

Appendix Q

IMPLAN Analysis Methods and Results

IMPLAN Analysis Overview

This appendix describes the methods OEA used to estimate the regional economic impact of construction and operation of the proposed rail line. A variety of tools are available to estimate regional economic impacts, but the most widely used are input-output models. Input-output models are generally static models used to analyze the effects of an economic stimulus (in the form of a specific policy or project) on a region.

Regional economic modeling is founded on the principle that industry sectors are interdependent: one industry purchases inputs from other industries and households (e.g., labor) and then sells outputs to other industries, households, and government entities. Therefore, economic activity in one sector causes an increased flow of money throughout the economy. This assessment relies on the Impact analysis for PLANning (IMPLAN) regional economic modeling software to estimate the total employment and income effects associated with the Action Alternatives for the proposed rail line.

The regional economic modeling for the proposed rail line assesses the economic impact of the three Action Alternatives on the four-county study area that includes Carbon, Duchesne, Uintah, and Utah Counties in Utah. Economic impacts could result from construction and operation of the Action Alternatives. OEA estimated employment, labor income, and total value added or gross regional product (GRP) as the key economic measures for the study and defined GRP as the market value of all goods and services produced in the four-county region, annually. OEA estimated direct, indirect, and induced impacts for each key measure, expenditure type, and Action Alternative.

OEA derived the model inputs from project expenses and staffing information provided by the Seven County Infrastructure Coalition (Coalition). OEA generated indirect, induced, and total effects by conducting a multiregional input-output analysis in IMPLAN, which relied on 2018 IMPLAN data for the four-county study area.

Economic Impact Methods

The IMPLAN model relies on data from the U.S. Bureau of Economic Analysis, U.S. Department of Agriculture, U.S. Bureau of Labor Statistics, and the U.S. Census Bureau. The model includes 546 sectors based on the North American Industry Classification System (NAICS). The model uses region-specific multipliers to trace and calculate the flow of dollars from the industries that originate the impact to supplier industries. These multipliers are, thus, coefficients that describe the response of the economy to a stimulus (a change in demand or production).

A multiregional analysis makes it possible to track how an impact in any of the 546 IMPLAN sectors in the four-county study area can affect the production of all 546 sectors and household spending in another region. This allows users to demonstrate how an impact in the study area disperses into other regions and how these effects in surrounding areas create additional local effects.

IMPLAN's outputs include three types of impacts: direct impacts, indirect impacts, and induced impacts.

- **Direct impacts.** Direct impacts are impacts in the primary industries where production changes or expenditures made by producers/consumers as a result of an activity or policy are made, such as railroad track manufacturers.
- **Indirect impacts.** Indirect impacts are impacts in the industries that supply or interact with the primary industries, for example when a railroad track manufacturer would source material inputs from upstream suppliers.
- **Induced impacts.** Induced impacts represent increased spending by workers who earn money due to the proposed projects, such as when construction workers spend their wages at local restaurants.

OEA used the IMPLAN model to assess the economy-wide and industry-specific impacts of the direct spending associated with both construction and operation of the proposed rail line. OEA used three common metrics to report the results of the analysis: employment, labor income, and value added.

- **Employment.** Employment represents the jobs supported in each industry, based on the output per worker and output impacts for each industry.
- **Labor income.** Labor income includes all forms of employment income generated by the direct input, including employee compensation (wages and benefits) and proprietor income.
- **Value added.** Value added represents the total market value of all final goods and services produced within a region (also known as gross domestic product or GRP).

Model Inputs

The following discussion details the data and calculations OEA used to calculate the inputs for the IMPLAN model. The economic modeling assessed the direct activity associated with two main spending vectors: construction and operations and maintenance (O&M).

Construction Inputs

The Coalition provided construction cost estimates for each Action Alternative (Coalition 2019). OEA used these data to estimate the equipment, labor, and materials expenses related to six construction cost categories: construction of the track, earthwork, bridges and drainage structures, communications and signaling, tunnels, and fencing. These data also contained an estimate of the portion of construction spending anticipated to occur locally and nonlocally. Consistent with modeling best practices, only local expenditure was applied to the economic multipliers. OEA mapped the six construction cost categories provided by the Coalition to the appropriate IMPLAN sectors using an NAICS to IMPLAN crosswalk (IMPLAN 2020).

