



Applying Social Return on Investment to Risk-Based Transportation Asset Management Plans in Low-Volume Bridges (11LVR-0008, 2473 LVRB09)

Catalina Miller PhD, ENV SP
Jorge A. Rueda
Douglas D. Gransberg PhD, PE

Aging and deterioration of
national transportation
infrastructure + limited resources



Risk Base- Transportation Asset
Management (TAM)

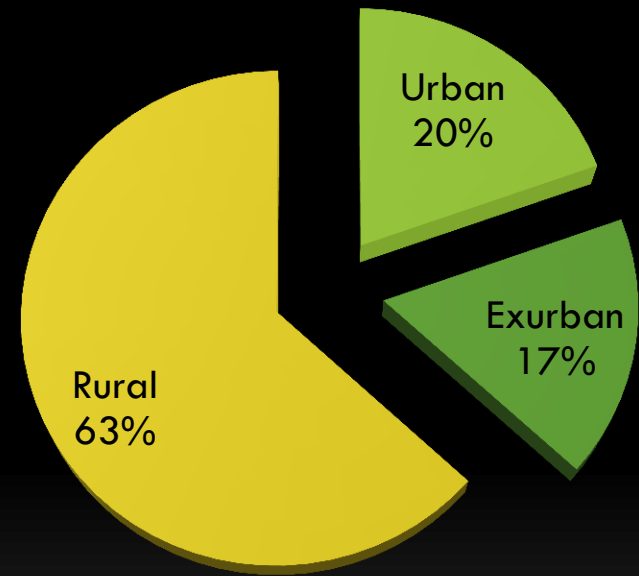


What Is the Risk of Allocating
Resources to an Asset Versus Other?

GEOGRAPHICAL CONTEXT

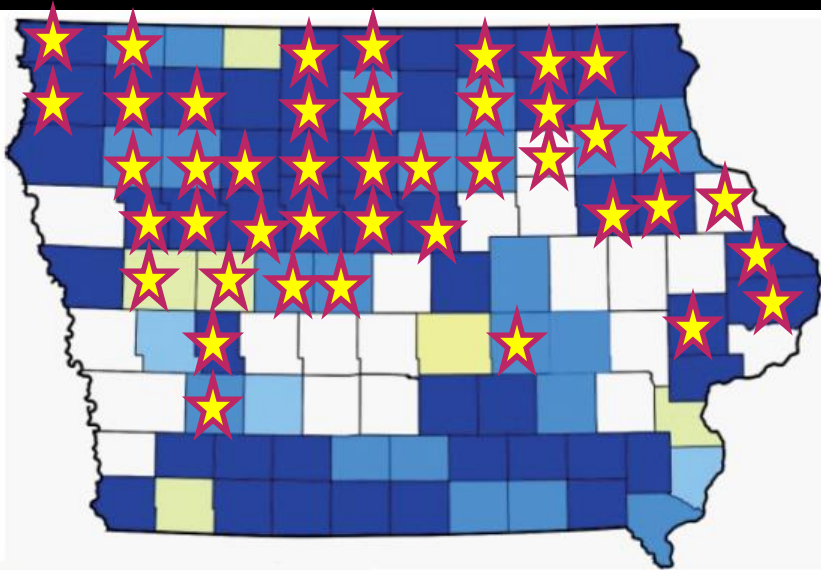
- The U.S. provides nearly half of all the world's grain exports.
- Iowa ranks first among the states in production of corn and soybeans

Where are the bridge needing repair located?



