INTERSECTION *CONTROL* ALTERNATIVES ANALYSIS: **Benefit / Cost Ratio** Calculations* *for Safety Grant Candidates*

Main street Minor street	Location / Significance	TRAFFIC Entering (ADT)	KSI Crashes (2018-23) Fatal & Severe Injury	KSI Crashes (2018-23) Minor INJ Visible (VI) / C of P	ALTERNATIVES	COST ($)	C R F	Crash Cost Savings-$ Basic	Crash Cost Savings-$ LHSIP	B/C Ratio (safety only) Basic*	B/C Ratio (safety only) LHSIP
Land Park Dr / 11th Ave	Main (north) entrance to Wm LP / serving major E-W Ped, B & vehicle travel	11 / 1.0 k in 2045: 12 / 1.2 k	0	4 VI 3 CoP	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $300k $550k	NA 0.3 0.3	 3.72 M 3.72 M		**(3.72 : 1)** **12.4 to 1** **6.8 to 1**	
Riverside / Swanston Way	Upper Land Park / just 1 block N/O Crocker River.-side Elementary School	12 / 0.8 k In 2045: 12.5 / 1 k	1 F	1 VI	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $250k $550k	NA 0.3 0.3	 3 M 3 M		**(3 : 1)** **12 to 1** **5.5 to 1**	
Sutterville / Mead / 17th Ave	Major Entrance to WLP / serving major N-S Ped & Bike, SRTS + vehicle traffic	15 / 1.5 k In 2045: 16 / 2 k	2 SI	2 VI 1 CoP	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $325k $750k	NA 0.3 0.3	 6.1 M 6.1 M		**(6 : 1)** **18.8 to 1** **8.1 to 1**	
Land Park Dr / 2nd Ave	Old LP / serving residents, commuters, Park visitors, bike route, E-W travel	12.5 / 1.2 k In 2015: 13 / 1.5 k	O	3 VI 2 CoP	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $300k $550k	NA 0.3 0.3	 630k 630k		**(0.6 : 1)** **2.1 to 1** **1.1 to 1**	
For All 4			4: 1 F / 3 SI	16: 10 VI / 6 CoP	***Mini-Roundabout*** ***Traffic Signal***	$1.175 $2.4 M	0.3 0.3	13.5 M 13.5 M		**11.4 to 1** **5.6 to 1**	

SUMMARY of RESULTS	Mini-Calming Circle[1]	Mini-Roundabout	Traffic Signal
Benefit / Cost Ratio – BCR	**(*4.5 to* 1)**	**11.4 to 1**	**5.6 to 1**
Severe Crash Reduction[2]	see Note 3	**16** KSI ***prevented***	**12** KSI ***prevented***

* Basic Methodology; Local Road Safety Manual, version 1.6 (2022)

Notes:

[1] State and Federal Safety Funding Programs do not identify Traffic Circles as a Safety Countermeasure; also, the City's *Pocket Greenhaven Transportation Plan* (Draft) does not include Traffic Circles in its extensive lists of Improvement Strategies (Tables 1 and 2). * **But if we assume a CRF if 0.3, the BCRs are shown above (# : 1)**

[2, 3] Predicted over service life of 20 years (based on CRFs for KSI only of: 0.8 for roundabouts and 0.5 for traffic signals; see next slide for additional information

INTERSECTION *CONTROL* ALTERNATIVES ANALYSIS:

DRAFT **Benefit / Cost Ratio** for Local HSIP (Cycle 12) Candidates

Main street Minor street	Location / Significance	TRAFFIC Entering (ADT)	CRASHES (2019-23) → 5 years: Fatal (FI) / Injury (I)	CRASHES (2019-23) → 5 years: Property Damage Only (assumed)	ALTERNATIVES	COST ($)	C R F	Crash Cost Savings-$	B/C Ratio (safety only) *CCA Tool*
Land Park Dr / 11th Ave	Main (north) entrance to Wm LP / serving major E-W Ped, B & vehicle travel	11 / 1.0 k in 2045: 12 / 1.2 k	0 F / 7 I	10	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $300k $550k	NA 0.8 ?	 18.3 M 13.1 M	Not Eligible **60.9 to 1** 23.9 to 1
Riverside / Swanston Way	Upper Land Park / just 1 block N/O Crocker River.-side Elementary School	12 / 0.8 k In 2045: 12.5 / 1 k	1 F / 1 I	3	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $250k $550k	NA 0.8 ?	 4.8 M 1.4 M	Not Eligible **19.4 to 1** 2.6 to 1
Sutterville / Mead / 17th Ave	Major Entrance to WLP / serving major N-S Ped & Bike, SRTS + vehicle traffic	15 / 1.5 k In 2045: 16 / 2 k	0 F / 6 I (2 SI)	8	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $325k $900k	NA 0.8 ?	 14.8 M 10.2 M	Not Eligible **45.4 to 1** 11.4
Land Park Dr / 2nd Ave	Old LP / serving residents, commuters, Park visitors, bike route, E-W travel	12.5 / 1.2 k In 2015: 13 / 1.5 k	O F / 2 I	4	1. Mini-Calming Circle[1] 2. Mini-roundabout 3. Signal	$1 M $300k $550k	NA 0.8 ?	 5.8 M 2.2 M	Not Eligible **19.5** 3.9
For All 4			1 F / 16 I (2 SI)	25	***Mini-Roundabout*** ***Traffic Signal***	**$1.175** $2.55 M	0.8 ?	43.7 M 27.0 M	**36.3 to 1** (avg.) 10.4 to 1

