Appendix F

Implementation Details

2020 Network Phasing

Prioritization Methodology

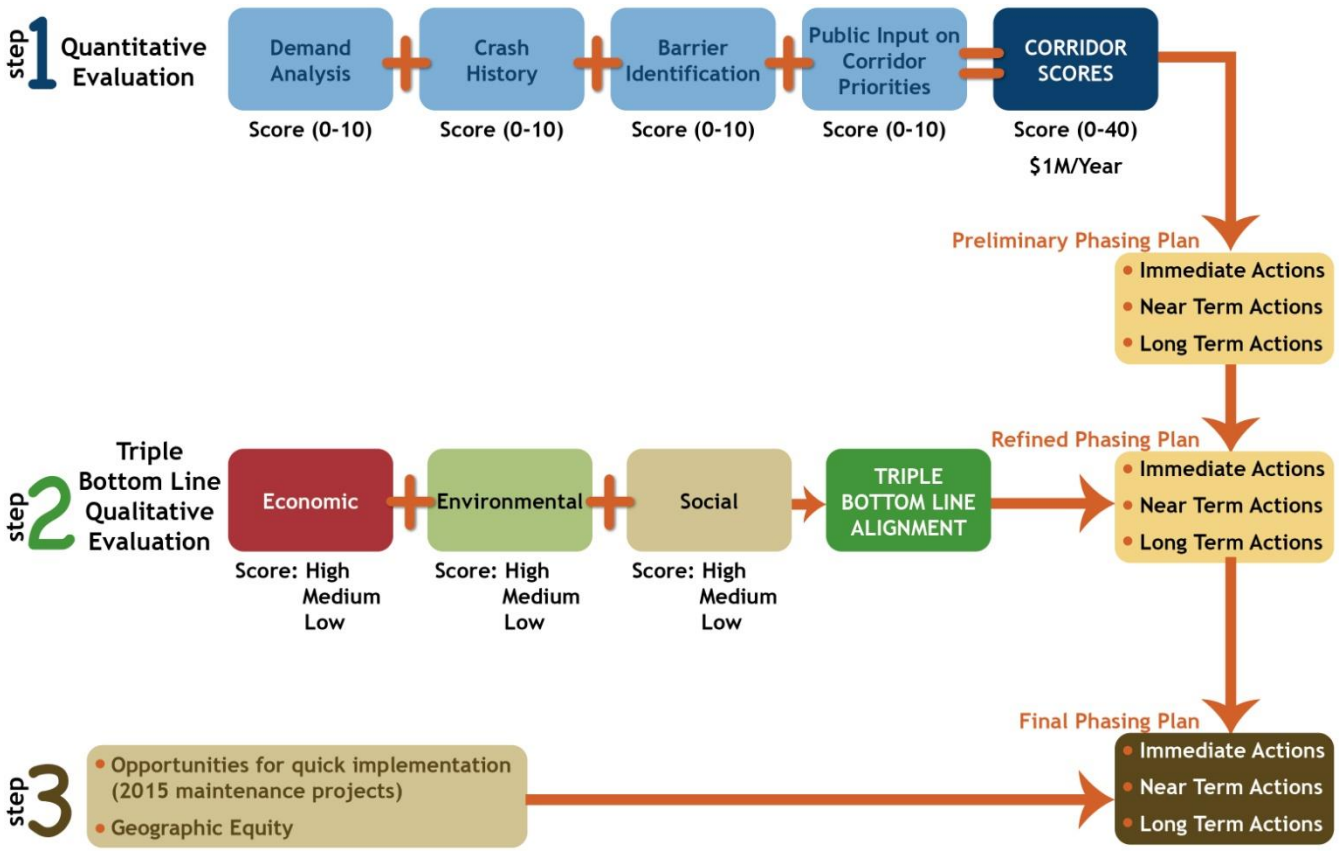
The recommended low-stress bike network improvements have been grouped and evaluated by corridor, as shown in Chapter 5 of the 2014 Plan. The corridors include a combination of segment and intersection improvements. A three-step evaluation process, as detailed in Figure 1 and described below, was applied to the 38 corridors to establish the corridor phasing plan.

Step 1 – The quantitative analysis is based on four evaluation criteria, each of which was given a normalized score ranging from 0–10, with 10 being the best. The scores were summed, and each corridor was given a Quantitative Corridor Score ranging from 0–40, with 40 being the best. The four criteria are as follows:

- The **Demand Analysis** results (as described in Chapter 2) identify the areas of Fort Collins with the highest bicycle demand and relate to many of the Bike Plan Goals/Themes. The demand score is based on the average demand calculated over the length of the corridor.
- The **Crash History** score accounts for the history of bicycle-related crashes (2009-2013) within a 150 foot buffer of the corridor. Corridors with a higher number of bicycle-related crashes per mile suggest the need for infrastructure improvements and therefore receive a higher score.
- The community was asked to identify barriers to bicycling in Fort Collins on the online interactive WikiMap. The **Barrier Identification** score is based on the number of recognized barriers per mile within a 150 foot buffer of each corridor.
- Over the course of the planning process, the community has been asked to identify the highest priority corridors for bike network improvements. This input was summarized and used to calculate the **Public Input on Corridor Priorities** score. In some cases, the public has strongly identified an arterial route, such as Prospect Road, as needing bike improvements. Because the 2020 Network focuses on non-arterial routes, these “votes” have been transferred to the nearest parallel low-stress corridor. For example, the Prospect Road “votes” were applied to the Pitkin and Stuart corridors.