Adjusted from the Transportation from America/Daily Yonder

Iowa has 3rd highest percentage of deficient bridges in the nation



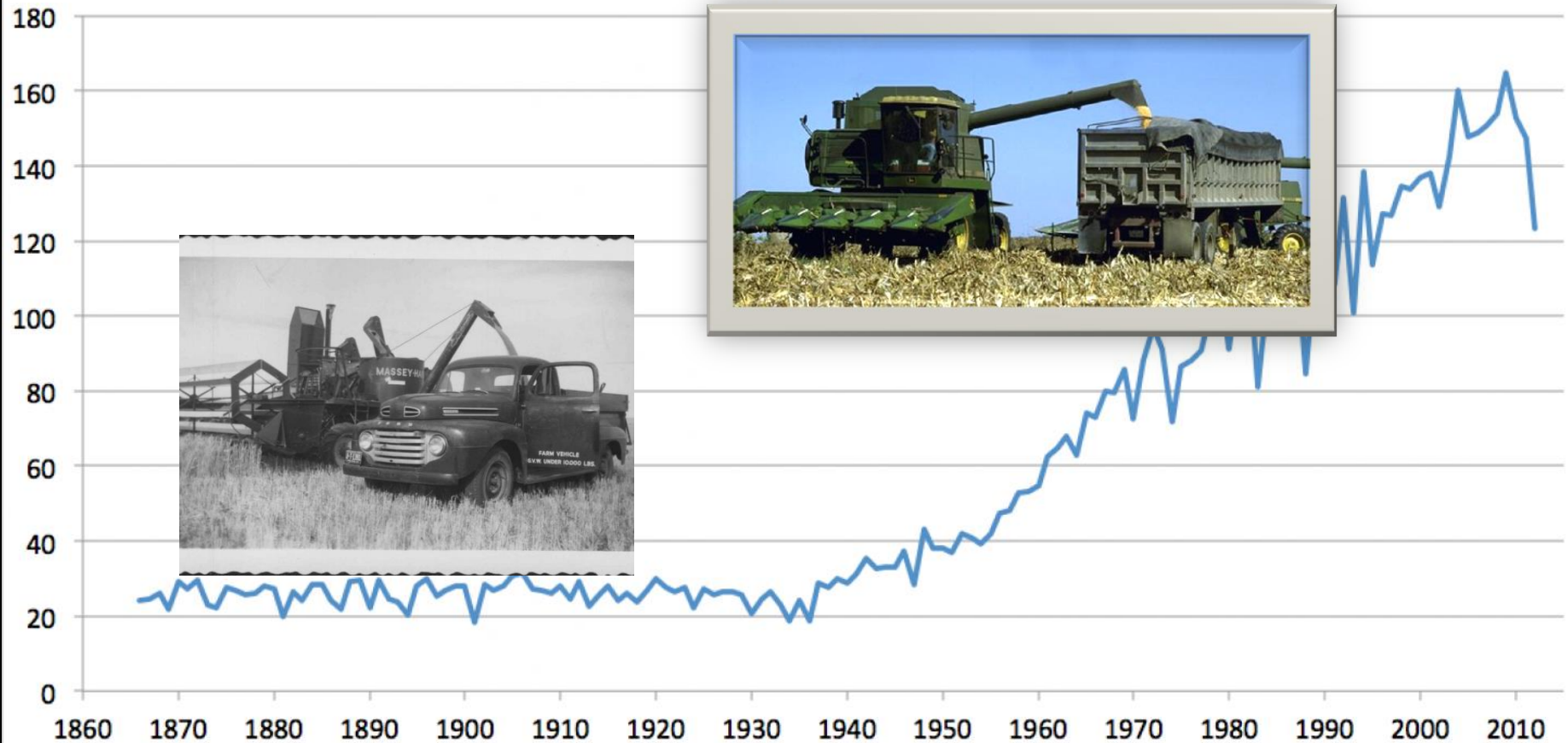
Bridges found 'structurally deficient' by Federal Highway Administration



Counties with the highest yield of Corn in 2011

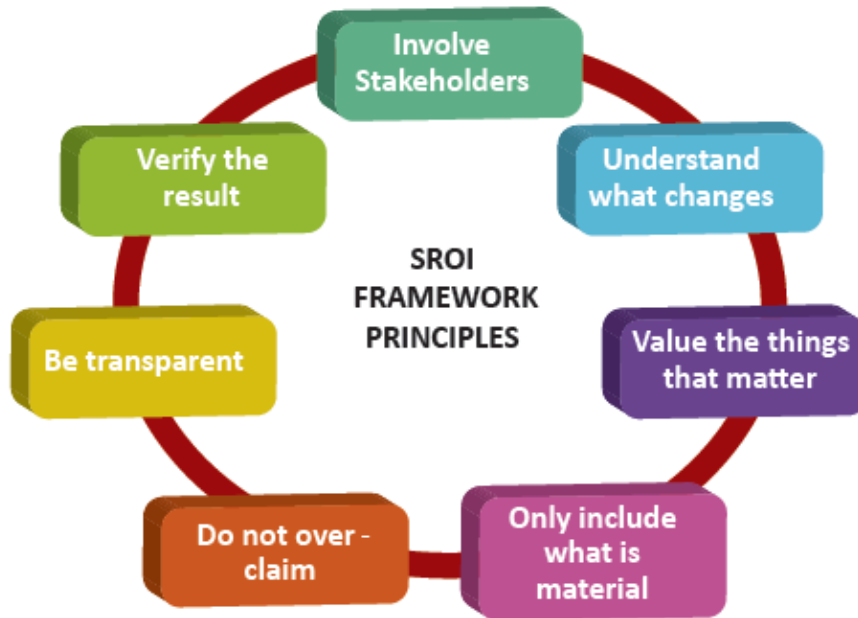
- From 20.1% to 62% of bridges structurally deficient
- From 11.1% to 20% deficient
- From 8.1% to 11% deficient
- From 1% to 8% deficient