Because employment is site-based in IMPLAN, OEA accounted for all construction employment in the analysis. However, OEA calculated impacts from local and nonlocal labor separately to account for differences in typical spending profiles. OEA calculated employee compensation for local labor using the compensation per employee provided by the Coalition. Because it is unreasonable to assume that construction workers and contractors from outside the region would spend their income in the same way as residents, OEA used the federal per diem rate for Utah to estimate the

per diem lodging and food expenditure of these temporary residents (GSA 2020). Table Q-1 shows the IMPLAN sectors used to calculate the economic impacts from construction.

Table Q-1. Construction Input Sector Crosswalk

Input Category	Spending Description	IMPLAN Sector	IMPLAN Sector Description
Local construction expenditure	Bridges and tunnels	54	Construction of new highways and streets
	Track, earthwork, drainage and structures, fencing	56	Construction of other new nonresidential structures
	Communications and signaling	303	Other communications equipment manufacturing
Nonlocal labor expenditure	N/A (lodging)	507	Hotels and motels
	N/A (food)	509	Full-service restaurants

Notes:

Source: Coalition 2019

N/A = not applicable

The Coalition's current construction cost estimate is approximately \$1.29 billion for the Indian Canyon Alternative, \$2.14 billion for the Wells Draw Alternative, and \$1.35 billion for the Whitmore Park Alternative. OEA applied construction costs to the four-county study area based on the calculated percentage of track mileage in each county. Table Q-2 details the percentage of Action Alternative miles by county used to calculate the construction inputs.

Table Q-2. Percentage of Action Alternative Miles by County

Action Alternative	Carbon County (%)	Duchesne County (%)	Uintah County (%)	Utah County (%)
Indian Canyon	6	78	9	8
Wells Draw	4	81	8	7
Whitmore Park	7	74	8	12

Notes:

Source: Coalition 2019

Table Q-3 details the total annual construction cost inputs by Action Alternative and county. The Wells Draw Alternative would have the highest annual construction cost, while the Indian Canyon Alternative would have the smallest annual construction budget.

Table Q-3. Annual Total Local Construction Spending on Inputs, by Action Alternative and County

Action Alternative	Expected Years of Construction	Carbon County (\$ million)	Duchesne County (\$ million)	Uintah County (\$ million)	Utah County (\$ million)	Annual Total (\$ million)
Indian Canyon	2	24.7	347.8	38.2	38.0	448.7
Wells Draw	3	23.5	442.9	43.6	36.1	546.1
Whitmore Park	2	33.0	348.8	36.5	54.5	472.8

Notes:

The construction phase total local expenditures by alternative can be found by multiplying the annual total by the expected years of construction.

Source: Coalition 2019

Operations Inputs

The Coalition provided annual O&M cost estimates for the low rail traffic scenario and high rail traffic scenario (Coalition 2019). On an annual basis, the estimated O&M costs are anticipated to vary from \$22.8 to \$63.3 million for the Indian Canyon Alternative, \$28.5 to \$79.1 million for the Wells Draw Alternative, and \$24.7 to \$68.6 million for the Whitmore Park Alternative. The Coalition also provided an estimated breakdown of the O&M workforce by job type, including general operations, maintenance-of-way, mechanical, and management. OEA mapped the O&M job type categories provided by the Coalition to the appropriate IMPLAN sectors using a NAICS to IMPLAN crosswalk, as shown in Table Q-4.

Table Q-4. Operations Input Sector Crosswalk

Scenario	Job Type	Percentage (%)	IMPLAN Sector	IMPLAN Sector Description
Low rail traffic	Operations	45	415	Rail transportation
	Maintenance-of-way	35	60	Maintenance and repair construction of nonresidential structures
	Mechanical	5	457	Architectural, engineering, and related services
	Management	15	469	Management of companies and enterprises
High rail traffic	Operations	60	415	Rail transportation
	Maintenance-of-way	25	60	Maintenance and repair construction of nonresidential structures
	Mechanical	5	457	Architectural, engineering, and related services
	Management	10	469	Management of companies and enterprises

Notes:

Source: Coalition 2019

OEA applied O&M costs to the four-county study area counties based on the calculated percentage of track mileage in each county (Table Q-2). Table Q-5 depicts the annual low rail traffic scenario and high rail traffic scenario volume O&M inputs for each Action Alternative by county. The Wells Draw Alternative would have the largest annual O&M expected costs.