Step 2 – The recommended corridor projects were evaluated qualitatively based on their ability to make improvements in the three areas of the Triple Bottom Line (TBL): economic, environmental, and social sustainability. A series of questions were posed, and each corridor was given a rating of High, Medium, or Low in each TBL category. The TBL evaluation was used to refine the phasing plan, ensuring a balanced mix of projects in each time horizon.

Figure 1. Corridor Prioritization Process



Economic Sustainability

- Does the project connect to a commercial district?
- Does the project make use of existing infrastructure (e.g., restriping only)?
- Does the project have high potential for partnership and/or non-City funding contributions?
- Does the project enhance connectivity to the proposed bike share stations?

Environmental Sustainability

- Does the project increase connectivity to natural resources?
- Does the project limit the need for additional impervious surfaces?
- Does the project increase access to transit?

Social Sustainability

- Does the project address a safety concern?
- Does the project connect to a community activity (e.g., school, library, park)?
- Does the project enhance a cultural or historic district?
- Does the project serve traditionally underserved populations (e.g., low income, minority)?

Step 3 – The refined phasing plan, which accounts for both the Quantitative Evaluation and the Triple Bottom Line Evaluation, was then cross-checked to consider leveraging planned maintenance and CIP projects and to ensure geographic equity and logical system connectivity within the immediate and near term actions. Some projects were given a higher priority based on these considerations.

Planning-Level Cost Estimates

The conceptual cost estimates prepared for the bike plan are based on the basic understanding of certain roadway infrastructure elements that would need to be added, removed, and/or modified to implement the proposed bike facility improvement.

For example, the installation of new pavement markings and signing are relatively easily installed if other existing infrastructure isn't impacted; those costs are based on an estimate of bike lane markings and sign placement of approximately 20 per mile on each side of the street. However, improvements that require moving existing street edges can impact the removal and replacement of curb & gutter, drainage infrastructure, utilities, and landscaping/trees. These types of improvements may also require the purchase of additional right-of-way or establishment of an easement – all of which can increase the cost of a bike facility improvement substantially.

The methodology for estimating project costs includes:

- Identifying project elements that can be readily quantified
- Using existing data for each of these elements to estimate units costs on a linear foot, square foot, square yard, each, or lump sum basis
- Quantifying project elements to the extent possible and calculating the projected item cost
- Including percentage add-on costs for items that cannot be truly quantified at this time, e.g., drainage, landscaping, or utility impacts
- Including a percentage of the base construction cost for maintenance of traffic during construction
- Adding a percent contingency for unknown project costs

Costs do **not** include estimates for on-going maintenance such as sweeping and snow removal which may add to the cost of implementation as indicated in Chapter 5.

Until a specific street is identified for a particular improvement, costs for new infrastructure can only be estimated at a general level. Considering these factors, the following tables summarize the estimated cost ranges for several project types that are recommended in the 2014 Plan.

Signed Route

Includes: sign and post

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Sharrow	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Subtotal				**$19,000**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$1,900.00	$1,900	
			Subtotal	**$20,900**	
			10% Contingency	$2,090	
			Total Estimated Cost	**$23,000**	
			Per Linear Foot	***$4.36***	

Signed Route without Sharrows

Includes: sign and post

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Subtotal				**$8,000**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$800.00	$800	
			Subtotal	**$8,800**	
			10% Contingency	$880	
			Total Estimated Cost	**$9,700**	
			Per Linear Foot	***$1.84***	

Bike Lanes – Collector

Includes: bicycle lane markings in both directions with bicycle lane signs. No markings on existing roadway require removal.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4")	LF	21,120	$2.60	$54,912	4 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet, each side of road
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Subtotal				**$73,912**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$7,391.00	$7,391	
			Subtotal	**$81,303**	
			20% Contingency	$16,261	
			Total Estimated Cost	**$97,600**	
			Per Linear Foot	***$18.48***	

Bike Lanes – Arterial

Includes: bicycle lane markings in both directions with bicycle lane signs. Up to 2 traffic lane lines removed.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4")	LF	21,120	$2.60	$54,912	4 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet, each side of road
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Eradication (Skip Lines)	LF	2,640	$0.50	$1,320	Eradicate 2 skip lines
Replace Skip Lines	LF	2,640	$2.60	$6,864	
Subtotal				**$82,096**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$8,210.00	$8,210	
			Subtotal	**$90,306**	
			20% Contingency	$18,061	
			Total Estimated Cost	**$108,400**	
			Per Linear Foot	***$20.53***	

Buffered Bike Lane – No Marking Removal

Includes: buffered bicycle lane markings in both directions with bicycle lane signs. No markings on existing roadway require removal.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4")	LF	31,680	$2.60	$82,368	6 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Crosswalk	EA	4	$1,000.00	$4,000	4 Crosswalks per mile, 36 Feet x 10 Feet, High Visibility
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Subtotal				**$105,368**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$10,537.00	$10,537	
			Subtotal	**$115,905**	
			20% Contingency	$23,181	
			Total Estimated Cost	**$139,100**	
			Per Foot	***$26.34***	

Bike Lanes –Requires Roadway Widening (Outside of Existing Footprint)