CORN, GRAIN - YIELD, MEASURED IN BU / ACRE



Has American Infrastructure
Evolved with the Agro-Industry?

SROI & HDM-4

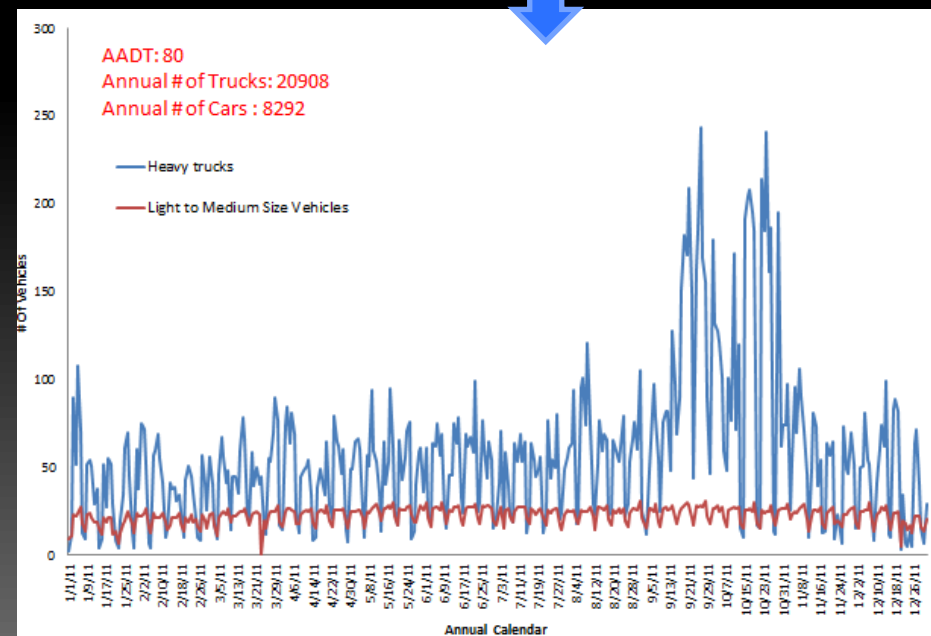
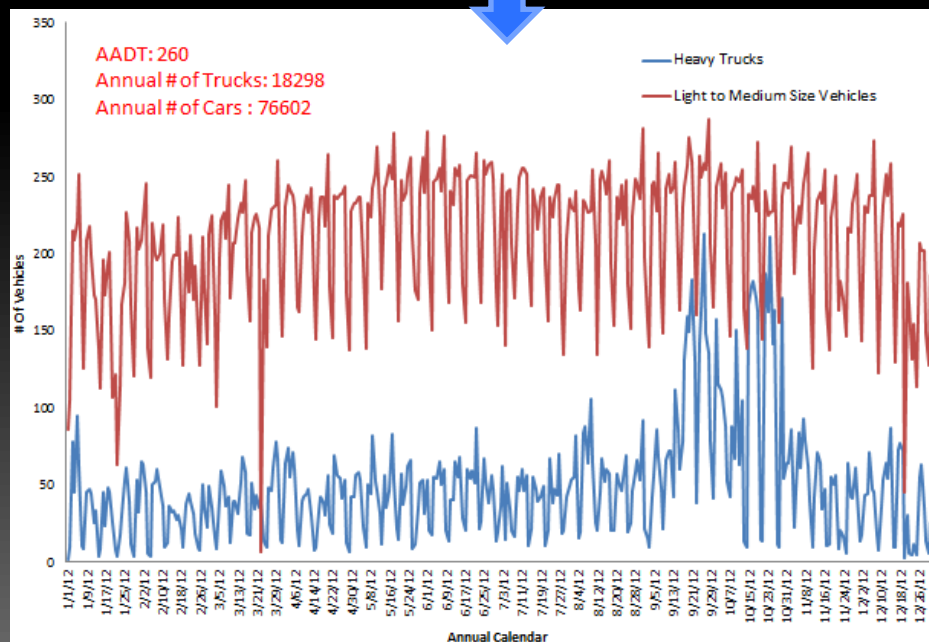
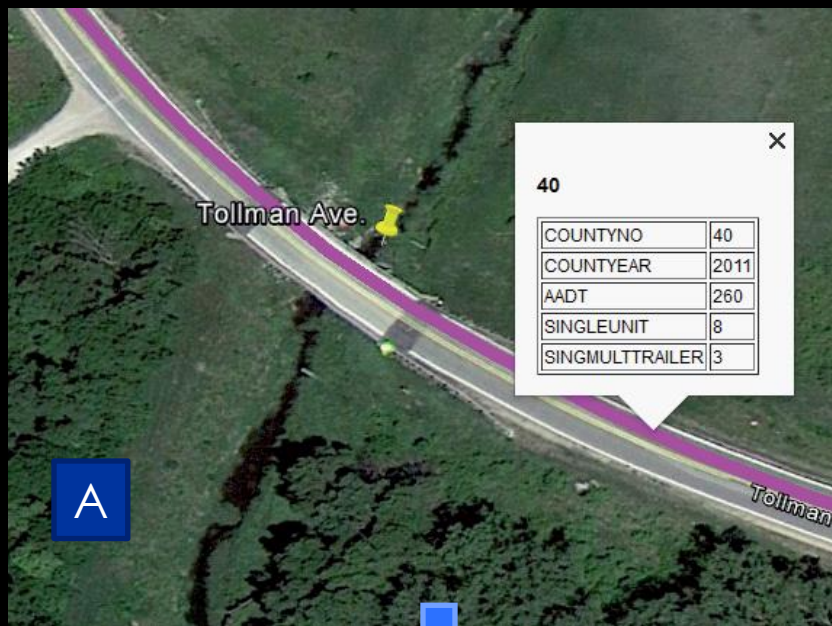