Table Q-5. Annual Operations and Maintenance Inputs by Action Alternative, Rail Traffic Scenario, and County

Action Alternative	Rail Traffic Scenario	Carbon County	Duchesne County	Uintah County	Utah County	Total ^a
Indian Canyon	Low	\$1,255,451	\$17,654,689	\$1,936,715	\$1,929,145	\$22,776,000
	High	\$3,488,210	\$49,052,689	\$5,381,068	\$5,360,034	\$63,282,000
Wells Draw	Low	\$1,225,336	\$23,122,187	\$2,277,058	\$1,882,419	\$28,507,000
	High	\$3,400,139	\$64,160,885	\$6,318,522	\$5,223,454	\$79,103,000
Whitmore Park	Low	\$1,732,290	\$18,312,780	\$1,918,646	\$2,863,920	\$24,828,000
	High	\$4,798,920	\$50,731,440	\$5,315,176	\$7,933,847	\$68,779,000

Notes:

^a These totals are rounded to the nearest thousand.

Source: Coalition 2019

IMPLAN Analysis Results

Indian Canyon Alternative

Construction of the Indian Canyon Alternative would support over 2,820 jobs, support \$196.8 million in labor income, and drive over \$290.6 million in GRP annually. Over the 2-year construction period, this would equate to approximately \$393.6 million in labor income, and \$581.1 million in GRP. Across all impact metrics, the Indian Canyon Alternative would have the lowest total construction impacts of the Action Alternatives. Table Q-6 shows the annual results of the IMPLAN analysis for this alternative.

Table Q-6. Detailed Annual Construction Impacts—Indian Canyon Alternative

Impact Type	Employment (annual jobs) ^a	Labor Income (\$ million) ^b	Value Added (\$ million) ^b
Direct	1,550	149.7	188.5
Indirect	740	30.4	62.4
Induced	530	16.7	39.6
Total	2,820	196.8	290.6

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Ongoing O&M for the Indian Canyon Alternative would support 170 to 420 total jobs, support between \$8.3 and \$23.3 million in labor income, and drive approximately \$15.2 to \$43.6 million in GRP annually. Table Q-7 shows the results of the IMPLAN analysis for this alternative.

Table Q-7. Annual O&M Impacts—Indian Canyon Alternative

Impact Type	Employment (annual jobs)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Low Rail Traffic Scenario			
Direct	110	5.8	9.6
Indirect	50	1.8	3.9
Induced	20	0.7	1.7
Total	170	8.3	15.2
High Rail Traffic Scenario			
Direct	250	16.5	31.4
Indirect	120	2.2	4.3
Induced	60	3.2	5.4
Total	420	23.3	43.6

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).

^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Wells Draw Alternative

Construction of the Well Draw Alternative would support approximately 3,450 jobs, support \$255.1 million in labor income, and drive \$351.3 million in GRP annually. Over the 3-year construction period, this would equate to \$765.2 million in labor income and \$1.1 billion in GRP. The Wells Draw Alternative would have the largest total economic impact of any of the Action Alternatives due to the longer construction timeline and higher cost of construction. Table Q-8 shows the results of the IMPLAN analysis for this alternative.

Table Q-8. Detailed Annual Construction Impacts—Wells Draw Alternative

Impact Type	Employment (annual jobs)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Direct	1,850	195.5	222.3
Indirect	930	38.6	78.5
Induced	680	21.0	50.6
Total	3,450	255.1	351.3

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).

^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Ongoing O&M for the Wells Draw Alternative would support approximately 220 to 530 total jobs, support between \$10.4 and \$29.0 million in labor income, and drive approximately \$18.9 to \$54.3 million in GRP annually. Table Q-9 shows the results of the IMPLAN analysis for this alternative.