SUMMARY of RESULTS	Mini-Calming Circle[1]	Mini-Roundabout	Traffic Signal
Benefit / Cost Ratio – **BCR**	see Note 1	**36.3 to 1**	10.4 to 1
Severe Crash Reduction[2]	see Note 1	**10 F+SI *prevented***	6 F + SI *prevented*

Notes:

[1] **State and Federal Safety Funding Programs do not identify Traffic Circles as a Safety Countermeasure; also, the City's *Pocket Greenhaven Transportation Plan* (Draft) does not include Traffic Circles in its extensive lists of Improvement Strategies (Tables 1 and 2).**

[2] Predicted over service life of 20 years (based on CRFs for KSI only of: 0.8 for roundabouts and 0.5 for traffic signals; see next slide for additional information

Draft INTERSECTION *CONTROL* ALTERNATIVES ANALYSIS:
Benefit Cost Ratio (BCR) Calculations *for Local HSIP (Cycle 12) Candidates*

SOURCES:

- Local Road Safety Manual, Version 1.6 (Section B.2, *Unsignalized Intersection Countermeasures* and Appendix D)
- *Making Our Roads Safer: One Countermeasure at a Time* – **28 Proven Safety Countermeasures,** FHWA
- *Crash Cost Analysis* (CCA) Tool, Caltrans
- AASHTO Countermeasure Clearinghouse
- City of Sacramento Traffic Database
- TIMS. UC Berkeley
- FHWA Resource Center (Intersection Safety & Design Team)
- VORTEX – Manufacturer of Modular Mini-Roundabout "kits"

Safety Performance Data from *Local* Circular Intersections

- **During 2022-23, one Fatal and two Severe Injury crashes occurred at two Mini-Traffic Calming Circles located in Sacramento's Midtown Neighborhood**
- **Zero severe injury or fatal crashes have occurred at roundabouts in the city of Sacramento (ever)**

Sample BCR Calculation for *Install Traffic Signal* at Land Park Drive / 11th Ave:

- KSI Crash Savings: [(4/6 years x 0.3) x 2.85 x 20] = $2.85 M
- Visible Injury Crash Savings: [(10/6 x 0.3) x 150 x 20] = $0.6 M
- Complaint of Pain Crash Savings: [(6/6 x 0.3) x 90 x 20 = $0.27 M

Total Crash SAVINGS = $3.72 M
Total Project COST = $0.55 M
BCR_{Signal} = 3.72 / 0.55 = 6.8 to 1

BASIS of Mini-Roundabout Cost Estimates (approximate size and presence / absence of required features)

- Existing Conditions: 2-lane by 2-lane intersections; LP Drive / 2nd Ave also has a center turn lane; each can accommodate:
  - **Inscribed Circle Diameters range between 55 and 70 feet** (shapes may be slightly oval due to narrower minor cross streets)
- Scope of Work also includes:
  - Relocation of existing, or installation of new RRFB's
  - Upstream signage + warning beacons (for 5 of 8 approaches) in order to mitigate for operating speed and curvilinear alignment
  - Need to add ADA curb ramps (2 intersections are currently missing ramps)
  - Project planning and engineering support (thru construction)

CCA Calculation Sheets (1 of 2)

LAND PARK DR / 11TH Ave

4/24/24

Intersection Control Evaluation
Collision Cost Analysis and B/C
-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
Sac	Land Park Dr		Cross Street: 11th Avenue

Area: (•) Suburban ( ) Rural ( ) Urban

Intersection Ty
F - Four-L
M - Multi-
S - Offsett
Y - "Y" W
Z - Others

Existing Condition	# of Years for Analysis	Rate Group
Stop Control (Minor Leg), Type F, M or S	20	I7

Existing ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
11.0	1.0	12.0	1.2	12.6	1.05

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 300		$ 300
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 550	$ -	$ 550
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	5	Total Collisions
Injury	7	PDO
Fatal	0	Fat + Inj

Collision Cost (x1000)

	Existing Condition		Desired Improvement		Projected Savings	B/C
1	Stop Control (Minor Leg), Type F, M or S	$18,993	Yield Control (Roundabout 1-Lane)	$734	$18,259	60.86
2	Stop Control (Minor Leg), Type F, M or S	$18,993	Yield Control (Roundabout 2-Lane)	$2,085	$16,908	0.00
3	Stop Control (Minor Leg), Type F, M or S	$18,993	Traffic Signal, Type F, M or S	$5,828	$13,165	23.94
4	Stop Control (Minor Leg), Type F, M or S	$18,993	All Way Stop, Type F, M or S	$6,208	$12,785	0.00

NOTE: Only average collision costs are used for calculation purposes.