IMPACT = Outcome – Deadweight – Drop Off

SROI =
$$\frac{\text{Total Present Value of the Impact}}{\text{Present value of the Project}}$$

HDM-4:

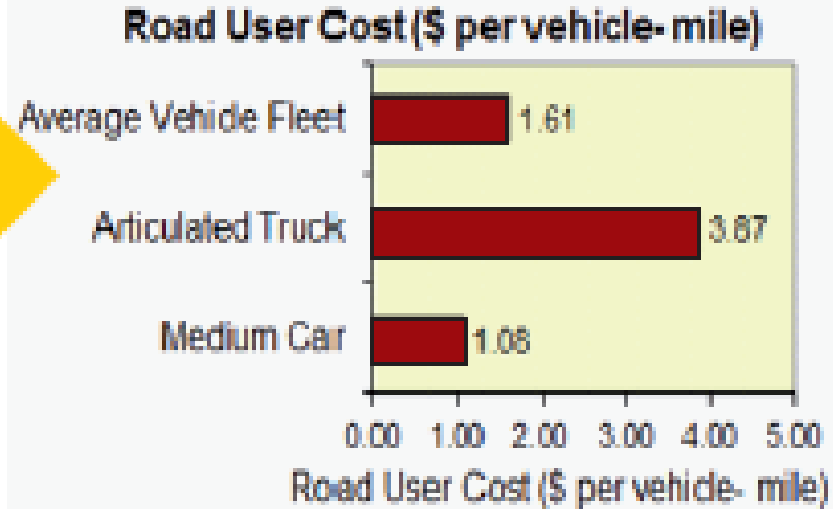
Used by the World Bank to analyze road user costs using speed, travel time, road condition, safety, type of vehicle, and local economic characteristics, as well as emissions.