Includes: bicycle lane markings in both directions with bicycle lane signs. Requires road widening up to 7' each side, 14' total, with 22' pavement overlay of existing roadway. Major grading required with curb and gutter. Drainage impacts.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Excavation, Grading	CY	5,476	$20.00	$109,511	7 feet width and 2 feet depth, each side of road
Aggregate Base Course	CY	2,738	$40.00	$109,511	7 feet width and 1 feet depth, each side of road
Milling	SY	11,733	$7.00	$82,133	22 feet width
Asphalt Base Course	TON	2,779	$70.00	$194,526	14 feet width and 0.5 feet depth, 13.3 CF in a TON
Asphalt Surface Course	TON	2,387	$70.00	$167,070	36 feet width and 0.125 feet depth, 13.3 CF in a TON
Thermoplastic Pavement Marking Lines (4")	LF	21,120	$2.60	$54,912	4 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road (bike lane)
Crosswalk	EA	4	$1,000.00	$4,000	4 Crosswalks per mile, 36 Feet x 10 Feet, High Visibility
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Retaining Wall (up to 6 foot height)	LF	528	$360.00	$190,080	
Curb & Gutter (Type 2)(II-B)	LF	9,504	$20.00	$190,080	
Subtotal				**$1,120,824**	
Lump Sum Items					
Landscaping (10%)	LS	1.00	$112,082.00	$112,082	
Drainage and E&S (15%)	LS	1.00	$168,124.00	$168,124	
Maintenance of Traffic (10%)	LS	1.00	$112,082.00	$112,082	
Utility Adjustments (10%)	LS	1.00	$112,082.00	$112,082	
			Subtotal	**$1,625,194**	
			30% Contingency	$487,558	

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
			Total Estimated Cost	**$2,112,800**	
			Per Foot	***$400.15***	

Buffered Bike Lane – Road Markings Removal

Includes: buffered bicycle lane markings in both directions with bicycle lane signs. Up to 4 traffic lane lines removed.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4")	LF	31,680	$2.60	$82,368	6 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Crosswalk	EA	4	$1,000.00	$4,000	4 Crosswalks per mile, 36 Feet x 10 Feet, High Visibility
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Eradication	LF	13,200	$0.50	$6,600	Eradicate 2 solid lane lines & 2 skip lines
Replace Solid & Skip Lines	LF	13,200	$2.60	$34,320	
Subtotal				**$146,288**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$14,629.00	$14,629	
			Subtotal	**$160,917**	
			20% Contingency	$32,183	
			Total Estimated Cost	**$193,200**	
			Per Foot	***$36.59***	

Priority Shared Lane Marking Treatment (no color)

Includes: shared lane pavement marking at 125 foot spacing with dotted white lines bracketing symbol. No markings on existing roadway require removal.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4" to 6")	LF	2,400	$2.60	$6,240	4 dotted lines, 30 foot length either side of symbol
Thermoplastic Pavement Marking Symbol	EA	80	$275.00	$22,000	1 Symbol every 125 feet per side of the road
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$0.00	$0	
			Subtotal	**$36,240**	
			20% Contingency	$7,248	
			Total Estimated Cost	**$43,500**	
			Per Foot	***$8.24***	

Neighborhood Greenway – Low

Include: *bike lane markings; sign and post.*

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Sign Panel (Class I)	EA	20	$120.00	$2,400	
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Sharrow	EA	40	$275.00	$11,000	
Subtotal				**$19,000**	
Lump Sum Items					
Maintenance of Traffic (Fixed)	LS	1.00	$1,900.00	$1,900	
			Subtotal	**$20,900**	
			10% Contingency	$2,090	
			Total Estimated Cost	**$23,000**	
			Per Linear Foot	***$4.36***	

Neighborhood Greenway – High

Includes: construction of traffic calming devices

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Excavation, Grading, Fill	CY	913	$20.00	$18,252	14 feet width and 1foott depth
Asphalt Surface Course (Overlay)	TON	1,989	$67.00	$133,258	10 feet width and 2" depth, 13.3 CF in a TON
Curb & Gutter Removal	LF	1,800	$5.00	$9,000	3-300' segments each side
Curb & Gutter (Type 2)(II-B)	LF	1,980	$20.00	$39,600	3-300' segments each side x 1.1
Pavement Removal	SY	733	$10.00	$7,330	1/2 of (300'x44')
Sign Panel (Class I)	EA	10	$120.00	$1,200	
Steel Sign Post (2x2 Inch Tubing)	EA	10	$280.00	$2,800	
Thermoplastic Pavement Marking Symbol	EA	10	$275.00	$2,750	
Milling	SY	17,600	$7.00	$123,200	
Subtotal				**$337,390**	
Lump Sum Items					
Landscaping (10%)	LS	1.00	$33,739.00	$33,739	
Drainage and E&S (10%)	LS	1.00	$33,739.00	$33,739	
Maintenance of Traffic (5%)	LS	1.00	$16,870.00	$16,870	
Utility Adjustments (10%)	LS	1.00	$33,739.00	$33,739	
			Subtotal	**$455,477**	
			30% Contingency	$136,643	
			Total Estimated Cost	**$592,200**	
			Per Foot	***$112.16***	

Protected Bike Lane – Sidewalk Level (Construct New - 7' asphalt w/ curb & gutter & median)– Both Sides

