly over \$4.1 Mn in indirect business taxes were lost due to these closures. These reduced expenditures and their secondary effects are estimated to result in a loss of 820 job-years to the regional economy between 2013 and 2020, or approximately 102 jobs each year.

Table 9. Economic impacts of reduced visitor expenditures due to temporary closures at Merritt Island National Wildlife Refuge and Canaveral National Seashore for the Commercial Vertical Launch Complex activities at Kennedy Space Center, 2013 – 2020.

Visitor Type / Effect Level	Output (Mn\$)	Value Added (Mn\$)	Labor Income (Mn\$)	Other Property Type Income (Mn\$)	Indirect Business Taxes (Mn\$)	Employment (Jobs)
Resident Visitors (direct)	-10.41	-5.97	-4.32	-0.92	-0.73	-149
Non-Resident Visitors	-59.11	-34.84	-23.76	-7.65	-3.43	-670
Direct	-27.38	-15.71	-11.37	-2.41	-1.93	-392
Indirect	-8.74	-4.92	-3.03	-1.46	-0.43	-71
Induced	-22.99	-14.22	-9.37	-3.79	-1.07	-207
Total all Visitors	-69.51	-40.81	-28.09	-8.56	-4.16	-820

Totals may not sum exactly due to rounding.  
Employment impacts include fulltime and part-time positions.

Real Estate, Retail Trade, Accommodations and Food Services, and Government were the industries most impacted by reductions in recreational visitor spending as a result of closures (Table A2). These are sectors that are typically impacted from changes in tourism activities. For retail trade, the number of jobs lost due to closures (22) is equal to 1.85 percent of the 1,196 retail jobs created by CVLC construction and ground operation activities.

### **Net Impacts for Construction, Ground Operations and Recreation/Tourism**

The net impacts of the CVLC are estimated by summing the positive impacts of expenditures for construction and operation of the complex, with the negative impacts from reduced visitor spending. These net impacts are summarized in Table 10 below. Net output impacts total over \$1.88 Bn for the life of the CVLC project (for an average of \$145 Mn per year). This represents a 3.56 percent reduction from the \$1.95 Bn in total positive output impacts from CVLC construction and ground operations shown in Table

8. A similar relationship exists between the magnitude of the net and total positive impacts for value-added, its components, and employment, except for indirect business taxes. The net indirect business tax impacts are nearly 7 percent less as a result of the recreational area closures. This is due to the higher proportion of retail sales, and sales taxes, associated with recreational expenditures, compared to fewer taxes collected on wholesale or producer level transactions associated with the construction and operation of the CVLC.

These total and net impacts of the CVLC are composed predominantly of direct and induced effects. This indicates that a substantially larger share of direct and induced spending occurs inside the region or study area, than is the case for indirect spending. The smaller proportion of indirect spending indicates that a large share of the intermediate inputs purchased by local contractors working on the CVLC are not produced within the region. The larger induced effects result from the fact that most of the employees for the CVLC project are likely to live and spend their earnings within the local three county study area.

Table 10. Net economic impacts of expenditure changes for the Commercial Vertical Launch Complex at Kennedy Space Center, 2008 – 2020.

Activity	Output (Mn\$)	Value-added (Mn\$)	Labor Income (Mn\$)	Other Property Income (Mn\$)	Indirect Business Taxes (Mn\$)	Employment (jobs)
Construction and Ground Operations	1,950.6	1,147.6	876.6	211.1	59.9	17,160
Recreation/Tourism	-69.5	-40.8	-28.1	-8.6	-4.2	-820
Net Impact	1,881.1	1,106.7	848.5	202.5	55.8	16,340

Values may not sum exactly due to rounding.  
Employment impacts include fulltime and part-time positions.

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## Appendix A

Table A1. Economic impacts of construction and ground operations expenditures for the Commercial Vertical Launch Complex at Kennedy Space Center by industry group, 2008 – 2020 (rank-ordered by output impacts).

Industry Group (NAICS)	Output	Value-Added	Labor Income	Other Property Income	Indirect Business Tax	Employment
	Million \$	Million \$	Million \$	Million \$	Million \$	Jobs
Construction	768.42	421.50	375.55	41.60	4.35	7,132
Manufacturing	147.52	52.86	43.99	8.15	0.72	391
Government & non NAICs	128.81	116.72	52.63	56.36	7.73	838
Prof. - scientific & tech. srvcs.	128.04	70.27	64.75	4.60	0.93	959
Administrative & waste srvcs.	123.15	85.93	72.20	12.85	0.88	1,460
Transportation & Warehousing	101.35	73.08	63.22	1.17	8.68	1,253
Health & social services	95.59	58.33	50.48	7.17	0.68	995
Retail trade	89.17	58.48	36.47	9.73	12.27	1,196
Finance & insurance	76.88	41.01	23.63	15.46	1.93	406
Real estate & rental	62.70	40.25	11.24	22.87	6.15	391
Wholesale Trade	57.04	38.45	21.59	8.43	8.43	327
Information	50.14	21.76	11.45	8.46	1.85	181
Accommodation & food services	41.21	22.15	14.76	4.84	2.56	653
Other services	31.89	16.75	13.11	2.42	1.22	524
Management of companies	20.83	12.71	9.86	2.65	0.20	91
Educational services	10.86	6.59	6.00	0.49	0.10	177
Arts- entertainment & recreation	10.11	6.09	4.16	1.27	0.67	157
Utilities	5.67	3.87	1.15	2.14	0.58	13
Ag, Forestry, Fish & Hunting	1.13	0.71	0.33	0.37	0.01	16
Mining	0.10	0.05	0.02	0.02	0.00	0
<b>Total</b>	<b>1,950.63</b>	<b>1,147.56</b>	<b>876.57</b>	<b>211.05</b>	<b>59.93</b>	<b>17,160</b>

All values in 2008 dollars.

