

Attachment C:  
Benefit-Cost Analysis Spreadsheet

TIGER VII Application  
Collier Community Streets and Infrastructure Project (CCSIP)  
June 5<sup>th</sup>, 2015

## Vanderbilt Drive BCA

### Summary

The Vanderbilt Drive Benefit Cost Analysis (BCA) has been developed using the TIGER BCA Guidance<sup>1</sup> and the TIGER BCA Resource Guide<sup>2</sup>.

The Vanderbilt Drive Corridor Improvements Project will cost \$22.445m (2015 dollars), of which \$12.093m or 53.9% is being requested as a TIGER grant with the remainder being provided through Collier County public funds. The BCA however excludes \$6.3m of utilities costs because these are funded by Collier County and will occur at the same time as the rest of the project. Consequently, no benefits from the utilities work has been included within the BCA.

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 travelled (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 Vanderbilt Drive due to the project providing improved sidewalk and cycle routes.

In addition, by replacing three functionally obsolete bridges and failing pavement, the project will improve the state of good repair and reduce future maintenance costs.

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 \$2.3m.

Time savings (\$2013)	\$0
Vehicle operating cost savings (\$2013)	\$6,701,024
Highway maintenance savings (\$2013)	\$1,201,791
Safety benefits (\$2013)	\$17,966,547
Emissions excluding CO2 (\$2013)	\$111,285
Healthcare benefits (\$2013)	\$942,462
Capital costs (\$2013)	(\$15,657,928)
Operating and maintenance costs (\$2013)	\$1,565,793
Undiscounted net benefits (\$2013)	\$9,699,388
Discounted net benefits (NPV, 3%)	\$2,269,994
CO2 emissions benefits (NPV, 3%)	\$78,599
<b>3% NPV total benefits</b>	<b>\$2,348,594</b>

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

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

### **Capital Costs**

The capital cost for the project is \$22.445m expressed in 2015 dollars and disaggregated as shown in the table below. TIGER grant contribution of 53.9% or \$12.093m is being sought with the remaining 46.1% or \$10.352m 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.

CCSIP		
COST CATEGORY	PERCENT OF PROJECT COST	TOTAL COSTS (2015 DOLLARS)
Roadway	11.4%	\$ 2,560,000
Structures	49.5%	\$ 11,100,000
Utilities	28.1%	\$ 6,300,000
Innovative Features	7.1%	\$ 1,585,000
Project Unknowns and Contingency	4.0%	\$ 900,000
TOTAL	100%	\$ 22,445,000

The BCA excludes the \$6.3m utilities costs because these are funded by Collier County and will occur at the same time as the rest of the project. Consequently, no benefits from the utilities work has been included within the BCA.

### **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.

### **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. 4.4% 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 introduction of a segregated sidewalk and cycle route is assumed to remove all pedestrian and bicycle crashes along Vanderbilt Drive between Bonita Beach Road and Vanderbilt Beach Road. Crash data from 2000 to 2004<sup>3</sup> 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.

---

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

	Vanderbilt Dr ( BBR to Wiggins)	
	Bicycle	Pedestrian
2005	0	0
2006	0	0
2007	2	1
2008	1	0
2009	0	0
2010	0	1
2011	1	0
2012	0	2
2013	0	0
2014	0	0
2015	0	0
Total	4	4
Avg. per year	0.25	0.250

	Vanderbilt Dr ( S. of Wiggins to VBR)	
	Bicycle	Pedestrian
2005	2	1
2006	0	0
2007	2	1
2008	3	1
2009	0	0
2010	1	0
2011	1	0
2012	0	1
2013	0	0
2014	0	0
2015	0	1
Total	9	5
Avg. per year	0.5625	0.313

	Vanderbilt Dr ( BBR to VBR)	
	Bicycle	Pedestrian
2000	0	0
2001	1	0
2002	0	1
2003	3	0
2004	2	0
2005	2	1
2006	0	0
2007	4	2
2008	4	1
2009	0	0
2010	1	1
2011	2	0
2012	0	3
2013	0	0
2014	0	0
2015	0	1
Total	19	10
Avg. per year	1.1875	0.625

Analysis of historical crashes<sup>4</sup> provides a likelihood of a fatality or an injury per crash.