Includes: relocation of existing 6 foot concrete sidewalk with new 7 foot minimum cycle track alongside a roadway (2' median w/ 5' track). Requires major grading with some retaining walls along with removal and replacement of existing curb and gutter.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Excavation, Grading, Fill	CY	9,387	$20.00	$187,733	12 feet disturbance each side and 2 feet depth
Aggregate Base Course	CY	2,738	$40.00	$109,511	7 feet width each side and 1 feet depth
Asphalt Surface Course	TON	928	$70.00	$64,972	7 feet width and 2" depth, 13.3 CF in a TON each side
Asphalt Base Course	TON	2,779	$70.00	$194,526	14 feet width and 0.5 feet depth, 13.3 CF in a TON
Retaining Wall (up to 6 foot height)	LF	528	$360.00	$190,080	10% of length
Curb and Gutter Removal	LF	10,560	$5.00	$52,800	Both sides
Remove 6 Foot Sidewalk	SY	7,040	$7.50	$52,800	Both sides
Curb & Gutter (Type 2)(II-B)	LF	10,560	$20.00	$211,200	Both sides
Curb & Gutter (Type 2)(I-B)	LF	21,120	$15.00	$316,800	Both sides-median C&G
Construct Concrete Sidewalk (4")	SY	7,040	$30.00	$211,200	Both sides - 6' Wide
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 symbol every 250 feet (cycle track)
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Median Cover Material	SF	21120	$5.00	$105,600	Both sides (2' x 5280' x 2)
Subtotal				**$1,716,223**	
Lump Sum Items					
Landscaping (5%)	LS	1.00	$85,811.00	$85,811	
Drainage and E&S (10%)	LS	1.00	$171,622.00	$171,622	
Maintenance of Traffic (10%)	LS	1.00	$171,622.00	$171,622	
Utility Adjustments (10%)	LS	1.00	$171,622.00	$171,622	
			Subtotal	**$2,316,900**	
			30% Contingency	$695,070	
			Total Estimated Cost	**$3,012,000**	
			Per Linear Foot	***$570.45***	

Protected Bike Lane (Street Level) – Both Sides

Includes: buffered bicycle lane markings in both directions with bicycle lane signs. No markings on existing roadway require removal; flexible delineators within the buffered lane markings; 2 bike lane signals heads each direction at each intersection; 2 bike detectors at each intersection; signal retiming work

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Thermoplastic Pavement Marking Lines (4")	LF	31,680	$2.60	$82,368	6 solid lines entire length
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Crosswalk	EA	4	$1,000.00	$4,000	4 Crosswalks per mile, 36 Feet x 10 Feet, High Visibility
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	EA	20	$280.00	$5,600	
Flexible Delineators	EA	264	$60.00	$15,840	1 every 40' each side
Bike Signal Head (12-12)	EA	16	$400.00	$6,400	2 each direction at each intersection; assume 4 intersections per mile = 16
Bike Detection	EA	8	$5,000.00	$40,000	1 each direction at each intersection; assume 4 intersections per mile = 8
Signal Retiming	LS	1	$5,000.00	$5,000	Assumes contractor work and that controller and cabinet are OK
Subtotal				**$172,608**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$17,261.00	$17,261	
			Subtotal	**$189,869**	
			20% Contingency	$37,974	
			Total Estimated Cost	**$227,900**	
			Per Foot	***$43.16***	

Two Way Cycletrack (Construct New 10' asphalt with curb, gutter and median), One Side

Includes: relocation of existing 6 foot concrete sidewalk with new 7 foot minimum cycle track alongside a roadway (2' median w/ 8' track). Requires major grading with some retaining walls along with removal and replacement of existing curb and gutter.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Excavation, Grading, Fill	CY	7,822	$20.00	$156,444	20 feet disturbance one side and 2 feet depth
Aggregate Base Course	CY	1,956	$40.00	$78,222	10 feet width, 1 feet depth
Asphalt Surface Course	TON	1,985	$70.00	$138,947	10 feet width and 2" depth, 13.3 CF in a TON
Asphalt Base Course	TON	663	$70.00	$46,408	10 feet width and 0.5 feet depth, 13.3 CF in a TON
Retaining Wall (up to 6 foot height)	LF	528	$360.00	$190,080	10% of length
Curb and Gutter Removal	LF	5,280	$5.00	$26,400	One side
Remove 6 Foot Sidewalk	SY	3,520	$7.50	$26,400	One side
Curb & Gutter (Type 2)(II-B)	LF	5,280	$20.00	$105,600	One side
Curb & Gutter (Type 2)(I-B)	LF	10,560	$15.00	$158,400	One side-median C&G
Construct Concrete Sidewalk (4")	SY	7,040	$30.00	$211,200	One side - 6' Wide
Thermoplastic Pavement Marking Symbol	EA	20	$275.00	$5,500	1 symbol every 250 feet (cycle track)
Sign Panel (Class I)	EA	10	$120.00	$1,200	1 Sign every 500 feet, one side of road
Steel Sign Post (2x2 Inch Tubing)	EA	10	$280.00	$2,800	
Median Cover Material	SF	10560	$5.00	$52,800	One side (2' x 5280')
Subtotal				**$1,200,402**	
Lump Sum Items					
Landscaping (5%)	LS	1.00	$60,020.00	$60,020	
Drainage and E&S (10%)	LS	1.00	$120,040.00	$120,040	
Maintenance of Traffic (10%)	LS	1.00	$120,040.00	$120,040	
Utility Adjustments (10%)	LS	1.00	$120,040.00	$120,040	
			Subtotal	**$1,620,542**	
			30% Contingency	$486,163	
			Total Estimated Cost	**$2,106,800**	
			Per Foot	***$399.02***	