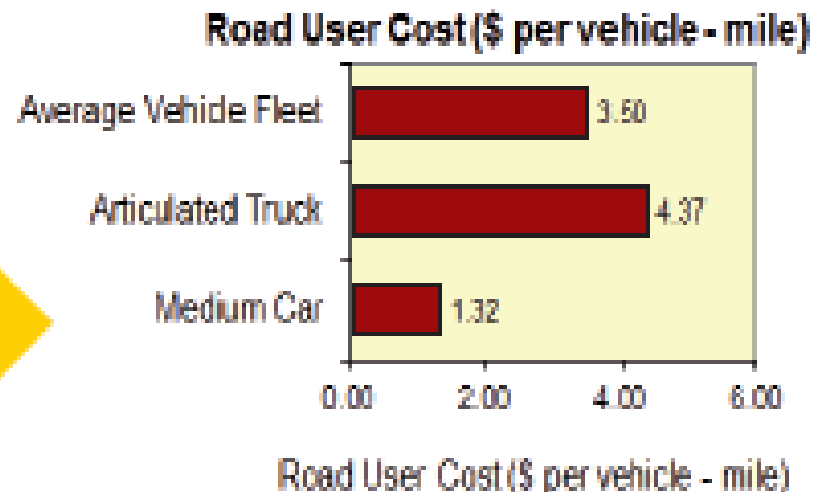
RUC

Road Users' Cost

In Paved Road



In Gravel Road



SROI Case Study

	Bridge A	Bridge B
Road Type	Paved	Gravel
AADT	260	80
Detour Distance (miles)	3.75	5.5
Number of Heavy trucks/year	18,298	20,908
RUC of Trucks/mile	\$3.87	\$4.37
Total Annual RUC due to detours	\$265,550	\$502,524
Total Impact (PV)	\$6,578,759	\$12,449,573
Total Life Cycle Cost	\$662,756	\$662,756
SROI Index	9.93	18.8

IADOT Prioritization Process

City Bridge Priority Point Rating Worksheet

FHWA Structure Number: _____ City: _____

Inspection date used: _____ Estimated improvement cost: _____

Sufficiency Rating:

Priority Points

81 - 100 = 0 points
75 - 80 = 1
67 - 74 = 2
59 - 66 = 3
51 - 58 = 4
43 - 50 = 5

35 - 42 = 6 points
27 - 34 = 7
19 - 26 = 8
11 - 18 = 9
≤ 10 = 10

Sufficiency Rating: _____ = _____

Estimated Average Daily Traffic:

< 25 = 0 points
25 - 250 = 1
251 - 500 = 2
501 - 1000 = 3
1001 - 2000 = 4
2001 - 3000 = 5

3001 - 4000 = 6
4001 - 6000 = 7
6001 - 8000 = 8
8001 - 10,000 = 9
> 10,000 = 10

Est. ADT: _____ = _____

Bypass, Detour Length (Out-of-distance Travel) (miles):

< 1 = 0 points
≥ 1 < 2 = 4
≥ 2 < 3 = 6

≥ 3 < 4 = 8
≥ 4 = 10

Detour: _____ (miles) = _____

Bridge Posting (SI&A Item 70 value):

5 = 0 points
4 = 2
3 = 4

2 = 6
1 = 8
0 = 10

Bridge Posting: _____ (SI&A Item 70 value) = _____

Total Points = _____

(40 points maximum)