<sup>4</sup> <http://www.colliermipo.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 Travelled**

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 5% of trips along Vanderbilt Drive between Bonita Beach Road and Vanderbilt Beach Road being replaced by equivalent walk or cycle trips of an average 2 mile length. This is based on analysis of the shift from vehicles to bicycle (2.57%) and to walk (2.65%) for the Lee County Complete Streets Initiative TIGER application.

### **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)<sup>5</sup>. 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 applied<sup>6</sup>.

### **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 Trucks<sup>7</sup>:

- 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**

---

<sup>5</sup>

[http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national\\_transportation\\_statistics/html/table\\_03\\_17.html](http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_03_17.html)

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

<sup>7</sup> 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%<sup>8</sup>. A healthcare cost saving of \$585.97 per year has been assumed<sup>9</sup> 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.

---

<sup>8</sup> State Indicator Report on Physical Activity, 2010

<sup>9</sup> 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	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										7,828,964		- 7,828,964	- 7,828,964			- 7,828,964
1	2018										7,828,964		- 7,828,964	- 7,600,936			- 7,600,936
2	2019	9,139	-	325,918	-	218,725	48,888	647,343	4,445	38,338		78,290	879,450	828,966	4,445	4,190	833,155
3	2021	9,360	-	333,779	-	228,750	50,067	670,779	4,547	39,263		78,290	915,116	837,461	4,547	4,161	841,622
4	2022	9,580	-	341,640	-	239,101	51,246	694,679	4,652	40,188		78,290	951,575	845,462	4,652	4,133	849,595
5	2023	9,800	-	349,501	-	249,788	52,425	719,049	4,759	41,113		78,290	988,843	852,985	4,759	4,105	857,090
6	2024	10,021	-	357,362	-	260,821	53,604	743,897	4,868	42,037		78,290	1,026,938	860,044	4,868	4,077	864,121
7	2025	10,241	-	365,223	-	272,209	54,783	769,232	4,980	42,962		78,290	1,065,877	866,655	4,980	4,049	870,705
8	2026	10,462	-	373,084	-	283,963	55,963	795,061	5,095	43,887		78,290	1,105,678	872,832	5,095	4,022	876,854
9	2027	10,682	-	380,945	-	296,093	57,142	821,392	5,212	44,811		78,290	1,146,361	878,590	5,212	3,994	882,584
10	2028	10,903	-	388,806	-	308,610	58,321	848,234	5,332	45,736		78,290	1,187,943	883,941	5,332	3,967	887,909
11	2029	11,123	-	396,667	-	321,524	59,500	875,596	5,454	46,661		78,290	1,230,445	888,900	5,454	3,940	892,840
12	2030	11,343	-	404,528	-	334,847	60,679	903,485	5,580	47,585		78,290	1,273,887	893,479	5,580	3,914	897,392
13	2031	11,564	-	412,388	-	348,591	61,858	931,910	5,708	48,510		78,290	1,318,288	897,690	5,708	3,887	901,577
14	2032	11,784	-	420,249	-	362,767	63,037	960,880	5,839	49,435		78,290	1,363,669	901,546	5,839	3,861	905,406
15	2033	12,005	-	428,110	-	377,387	64,217	990,404	5,974	50,360		78,290	1,410,051	905,058	5,974	3,834	908,893
16	2034	12,225	-	435,971	-	392,464	65,396	1,020,491	6,111	51,284		78,290	1,457,457	908,239	6,111	3,808	912,047
17	2035	12,446	-	443,832	-	408,011	66,575	1,051,150	6,252	52,209		78,290	1,505,907	911,099	6,252	3,782	914,881
18	2036	12,666	-	451,693	-	424,040	67,754	1,082,391	6,395	53,134		78,290	1,555,425	913,648	6,395	3,757	917,405
19	2037	12,886	-	459,554	-	440,566	68,933	1,114,223	6,543	54,058		78,290	1,606,034	915,898	6,543	3,731	919,630
20	2038	13,107	-	467,415	-	457,602	70,112	1,146,655	6,693	54,983		78,290	1,657,756	917,859	6,693	3,706	921,565
21	2039	13,327	-	475,276	-	475,162	71,291	1,179,697	6,847	55,908		78,290	1,710,616	919,541	6,847	3,681	923,221
Total			-	8,011,941	\$0	\$6,701,024	\$1,201,791	\$17,966,547	\$111,285	\$942,462	\$15,657,928	\$1,565,793	\$9,699,388	\$2,269,994	\$111,285	\$78,599	\$2,348,594