Intersection Crossing Improvements - Two-Way Cycle Track

Includes: install a raised median in the middle of the street; crosswalk markings; approach and delineator signing. Minor pavement marking removal.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Removal of Pavement Marking	LF	585	$0.50	$293	To add bike lane markings
Pavement Removal	SY	290	$10.00	$2,900	
Remove 6 Foot Sidewalk	SY	17	$7.50	$128	150 LF
Curb and Gutter Removal	LF	425	$5.00	$2,125	
Asphalt Patching	SY	775	$80.00	$62,000	
Curb & Gutter (Type 2)(I-B)	LF	1,305	$20.00	$26,100	
Construct Concrete Sidewalk (4")	SY	18	$30.00	$540	
Median Cover Material	SF	1740	$5.00	$8,700	
Crosswalk	EA	1	$1,000.00	$1,000	30 feet x 10 feet, high visibility
Thermoplastic Pavement Marking Lines (4")	LF	290	$2.60	$754	
Thermoplastic Pavement Marking Symbol	EA	6	$275.00	$1,650	
Sign Panel (Class I)	EA	8	$120.00	$960	
Steel Sign Post (2x2 Inch Tubing)	EA	8	$280.00	$2,240	
Subtotal				**$109,389**	
Lump Sum Items					
Landscaping (5%)	LS	1.00	$5,469.00	$5,469	
Drainage and E&S (10%)	LS	1.00	$10,939.00	$10,939	
Maintenance of Traffic (10%)	LS	1.00	$10,939.00	$10,939	
Utility Adjustments (5%)	LS	1.00	$5,469.00	$5,469	
			Subtotal	**$142,205**	
			20% Contingency	$28,441	
			Total Estimated Cost	**$170,700**	
			Per Foot	***$32.33***	

Intersection Crossing Improvements - Raised Median

Includes: install a raised median in the middle of the street; crosswalk markings; approach and delineator signing. Minor pavement marking removal.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Removal of Pavement Marking	LF	60	$0.50	$30	
Pavement Removal	SY	14	$10.00	$140	
Asphalt Patching	SY	5	$80.00	$400	
Curb & Gutter (Type 2)(I-B)	LF	60	$15.00	$900	
Median Cover Material	SF	90	$5.00	$450	
Crosswalk	EA	1	$1,000.00	$1,000	
Sign Panel (Class I)	EA	4	$120.00	$480	
Steel Sign Post (2x2 Inch Tubing)	EA	4	$250.00	$1,000	
Subtotal				**$4,400**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$440.00	$440	
			Subtotal	**$7,320**	
			20% Contingency	$1,464	
			Total Estimated Cost	**$8,800**	
			Per Foot	***$1.67***	

Intersection Crossing Improvements – High

Includes: HAWK Signal

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Traffic Signal Head (12-12-12)	EA	4	$700.00	$2,800	
Pedestrian Signal Head (Countdown)	EA	2	$600.00	$1,200	
Mast Arm-Light Pole (20')	EA	2	$10,000.00	$20,000	
Controller & Cabinet	EA	1	$20,000.00	$20,000	
Conduit (2")	LF	50	$12.00	$600	
Conduit (3")	LF	50	$15.00	$750	
Pedestrian Push Button	EA	2	$250.00	$500	
Pull Box (18" x 30")	EA	2	$800.00	$1,600	
Sign Panel (Class I)	SF	44	$25.00	$1,100	
Steel Sign Post (2x2 Inch Tubing)	LF	28	$20.00	$560	
Luminaire	EA	2	$1,500.00	$3,000	
Wiring	LS	1	$5,000.00	$5,000	
Subtotal				**$57,110**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$5,711.00	$5,711	
			Subtotal	**$62,821**	
			20% Contingency	$12,564	
			Total Estimated Cost	**$75,400**	
			EACH	***$100,000***	*ITE guidance*

Bike Signal Head

Includes: Installation of one signal head at one location

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Bike Signal Head	EA	1	$650.00	$650	
Subtotal				**$650**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$65.00	$65	
			Subtotal	**$715**	
			30% Contingency	$143	
			Total Estimated Cost	**$900**	

Trail through Open Land

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Excavation, Grading, Fill	CY	5,476	$20.00	$109,511	14 feet width and 2 feet depth
6" Concrete Sidewalk	SY	2,933	$35.00	$102,667	10 feet width and 0.5 feet depth
Aggregate Base Course for Pavement	TON	1,985	$70.00	$138,947	10 feet width and 0.5 feet depth, 13.3 CF in a TON
Sign Panel (Class I)	EA	20	$120.00	$2,400	1 Sign every 500 feet, each side of road
Steel Sign Post (2x2 Inch Tubing)	LF	20	$280.00	$5,600	
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Subtotal				**$370,125**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$37,013.00	$37,013	
Drainage and E&S (10%)	LS	1.00	$37,013.00	$37,013	
Maintenance of Traffic (5%)	LS	1.00	$18,506.00	$18,506	
Utility Adjustments (10%)	LS	1.00	$37,013.00	$37,013	
			Subtotal	**$499,670**	
			30% Contingency	$99,934	
			Total Estimated Cost	**$599,700**	
			Per Foot	***$113.58***	

Bike/Ped Push Button

Includes: installation of two push buttons at one location

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Pedestrian Push Button	EA	2	$250.00	$500	
Subtotal				**$500**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$50.00	$50	
			Subtotal	**$550**	
			30% Contingency	$110	
			Total Estimated Cost	**$700**	

Green Bike Lane Paint

Includes: white edge stripes (one each side); bike lane symbol; green paint 24" wide

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
8" White Edge Stripe	LF	21120	$5.20	$109,824	One each side of green paint
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000	1 Symbol every 250 feet each side of road
Green Bike Lane Paint	SF	42,240	$3.00	$126,720	$325 per gal./100sf per gal. rounded to $3/sf
Subtotal				**$247,544**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$24,754.00	$24,754	
			Subtotal	**$272,298**	
			30% Contingency	$54,460	
			Total Estimated Cost	**$326,800**	
			Per Foot	***$61.89***	