Table Q-9 Annual O&M Impacts—Wells Draw Alternative

Impact Type	Employment (annual jobs)^a	Labor Income (\$ millions)^b	Value Added (\$ millions)^b
Low Rail Traffic Scenario			
Direct	130	\$7.2	\$12.0
Indirect	60	\$2.3	\$4.9
Induced	30	\$0.8	\$2.0
Total	220	\$10.4	\$18.9
High Rail Traffic Scenario			
Direct	310	\$20.5	\$35.3
Indirect	140	\$6.2	\$13.4
Induced	80	\$2.3	\$5.6
Total	530	\$29.0	\$54.3

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Whitmore Park Alternative

Construction of the Whitmore Park Alternative would support approximately 3,000 jobs, support \$209.8 million in labor income, and drive \$311.8 million in GRP annually. Over the 2-year construction period, this would equate to approximately \$420.0 million in labor income and \$623.6 million in GRP. The economic impact of the Whitmore Park Alternative would be comparable to the total impact of the Indian Canyon Alternative. Table Q-10 shows the results of the IMPLAN analysis for this alternative.

Table Q-10. Detailed Annual Construction Impacts—Whitmore Park Alternative

Impact Type	Employment (annual jobs)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Direct	1,630	\$158.2	\$201.1
Indirect	760	\$31.2	\$63.7
Induced	620	\$20.3	\$47.0
Total	3,000	\$209.8	\$311.8

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Ongoing O&M for the Whitmore Park Alternative would support 190 to 470 total jobs, support between \$9.3 and \$25.8 million in labor income, and drive approximately \$16.8 to \$48.1 million of GRP annually. Table Q-11 shows the results of the IMPLAN analysis for this alternative.

Table Q-11. Annual O&M Impacts—Whitmore Park Alternative

Impact Type	Employment (annual jobs)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Low Rail Traffic Scenario			
Direct	120	6.4	10.6
Indirect	50	2.0	4.2
Induced	30	0.9	2.1
Total	190	9.3	16.8
High Rail Traffic Scenario			
Direct	270	18.0	30.9
Indirect	120	5.3	11.5
Induced	80	2.5	5.7
Total	470	25.8	48.1

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Total Construction Results

The section presents the total construction results for each Action Alternative across the four-county study area.

Table Q-12 presents the detailed construction impacts for the Indian Canyon Alternative. Construction of the Indian Canyon Alternative is expected to last 2 years. Cumulative employment impacts over the construction phase are presented in job-years. A single job-year refers to a single job for 1 year. For example, 1,000 jobs that are supported for 2 years would equate to 2,000 job-years. Dividing the total job-years by the length of construction would equate to the total number of jobs supported annually.

Table Q-12. Total Construction Impacts (Project Life)—Indian Canyon Alternative

Impact Type	Employment (job-years)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Direct	3,100	299.4	377.0
Indirect	1,480	60.9	124.8
Induced	1,060	33.3	79.3
Total	5,640	393.6	581.1

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Table Q-13 presents the detailed construction impacts for the Wells Draw Alternative. Construction of the Wells Draw Alternative is expected to last 3 years.

Table Q-13. Wells Draw Total Construction Impacts (Project Life)—Wells Draw Alternative

Impact Type	Employment (job-years)^a	Labor Income (\$ million)^b	Value Added (\$ million)^b
Direct	5,550	586.5	666.8
Indirect	2,780	115.7	235.4
Induced	2,030	63.0	151.7
Total	10,350	765.2	1,053.9

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

Table Q-14 presents the detailed construction impacts for the Whitmore Park Alternative. Construction of the Whitmore Park Alternative is expected to last 2 years.

Table Q-14. Total Construction Impacts (Project Life)—Whitmore Park Alternative

Impact Type	Employment (job-years)^a	Labor Income (\$ Million)^b	Value Added (\$ Million)^b
Direct	3,260	\$316.5	\$402.2
Indirect	1,510	\$62.5	\$127.5
Induced	1,240	\$40.7	\$94.0
Total	6,010	\$419.6	\$623.6

Notes:

OEA calculated employment, labor income, and value added impacts using IMPLAN model.

^a Numbers may not sum due to rounding. Employment is converted from IMPLAN employment to full-time equivalent (FTE).^b Numbers may not sum due to rounding. All dollar values are in 2020 dollars.

References

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