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RIVERSIDE / SWANSTON WAY

4/25/24

Intersection Control Evaluation
Collision Cost Analysis and B/C
-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
Sac	Riverside		Cross Street: SWANSTON WAY

Area: (•) Suburban ( ) Rural ( ) Urban

Intersection Ty
F - Four-Le
M - Multi-
S - Offsett
Y - "Y" Wy
Z - Others

Existing Condition	# of Years for Analysis	Rate Group
Stop Control (Minor Leg), Type F, M or S	20	I7

Existing ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
12.0	0.8	12.5	1.0	13.2	1.03

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 250		$ 250
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 550	$ -	$ 550
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	5	Total Collisions
Injury	1	PDO
Fatal	1	Fat + Inj

Collision Cost (x1000)

	Existing Condition		Desired Improvement		Projected Savings	B/C
1	Stop Control (Minor Leg), Type F, M or S	$5,618	Yield Control (Roundabout 1-Lane)	$771	$4,847	19.39
2	Stop Control (Minor Leg), Type F, M or S	$5,618	Yield Control (Roundabout 2-Lane)	$1,945	$3,672	0.00
3	Stop Control (Minor Leg), Type F, M or S	$5,618	Traffic Signal, Type F, M or S	$4,207	$1,411	2.57
4	Stop Control (Minor Leg), Type F, M or S	$5,618	All Way Stop, Type F, M or S	$6,456	($838)	0.00

NOTE: Only average collision costs are used for calculation purposes.

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CCA Calculation Sheets (2 of 2)

SUTTERVILLE / MEAD Ave

Intersection Control Evaluation
Collision Cost Analysis and B/C
-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
Sac	Sutterville		Cross Street: MEAD Ave

Area: ○ Rural ● Suburban ○ Urban

Intersection Ty: F - Four-Le; M - Multi-; S - Offsett; Y - "Y" Wy; Z - Others

Existing Condition	# of Years for Analysis	Rate Group
Stop Control (Minor Leg), Type F, M or S	20	I7

Existing ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
15.0	1.5	16.0	2.0	17.3	1.05

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 325		$ 325
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 900	$ -	$ 900
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	5	Total Collisions	14
Injury	6	PDO	8
Fatal	0	Fat + Inj	6

Collision Cost (x1000)

	Existing Condition		Desired Improvement		Projected Savings	B/C
1	Stop Control (Minor Leg), Type F, M or S	$15,783	Yield Control (Roundabout 1-Lane)	$1,028	$14,755	45.40
2	Stop Control (Minor Leg), Type F, M or S	$15,783	Yield Control (Roundabout 2-Lane)	$2,532	$13,250	0.00
3	Stop Control (Minor Leg), Type F, M or S	$15,783	Traffic Signal, Type F, M or S	$5,540	$10,242	11.38
4	Stop Control (Minor Leg), Type F, M or S	$15,783	All Way Stop, Type F, M or S	$8,442	$7,340	0.00

NOTE: Only average collision costs are used for calculation purposes.

LAND PARK DR / **2ND Ave**

Intersection Control Evaluation
Collision Cost Analysis and B/C
-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description
Sac	Land Park Dr		Cross Street: 2nd Avenue

Area: ○ Rural ● Suburban ○ Urban

Intersection Ty: F - Four-Le; M - Multi-; S - Offsett; Y - "Y" Wy; Z - Others

Existing Condition	# of Years for Analysis	Rate Group
Stop Control (Minor Leg), Type F, M or S	20	I7

Existing ADT (x1000)		Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF
12.5	1.2	13.0	1.5	14.1	1.03

Est. Capital Cost (x1000) for Desired Improvement

Desired Improvement	Const	R/W	Total
Yield Control (Roundabout 1-Lane)	$ 300		$ 300
Yield Control (Roundabout 2-Lane)			$ -
Traffic Signal, Type F, M or S	$ 550	$ -	$ 550
All Way Stop, Type F, M or S		.	$ -

Existing Collision Data

Number of Years	5	Total Collisions	6
Injury	2	PDO	4
Fatal	0	Fat + Inj	2

Collision Cost (x1000)

	Existing Condition		Desired Improvement		Projected Savings	B/C
1	Stop Control (Minor Leg), Type F, M or S	$6,688	Yield Control (Roundabout 1-Lane)	$844	$5,843	19.48
2	Stop Control (Minor Leg), Type F, M or S	$6,688	Yield Control (Roundabout 2-Lane)	$2,092	$4,596	0.00
3	Stop Control (Minor Leg), Type F, M or S	$6,688	Traffic Signal, Type F, M or S	$4,514	$2,173	3.95
4	Stop Control (Minor Leg), Type F, M or S	$6,688	All Way Stop, Type F, M or S	$6,952	($265)	0.00

NOTE: Only average collision costs are used for calculation purposes.