Rectangular Rapid Flashing Beacon

http://safety.fhwa.dot.gov/intersection/resources/techsum/fhwasa09009/

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Rectangular Rapid Flashing Beacon	EA	1	$7,500.00	$7,500	
Steel Sign Post (2x2 Inch Tubing)	EA	1	$280.00	$280	
Subtotal				**$7,780**	
Lump Sum Items					
Maintenance of Traffic (10%)	LS	1.00	$778.00	$778	
			Subtotal	**$8,558**	
			30% Contingency	$1,712	
			Total Estimated Cost	**$10,300**	

Shared Use Path Bridge (14')

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Basic Prefab Bridge (60 foot span)	SF	840	$200.00	$168,000	
			Total Estimated Cost	**$168,000**	
			Per Foot	***$840***	

Sidewalk With Bikes Permitted, Widen Sidewalk

Includes: removal of existing sidewalk. Widening of sidewalk to 8 feet minimum where feasible, minimal grading to avoid property acquisition, retaining wall relocation or construction.

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Earthwork, Fill, Excavation, Grading	CY	3,129	$17.00	$53,191	4 feet width, up to 2 feet depth, two sides
Aggregate Base Course	CY	1,564	$25.00	$39,111	4 feet width and 1 foot depth, both sides
Widen Concrete Sidewalk (4" Thickness)	SY	4,693	$58.00	$272,213	Assume 4 feet, both sides
Repair Concrete Sidewalk (4" Thickness)	SY	1,760	$58.00	$102,080	Assume 25% of existing sidewalk, both sides
New Sign	EA	20	$246.00	$4,920	1 Sign every 500 feet, each side of road
Lump Sum Items					
Landscaping (5%)	LS	1.00	$23,576.00	$23,576	
Drainage and E&S (5%)	LS	1.00	$23,576.00	$23,576	
Maintenance of Traffic (10%)	LS	1.00	$47,152.00	$47,152	
Utility Adjustments (5%)	LS	1.00	$23,576.00	$23,576	
			Subtotal	**$589,396**	
			30% Contingency	$176,819	
			Total Estimated Cost	**$766,300**	
			Per Foot	***$145.13***	
			Per Side	**$383,150**	
			Per Foot, Per Side	***$72.57***	

2020 Network Project Cost Estimates

Based on the methodology discussed, the following table shows itemized cost estimates for each of the 2020 Network project corridors. The 2020 Network project corridors are presented in Chapter 5 of the 2014 Plan. Each total project cost consists of spot improvement costs as well as striping or construction needed for segment improvements. All costs are based on the estimates presented above. Full detail on the facility type and streets included in each project is housed in the GIS database that is part of the 2014 Plan.

Costs for projects that include protected bike lanes are presented as a range using the lowest (flexible delineator retrofit of bike lane) and highest (one-way, both sides, sidewalk-level) cost estimates per mile. The final determination of street configuration will be made during the design process and cannot be accurately portrayed here.

Project	Improvement Type	Cost	Protected Bike Lane Upper Range	Total
Hampshire Road (1)	Median w/RRFB	$66,400		**$380,600**
	Median	$26,400		
	Two-way Sidepath	$130,700		
	Two-way Sidepath	$130,700		
	Median	$26,400		
W Vine Drive (2)	Protected Bike Lane	$188,452	$5,926,169	**$188,452 to $5,296,169**
Capitol Drive (3)	Two-way Sidepath	$130,700		**$261,400**
	Two-way Sidepath	$130,700		
LaPorte Avenue (4)	Bike Lanes	$143,920		**$143,920**
Loomis Avenue (5)	Signal Improvement	$50,000		**$50,000**
W Elizabeth Street (6)	Protected Bike Lane	$190,448	$5,988,930	**$190,448 to $5,988,930**
Colony Drive (7)	Bike Lanes	$18,913		**$18,913**
W Stuart Street (8)	Median w/RRFB	$66,400		**$66,400**
N College Avenue (9)	Protected Bike Lane	$166,514	$5,236,294	**$166,514 to $5236,294**
Laurel Street (10)	Buffered Bike Lanes	$47,676		**$48,376**
	Push Button	$700		
N Lemay Avnue (11)	Protected Bike Lane	$239,287	$7,524,735	**$239,287 to $7,524,735**
Swallow Road (12)	Buffered Bike Lanes	$691,269		**$896,709**
	New Connection	$8,340		
	Two-way Sidepath	$130,700		
	Median w/RRFB	$66,400		
Stover Street (13)	Buffered Bike Lanes	$580,417		**$854,836 to $1,600,614**
	Protected Bike Lane	$24,495	$770,272	
	New Connection	$149,925		
	Half Signal	$50,000		
	Half Signal	$50,000		