Employment impacts include fulltime and part-time positions.

NAICS is the North American Industry Classification System

Table A2. Economic impacts of reduced visitor expenditures due to temporary closures at Merritt Island National Wildlife Refuge and Canaveral National Seashore for Commercial Vertical Launch Complex activities at Kennedy Space Center, by industry group, 2013 – 2020 (rank-ordered by output impacts).

Industry Group (NAICS)	Output	Value-Added	Labor Income	Other Property Income	Indirect Business Tax	Employment
	Million \$	Million \$	Million \$	Million \$	Million \$	Jobs
Real estate & rental	-1.45	-0.86	-0.62	-0.19	-0.05	-14
Retail trade	-1.42	-0.90	-0.56	-0.13	-0.20	-22
Accommodation & food services	-1.37	-0.72	-0.48	-0.16	-0.08	-22
Government & non NAICS	-0.56	-0.51	-0.28	-0.20	-0.03	-5
Prof. - scientific & tech. svcs.	-0.35	-0.19	-0.17	-0.02	-0.00	-3
Health & social services	-0.33	-0.20	-0.17	-0.02	-0.00	-3
Finance & insurance	-0.29	-0.16	-0.09	-0.06	-0.01	-2
Manufacturing	-0.28	-0.07	-0.05	-0.02	-0.00	-1
Construction	-0.27	-0.12	-0.11	-0.01	-0.00	-2
Wholesale Trade	-0.21	-0.14	-0.08	-0.03	-0.03	-1
Information	-0.19	-0.08	-0.05	-0.03	-0.01	-1
Administrative & waste svcs.	-0.19	-0.12	-0.09	-0.02	-0.00	-3
Transportation & Warehousing	-0.12	-0.07	-0.06	-0.01	-0.00	-1
Other services	-0.12	-0.06	-0.05	-0.01	-0.00	-2
Management of companies	-0.11	-0.06	-0.05	-0.01	-0.00	-1
Arts- entertainment & recreation	-0.07	-0.04	-0.03	-0.01	-0.00	-1
Educational services	-0.04	-0.02	-0.02	-0.00	-0.00	-1
Utilities	-0.03	-0.02	-0.01	-0.01	-0.00	-0
Ag, Forestry, Fish & Hunting	-0.01	-0.00	-0.00	-0.00	-0.00	-0
Mining	-0.00	-0.00	-0.00	-0.00	-0.00	-0
Total	-7.39	-4.35	-2.97	-0.96	-0.43	-84

All values in 2008 dollars.

Employment impacts include fulltime and part-time positions.

NAICS is the North American Industry Classification System.

## Appendix B: Glossary of Regional Economic Terminology

**Direct effects/impacts:** Direct impacts, represent the revenues, value-added, income, or jobs that result directly from an economic activity within a regional economy.

**Employment or Jobs:** Represents the total numbers of wage and salaried employees as well as self-employed jobs. This includes full-time, part-time and seasonal workers measured in annual average jobs.

**Indirect Business Taxes:** Include sales, excise, and property taxes as well as fees and licenses paid by businesses during normal operations. It does not include taxes on profits or income.

**Indirect effects/impacts:** Indirect effects occur when businesses use revenues originating from outside the region, or study area, to purchase inputs (goods and services) from local suppliers. This secondary, or indirect business, generates additional revenues, income, jobs and taxes for the area economy.

**Induced effects/impacts:** Induced effects or impacts occur when new dollars, originating from outside the study area, are introduced into the local economy. Induced economic impacts occur as the households of business owners and employees spend their earnings from these enterprises to purchase consumer goods and services from other businesses within the region. This induced effect generates additional revenues, income, jobs and taxes for the area economy.

**Input-Output Analysis:** The use of input-output models to estimate how revenues or employment for one or more particular industries, businesses or activities in a regional economy impact other businesses and institutions in that region, and the regional as a whole.

**Input-Output Models:** A mathematical representation of economic activity within a defined region using inter-industry transaction tables or matrices where the outputs of various industries are used as inputs by those same industries and other industries as well.

**Labor Income:** All forms of employment compensation, including employee wages and salaries, and proprietor income or profits.

**Local revenues/expenditures:** Local revenues or spending represent simple transfers between individuals or businesses within a regional economy. These transactions do not generate economic spin-off or multiplier (indirect and induced) effects.

**Margins:** Represent the differences between retail, wholesale, distributor and producers prices.

**Non-local revenues/expenditures:** When outside or new revenues flow into a local economy either from the sale of locally produced goods and services to points outside the study area, or from expenditures by non-local visitors to the study area, additional economic repercussions occur through indirect and induced (multiplier) effects.

**Other Property Type Income:** Income in the form of rents, royalties, interest, dividends, and corporate profits.

**Output:** Revenues or sales associated with an industry or economic activity.

**Total Impacts:** The sum of direct, indirect and induced effects or economic impacts.

**Value-added:** Includes wages and salaries, interest, rent, profits, and indirect taxes paid by businesses.