

Attachment C:
Benefit-Cost Analysis Spreadsheet

TIGER VII Application
Collier Blvd. Corridor Improvements
June 5th, 2015

Collier Blvd BCA

Summary

The Collier Boulevard Benefit Cost Analysis (BCA) has been developed using the TIGER BCA Guidance¹ and the TIGER BCA Resource Guide².

The Collier Boulevard Corridor Improvements Project will cost \$33.4m (2015 dollars), of which \$26.72m or 80% is being requested as a TIGER grant with the remainder being provided through Collier County public funds.

The following economic benefits of the project have been estimated:

- Reduced delays (travel time) due to the improved road layout
- A reduction in vehicle miles traveled (VMT) through encouraging more cycling and walking trips, leading to:
 - Reduced vehicle operating costs
 - Reduced highway maintenance expenditure
 - Reduced vehicle emissions
 - Reduced healthcare costs
- Benefits from reducing the number of pedestrian and bicycle crashes along Collier Boulevard due to the project providing improved sidewalk and cycle routes.

In addition, by replacing a structurally deficient bridge over the Main Golden Gate Canal, the project will improve the state of good repair and reduce future maintenance costs, although this has not been quantified as part of the BCA.

In agreement with TIGER applications guidance we have converted prices to 2013 \$ values and calculated present values using a discount rate of 3% because the funds would otherwise be used for public expenditures. The project has been appraised over a 20 year period following the end of construction. The table below summarizes the benefits and costs of the project over the appraisal period. The project delivers an NPV of \$1.0m.

Time savings (\$2013)	\$27,896,806
Vehicle operating cost savings (\$2013)	\$4,440,874
Highway maintenance savings (\$2013)	\$796,446
Safety benefits (\$2013)	\$16,676,864
Emissions excluding CO2 (\$2013)	\$73,494
Healthcare benefits (\$2013)	\$1,209,230
Capital costs (\$2013)	(\$32,392,368)
Operating and maintenance costs (\$2013)	(\$3,239,237)
Undiscounted net benefits (\$2013)	\$15,462,109
Discounted net benefits (NPV, 3%)	\$910,834
CO2 emissions benefits (NPV, 3%)	\$84,301
3% NPV total benefits	\$995,135

¹ <http://www.dot.gov/sites/dot.gov/files/docs/TIGER%20BCA%20Guidance%202014.pdf>

² <http://www.dot.gov/sites/dot.gov/files/docs/TIGER%20BCA%20Resource%20Guide%202014.pdf>

Over the 20 year appraisal period, the project will take 5m vehicle miles off the road, resulting in the avoidance of nearly 2,000 tons of CO2 from vehicle emissions.

Capital Costs

The capital cost for the project is \$33.4m expressed in 2015 dollars and disaggregated as shown in the table below. TIGER grant contribution of 80% or \$26.72m is being sought with the remaining 20% or \$6.68m being provided by Collier County. It is assumed for the purpose of the BCA that the capital costs are incurred equally in 2017 and 2018, with construction complete in 2019.

Collier Blvd. Improvements		
COST CATEGORY	PERCENT OF PROJECT COST	TOTAL COSTS (2015 DOLLARS)
Roadway	43.1%	\$ 14,383,940
Structures	24.3%	\$ 8,100,000
SAPM, Signals, Lighting and Utilities	7.3%	\$ 2,436,000
Landscaping and Amenities	3.0%	\$ 1,000,000
Maintenance of Traffic (MOT)	3.0%	\$ 1,000,000
Mobilization	3.0%	\$ 1,000,000
Construction Engineering and Inspection	5.2%	\$ 1,750,000
Professional Services	3.0%	\$ 1,000,000
Project Unknowns and Contingency	8.2%	\$ 2,730,060
TOTAL	100%	\$ 33,400,000

Operating and Maintenance Costs

The additional infrastructure being introduced as part of the project will incur an incremental operating and maintenance cost compared with the No Build alternative. This is assumed to be 0.5% of the capital expenditure. Note that whilst the project introduces additional infrastructure, it is replacing an old bridge which will lower the future maintenance costs compared with the No Build.