Project	Improvement Type	Cost	Protected Bike Lane Upper Range	Total
Troutman Drive, Breakwater Drive (14)	Bike Lanes	$19,601		**$238,940**
	Buffered Bike Lanes	$5,913		
	New Connection	$34,750		
	Jughandle	$40,000		
	Jughandle	$40,000		
	New Connection	$47,976		
	Half Signal	$50,000		
	Push Button	$700		
Brookwood Drive (15)	Buffered Bike Lanes	$232,390		**$593,790**
	Two-way Sidepath	$130,700		
	Two-way Sidepath	$130,700		
	Add Signal	$100,000		
Magnolia Street (16)	Priority Shared Lane	$48,489		**$98,489**
	Intersection Improvement	$50,000		
Kingsley Drive, Corbett Drive (17)	New Signal	$100,000		**$100,000**
Mountain Avenue (18)	Priority Shared Lane	$28,133		**$282,901**
	Buffered Bike Lanes	$254,768		
S College Avenue (21)	Protected Bike Lane	$226,751	$7,130,580	**$226,751 to $7,130,580**
Columbia Road (22)	New Signal	$100,000		**$100,000**
Shields Street (23)	Protected Bike Lane	$130,027	$4,088,901	**$130,027 to $4,088901**
E Elizabeth Street (24)	Bike Lanes	$70,401		**$120,401**
	Signal Improvement	$50,000		
E Vine Drive (26)	Protected Bike Lane	$140,806	$4,427,910	**$140,806 to $4,427,910**
Mulberry Street Frontage (28)	New Connection	$168,000		**$303,950**
	New Connection	$5,250		
	Two-way Sidepath	$130,700		
N Taft Hill Road (29)	Protected Bike Lane	$117,662	$3,700,050	**$117,662 to $3,700,050**
Howes Street (31)	Buffered Bike Lanes	$181,737		**$181,737**
Nancy Gray Avenue (32)	New Connection	$57,926		**$57,926**
Linden Street (33)	Priority Shared Lane	$17,373		**$17,373**

Project	Improvement Type	Cost	Protected Bike Lane Upper Range	Total
E Drake Road (34)	Protected Bike Lane	$142,995	$4,496,687	**$142,995 to $4,496,687**
E Trilby Road (35)	Protected Bike Lane	$53,553	$1,684,042	**$53,553 to $1,684,042**
Skyway Drive (37)	Half Signal	$50,000		**$50,000**
Pitkin Street (28)	Buffered Bike Lanes	$314,740		**$676,140**
	Two-way Sidepath	$130,700		
	Two-way Sidepath	$130,700		
	Add Signal	$100,000		
Riverside Avenue (39)	Protected Bike Lane	$105,656	$3,322,518	**$105,656 to $3,322,518**
Cherry Street, Maple Street (40)	Two-way Sidepath	$130,700		**$130,700**
Wood Street (41)	New Connection	$22,600		**$99,874**
	Bike Lanes	$77,274		
Kneeland Drive (42)	New Connection	$22,716		**$22,716**
Remington Street (43)	Buffered Bike Lanes	$320,625		**$347,725**
	Add Median	$26,400		
	Push Button	$700		
E Lincoln Avenue (44)	Protected Bike Lane	$137,981	$4,339,011	**$137,981 to $4,339,011**
Raintree Drive (46)	Two-way Sidepath	$130,700		**$130,700**
Nassau Way (48)	Half Signal	$50,000		**$50,000**
Conifer Street (50)	Two-way Sidepath	$130,700		**$130,700**

Priority Intersections

Based on the methodology discussed, the following tables show the priority interaction projects. The priority corridors are presented in Chapter 5 of the 2014 Plan.

Chart 1: 2020 Low-Stress Network Prioritized Intersections

Intersection	Evaluation Criteria				Total Intersection Analysis Score (0-40)
	Demand	Crashes	Barriers	Public Input	
College & Laurel	10.00	5.56	6.67	7.91	30.14
Elizabeth & Shields	8.65	7.22	3.33	6.40	25.60
Elizabeth & Taft Hill	5.95	3.89	10.00	2.67	22.51
Prospect & Shields	7.84	6.11	1.67	5.70	21.31
City Park & Elizabeth	5.95	10.00	0.00	0.12	16.06
Center & Prospect	7.30	2.22	3.33	3.02	15.88
W Prospect Road & Lynnwood Drive*	7.17	8.00	0.00	0.00	15.17
Mason Trail & Prospect	8.38	0.00	5.83	1.05	15.26
College & Mountain	7.57	5.56	0.00	1.40	14.52
Prospect & Remington	7.16	0.56	4.17	1.63	13.51
Lake & Shields*	7.57	3.33	2.50	0.00	13.40
Horsetooth & Mason Trail	6.89	1.67	2.50	1.98	13.04
Mulberry & Remington	7.57	2.22	0.83	0.58	11.20
College & Laporte	6.49	1.67	2.50	0.35	11.00
S College Avenue & E Elizabeth Street*	10.00	0.00	0.00	0.00	10.00
Laporte Avenue & S Loomis Avenue*	9.00	0.00	0.00	0.00	9.00
N College Ave & Hickory/Conifer Street*	5.00	4.00	0.00	0.00	9.00
W Mulberry Street & City Park Avenue*	6.50	2.00	0.00	0.00	8.50
S Sherwood Street at Magnolia Street/Canyon Avenue*	7.50	1.00	0.00	0.00	8.50
College & Swallow*	4.86	0.56	1.67	0.81	7.90
Drake & Timberline	2.84	4.44	0.00	0.58	7.86
N Shields Street between Maple Street & Cherry Street*	6.83	1.00	0.00	0.00	7.83
Lemay & Vine	2.97	2.22	2.50	0.12	7.81
Laporte & Shields	5.95	1.11	0.00	0.58	7.64
Mulberry & Taft Hill	3.92	0.56	2.50	0.47	7.44
Cherry & College	5.54	1.67	0.00	0.00	7.21
E Prospect Road & Stover Street*	7.00	0.00	0.00	0.00	7.00
E Swallow Road & S College Avenue Frontage Road*	6.00	1.00	0.00	0.00	7.00
Lemay & Riverside	4.73	0.00	1.67	0.58	6.98
Tulane Drive & E Drake Road*	5.83	1.00	0.00	0.00	6.83
E Mulberry Street between Cowan Street and Riverside Avenue*	6.83	0.00	0.00	0.00	6.83