CITY BRIDGE CANDIDATE LIST 2014

Accept/ Decline	County #	FHWA Structure #	City	City Street	Feature Crossed	Sufficiency Rating	ADT	Detour Length	Posting Tons	Relationship of Operational Rating to Maximum Legal Load (SI&A Item 70)	Structure Open, Posted, or Closed to Traffic (OPCL)	Sufficiency Rating Score	ADT Score	Detour Length Score	Relationship of Operational Rating to Maximum Legal Load Score (SI&A Item 70)	Replacement Score	Type of Funding
A	3	361690	LANSING	SOUTH ROAD	CLEAR CREEK	20	113	2	5	0	P	8	1	6	10	25	Federal
D	67	501110	WHITING	WEST ST	McCandless Cleghorn Ditch	34	60	2	15	0	P	7	1	6	10	24	--
A	78	504045	COUNCIL BLUFFS	10TH STREET	INDIAN CREEK	32	990	1	15	0	P	7	3	4	10	24	Federal
D	78	504040	COUNCIL BLUFFS	9TH STREET	INDIAN CREEK	38	1103	1	15	0	P	6	4	4	10	24	--
D	78	2700	COUNCIL BLUFFS	BENTON ST	INDIAN CREEK	32	853	1	15	0	P	7	3	4	10	24	--
A	23	123490	WELTON	180TH ST	SILVER CREEK(WEST)	33	60	6	15	2	P	7	1	10	6	24	Federal
D	56	8370	MONTROSE	X-28 & MIDDLE R	MISSISSIPPI SLOUGH	23	990	1	10	1	P	8	3	4	8	23	--
D	97	10760	SIOUX CITY	MAIN ST	PERRY CREEK	37	833	1	10	0	K	6	3	4	10	23	--
D	97	10770	SIOUX CITY	MARKET ST	PERRY CREEK	35	700	1	5	2	K	6	3	4	10	23	--
A	67	37220	WHITING	K-45	CLEGHORN DITCH	16	1090	19	0	5	A	9	4	10	0	23	Federal
A	91	335250	DES MOINES	CLOVER HILL DRI	MID SOUTH CREEK	39	150	99	5	2	P	6	1	10	6	23	Federal
D	57	220880	BERTRAM	BIG CREEK RD.	BIG CREEK	20	140	4	15	3	P	8	1	10	4	23	--
D	97	502190	SIOUX CITY	EXT MILITARY RD	BIG SIOUX RIVER	58	9200	8	0	5	A	4	9	10	0	23	--
A	82	503700	DAVENPORT	KIMBERLY RD	DUCK CREEK	65	13500	4	0	5	A	3	10	10	0	23	Federal
A	88	2720	CRESTON	ADAMS ST	MCKINLEY LAKE	22	2320	2	0	3	P	8	5	6	4	23	Federal
A	6	14550	KEYSTONE	5TH AVE S	PRAIRIE CREEK	31	1300	16	5	4	P	7	4	10	2	23	Federal
A	99	4360	EAGLE GROVE	9TH ST SOUTH	DRAINAGE DITCH #15	20	321	1	5	1	P	8	2	4	8	22	Federal
A	81	300120	LAKE VIEW	QUINCY AVE	INDIAN CREEK	43	70	3	10	1	P	5	1	8	8	22	Federal
A	94	343190	FORT DODGE	160TH ST	SOLDIER CREEK	50	45	2	10	0	P	5	1	6	10	22	Federal
A	86	5555	GLADBROOK	GRAND ST	DRAINAGE	34	60	1	15	0	P	7	1	4	10	22	Federal
	97	10570	SIOUX CITY	18TH ST	FLOYD RIVER	26	2960	3	0	5	A	8	5	8	0	21	
	23	2240	CLINTON	W DEER CK RD	DRAINAGE	25	80	2	5	2	P	8	1	6	6	21	
	79	820	BROOKLYN	ORCHARD ST	LITTLE BEAR CREEK	44	470	1	10	0	P	5	2	4	10	21	
	85	180	AMES	6TH ST	SQUAW CREEK	42	4160	3	0	5	A	6	7	8	0	21	
	82	3130	DAVENPORT	E 53RD ST	GOOSE CREEK	75	22200	4	0	5	A	1	10	10	0	21	
	43	178621	WOODBINE	BUS BROWN DR	DRAINAGE	25	940	0	0	0	P	8	3	0	10	21	
	3	503880	WATERVILLE	LOCAL	PAINT CREEK	18	152	0	15	0	P	9	1	0	10	20	
	57	640	BERTRAM	FLY ST	BIG CREEK	34	130	4	15	4	P	7	1	10	2	20	

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Total Funds:\$87,758,303

Total SROI index for 2014: 24

RESULTS

- IADOT could have **increased the impact generated by 17%**
- IADOT could **reduced entities liabilities** by reducing the percentage of bridges that will remain as structurally deficient condition **from 52% to 32%**

CONCLUSIONS

- After testing the proposed methodology it was found that higher AADT did not necessarily represented a higher impact.
- SROI and HDM-4 proof to serve as an additional indicator to support economical and social growth in a TAM.
- SROI in TAM helped measure and communicate the performance, providing a clear and objective explanation of the allocation of the resources and how these impact the community.