Time saving benefits

Time savings have been estimated as follows. The 2014 all day traffic volumes (ADT) for the project area have been assumed to grow at the average growth rate of the previous 4 years, i.e. 2.3% per year. The signalized delay for the build and no build scenarios has been estimated using two different methods and the average of the two methods gives the average delay saving for a given year between build and no build. These savings are converted into a total daily saving using a time of day profile. The value of this time saving is estimated using the recommended monetized values in the TIGER BCA Resource Guide, assuming a split of 95.2% autos and 4.8% trucks based on vehicle classification counts on Collier Boulevard, and an average vehicle occupancy of 1.285 estimated by comparing the number of registered vehicles to the total population in Collier County.

Safety benefits

The proposed project assumed to remove all pedestrian and bicycle crashes along Collier Boulevard between Golden Gate Canal and Green Boulevard. Crash data from 2000 to 2015³ has been analyzed to estimate an average number of pedestrian and cycle crashes per year along this segment of the route, as shown in the table below.

	Collier Boulevard	
	Bicycle	Pedestrian
2000	0	0
2001	0	1
2002	0	0
2003	0	1
2004	1	1
2005	0	0
2006	2	0
2007	1	1
2008	2	1
2009	1	0
2010	0	0
2011	0	1
2012	0	1
2013	1	0
2014	1	1
2015	0	0
Total	9	8
Avg. per year	0.6	0.5

Analysis of historical crashes⁴ provides a likelihood of a fatality or an injury per crash.

³ <http://www.colliergov.net/index.aspx?page=580>

⁴ <http://www.colliermpo.com/modules/showdocument.aspx?documentid=5389>

Collier County average		Number	Proportion
Pedestrian	Killed	6	6%
	Injured	88	94%
Bicycle	Killed	2	2%
	Injured	94	98%

It is assumed that non-reported crashes do not cause any injuries, this may understate the safety benefits. The number of crashes is assumed to increase in line with overall growth in ADT.

Reduction in Vehicle Miles Traveled

The reduction in VMT drives benefits in terms of vehicle operating costs, highways maintenance costs, emissions and healthcare costs.

A reduction in VMT has been assumed based on 1% of trips along Collier Boulevard between Golden Gate Canal and Green Boulevard being replaced by equivalent walk or cycle trips of an average 2 mile length.

Vehicle Operating Costs

A reduction in vehicle operating costs of \$0.59 per VMT has been assumed based on the Bureau of Transportation Statistics (Cost of Owning and Operating an Automobile, 2011)⁵. This is assumed to appreciate at 2.12% per annum.

Highway Maintenance

Highway maintenance costs will also be reduced as a result of a reduction in VMT. A rate of \$0.15 per VMT saved has been applied⁶.

Emissions

Emissions benefits occur as a result of the reduction in VMT. The following emissions rates have been used, sourced from the Average annual Emissions and Fuel Consumption for Gasoline-Fuelled Passenger Cars and Light Trucks⁷:

- Carbon dioxide – 369g/VMT
- Hydrocarbons (Volatile Organic Compounds) – 1.36g/VMT
- Particulate Matter – PM10 0.0052g/VMT, PM2.5 0.0049g/VMT
- Nitrous Oxides – 0.95g/VMT

Economic costs associated with these emissions have been valued using the TIGER BCA Resource Guide.

Health benefits

⁵

http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/national_transportation_statistics/html/table_03_17.html

⁶ Development of a Pavement Maintenance Cost Allocation Model, Institute of Transportation Studies – University of California, Davis.

⁷ EPA Report 420-F-05-022

The reduction in VMT will lead to an increase in the number of walking and cycle trips, thereby leading to health benefits. In Florida, the physical inactivity rate is 25.4%⁸. A healthcare cost saving of \$585.97 per year has been assumed⁹ and for every 1,000 trips removed from the road it is assumed that 254 of them will involve people who are physically inactive, thereby providing a cost saving.

⁸ State Indicator Report on Physical Activity, 2010

⁹ Relationship of Body Mass Index and Physical Activity to Health Care Costs Among Employees; Guidelines for Analysis of investments in Bicycle Facilities (NCHRP Report 552, Transportation Research Board, 2006)

Results

The table below summarizes the BCA results by year.