Intersection	Evaluation Criteria				Total Intersection
Ponderosa Drive & W Elizabeth Street*	3.50	3.00	0.00	0.00	6.50
S Shields Street between W Stuart Street & Hobbit Street*	6.33	0.00	0.00	0.00	6.33
Lemay & Mulberry	4.46	1.67	0.00	0.00	6.13
E Prospect Road & Welch Street*	6.00	0.00	0.00	0.00	6.00
Mulberry Street and Stover Street*	6.00	0.00	0.00	0.00	6.00
Stanford Road at E Swallow Road*	5.67	0.00	0.00	0.00	5.67
Ziegler Road & Paddington Road/Gr& Teton Place*	2.50	3.00	0.00	0.00	5.50
Harmony & Mason Trail	4.73	0.56	0.00	0.12	5.40
S Lemay Avenue between E Swallow Road & Centennial Road*	5.17	0.00	0.00	0.00	5.17
S Taft Hill Road between Springfield Drive & Clearview Avenue*	5.17	0.00	0.00	0.00	5.17
S Taft Hill Road & W Stuart Street*	3.83	1.00	0.00	0.00	4.83
W Drake Road & Hampshire Road*	3.50	1.00	0.00	0.00	4.50
S Taft Hill Road & Orchard Place*	4.33	0.00	0.00	0.00	4.33
Keenland Drive*	4.17	0.00	0.00	0.00	4.17
Boardwalk Drive & E Troutman Parkway*	4.17	0.00	0.00	0.00	4.17
Boardwalk Drive & Breakwater Drive*	4.00	0.00	0.00	0.00	4.00
E Horsetooth Road between S Lemay Street & Lochwood Drive*	4.00	0.00	0.00	0.00	4.00
W Mulberry Street & S Impala Drive*	3.00	1.00	0.00	0.00	4.00
W Mulberry Street between S Impala Drive & Ponderosa Drive*	3.00	1.00	0.00	0.00	4.00
W Troutman Parkway to S Shields Street*	3.67	0.00	0.00	0.00	3.67
S Taft Hill Road between Stuart Street & Sheffield Drive*	3.50	0.00	0.00	0.00	3.50
S Taft Hill Road north of Hull Street*	3.50	0.00	0.00	0.00	3.50
W Prospect Road between Hampshire Road & Fuqua Drive*	3.33	0.00	0.00	0.00	3.33
Caribou Drive*	3.17	0.00	0.00	0.00	3.17
S Lemay Avenue & Harbor Walk Drive*	3.17	0.00	0.00	0.00	3.17
S Taft Hill Road and Hull Street*	3.00	0.00	0.00	0.00	3.00
Wood Street*	3.00	0.00	0.00	0.00	3.00
W Horsetooth Road between Capitol Drive & Dunbar Avenue*	3.00	0.00	0.00	0.00	3.00
Hull Street west of Hanover Drive*	2.67	0.00	0.00	0.00	2.67
W Trilby Road & Constellation Drive*	2.50	0.00	0.00	0.00	2.50
Kingsley Drive & E Horsetooth Road*	2.50	0.00	0.00	0.00	2.50
Corbett Drive to Kingsley Court*	2.33	0.00	0.00	0.00	2.33
E Trilby Road & Kyle Ave*	2.17	0.00	0.00	0.00	2.17
Kyle Avenue south of E Skyway Drive*	2.00	0.00	0.00	0.00	2.00
Nancy Gray Avenue west of Joseph Allen Drive*	2.00	0.00	0.00	0.00	2.00

Intersection	Evaluation Criteria				Total Intersection
S Lemay Avenue & Province Road/Nass*	1.67	0.00	0.00	0.00	1.67
Mulberry Street Frontage Road between Dawn Avenue and Greenfields Court*	0.00	0.00	0.00	0.00	0.00
Mulberry Street Frontage Road & S Timberline Road*	0.00	0.00	0.00	0.00	0.00
Carpenter Road at Allott Avenue*	0.00	0.00	0.00	0.00	0.00

** These intersections have been identified for spot improvements*

Chart 2: Non-2020 Network Prioritized Intersections

Intersection	Evaluation Criteria				Total Intersection Analysis Score (0-40)
	Demand	Crashes	Barriers	Public Input	
College & Prospect	9.32	3.89	3.33	10.00	26.55
College & Drake	6.49	6.67	0.00	6.63	19.78
College & Horsetooth	6.22	2.78	0.83	6.16	15.99
Harmony & Timberline	4.19	5.00	0.00	3.37	12.56
College & Mulberry	7.30	1.67	0.00	2.91	11.87
College & Harmony	4.86	1.11	1.67	3.72	11.36
Mulberry & Shields	6.62	1.11	1.67	1.74	11.14
Harmony & Lemay	5.00	0.56	1.67	1.05	8.27
Drake & Lemay	5.14	1.67	0.83	0.58	8.22
Prospect & Timberline	3.78	2.78	0.00	1.16	7.72
Harmony & Shields	4.05	3.33	0.00	0.00	7.39
Horsetooth & Lemay	3.38	1.11	2.50	0.35	7.34
Lemay & Prospect	6.22	0.56	0.00	0.23	7.00
Harmony & Ziegler	3.11	0.00	0.83	0.12	4.06

** These intersections have been identified for spot improvements*