Project Year	Calendar Year	Affected drivers (return trips per day)	TIME BENEFIT (person-hours/yr)	VMT Reduction (miles per yr)	TIME BENEFIT \$ Per Year	Vehicle Operating Cost \$ Per Year	Highways Maintenance \$ Per Year	Safety Benefit \$ Per Year	Emission (excl CO2) \$ Per Year	Healthcare Benefits \$ Per Year	Capital Cost \$ Per Year	Operational and Maintenance Cost \$ Per Year	Undiscounted Net Benefits (excl CO2)	Net Benefits Discounted @3% (excl CO2)	Undiscounted CO2 costs @ 3% Avg SCC \$ Per Year	NPV CO2 costs @ 3% Avg SCC \$ Per Year	3% NPV Total Benefits
0	2017										16,196,184		- 16,196,184	- 16,196,184			- 16,196,184
1	2018										16,196,184		- 16,196,184	- 15,724,450			- 15,724,450
2	2019	28,886	42,620	215,991	586,016	144,953	32,399	600,875	2,990	49,190		161,962	1,254,460	1,182,449	4,065	3,831	1,186,281
3	2020	29,583	48,662	221,201	669,864	151,596	33,180	622,629	3,062	50,377		161,962	1,368,746	1,252,596	4,244	3,884	1,256,481
4	2021	30,280	54,705	226,410	753,912	158,456	33,962	644,813	3,134	51,563		161,962	1,483,877	1,318,406	4,344	3,860	1,322,266
5	2022	30,976	60,748	231,620	838,163	165,538	34,743	667,433	3,206	52,750		161,962	1,599,872	1,380,063	4,615	3,981	1,384,044
6	2023	31,673	66,790	236,829	922,621	172,850	35,524	690,498	3,278	53,936		161,962	1,716,746	1,437,747	4,806	4,025	1,441,773
7	2024	32,370	72,833	242,039	1,007,288	180,397	36,306	714,014	3,350	55,122		161,962	1,834,517	1,491,630	5,001	4,067	1,495,697
8	2025	33,066	78,876	247,248	1,092,170	188,187	37,087	737,989	3,422	56,309		161,962	1,953,203	1,541,876	5,200	4,105	1,545,982
9	2026	33,763	84,918	252,458	1,177,269	196,226	37,869	762,431	3,494	57,495		161,962	2,072,822	1,588,646	5,403	4,141	1,592,787
10	2027	34,460	90,961	257,668	1,262,590	204,521	38,650	787,346	3,567	58,682		161,962	2,193,393	1,632,091	5,705	4,245	1,636,336
11	2028	35,157	97,004	262,877	1,348,136	213,079	39,432	812,743	3,639	59,868		161,962	2,314,935	1,672,358	5,917	4,275	1,676,633
12	2029	35,853	103,046	268,087	1,433,911	221,909	40,213	838,630	3,711	61,055		161,962	2,437,466	1,709,590	6,133	4,302	1,713,892
13	2030	36,550	109,089	273,296	1,519,919	231,017	40,994	865,015	3,783	62,241		161,962	2,561,007	1,743,921	6,353	4,326	1,748,248
14	2031	37,247	115,132	278,506	1,606,164	240,411	41,776	891,906	3,855	63,428		161,962	2,685,577	1,775,483	6,474	4,280	1,779,763
15	2032	37,943	121,174	283,716	1,692,650	250,100	42,557	919,310	3,927	64,614		161,962	2,811,197	1,804,400	6,805	4,368	1,808,768
16	2033	38,640	127,217	288,925	1,779,381	260,092	43,339	947,238	3,999	65,800		161,962	2,937,888	1,830,794	7,036	4,385	1,835,179
17	2034	39,337	133,259	294,135	1,866,362	270,395	44,120	975,696	4,071	66,987		161,962	3,065,670	1,854,781	7,272	4,400	1,859,180
18	2035	40,034	139,302	299,344	1,953,596	281,018	44,902	1,004,694	4,143	68,173		161,962	3,194,565	1,876,470	7,511	4,412	1,880,882
19	2036	40,730	145,345	304,554	2,041,088	291,970	45,683	1,034,241	4,216	69,360		161,962	3,324,596	1,895,971	7,754	4,422	1,900,393
20	2037	41,427	151,387	309,763	2,128,843	303,260	46,465	1,064,345	4,288	70,546		161,962	3,455,785	1,913,384	8,115	4,493	1,917,878
21	2038	42,124	157,430	314,973	2,216,864	314,898	47,246	1,095,016	4,360	71,733		161,962	3,588,155	1,928,810	8,368	4,498	1,933,308
Total			2,000,499	5,309,640	\$27,896,806	\$4,440,874	\$796,446	\$16,676,864	\$73,494	\$1,209,230	\$32,392,368	\$3,239,237	\$15,462,109	\$910,834	\$121,125	\$84,301	\$995,135