Iowa Intersection

Potential for Crash Reduction

Crash Abbreviations

K = Fatal

A = Major Injury

B = Minor Injury

C = Possible/Unknown Injury

O = Property Damage Only (PDO)

Overview

1. Historic Intersection Assessment
2. Crash Rate Issues
3. Safety Performance Function
4. Potential for Crash Reduction
5. Intersections, Segments…
6. Website, how to interpret

Historic Intersection Assessment

Crash Tables – Frequency, Severity, Type

Table 4.1 – Crash Severity

Intersection / Roadway	Crash Severity					Total
	Fatal (K)	Suspected Serious Injury (A)	Suspected Minor Injury (B)	Possible/ Unknown Injury (C)	Property Damage Only (O)	
Intersection 1	1	1	3	6	8	19
Intersection 2	0	2	0	4	12	18
Intersection 3	2	1	0	5	2	10
Roadway 1	0	0	4	4	6	14
Roadway 2	3	4	3	5	19	34
Total	**6**	**8**	**10**	**24**	**47**	**95**

Source: ICAT, 2016 - 2020

Table 4.2 – Manner of Crash Collision

Intersection / Roadway	Manner of Crash Collision							Total
	Rear-End	Head-On	Non-Collision	Angle	Sideswipe	Broadside	Other	
Intersection 1	8	5	1	1	3	0	1	19
Intersection 2	2	1	0	7	6	1	1	18
Intersection 3	0	2	1	5	0	1	1	10
Roadway 1	1	3	3	4	0	1	2	14
Roadway 2	3	2	5	16	2	3	3	34
Total	**14**	**13**	**10**	**33**	**11**	**6**	**8**	**95**

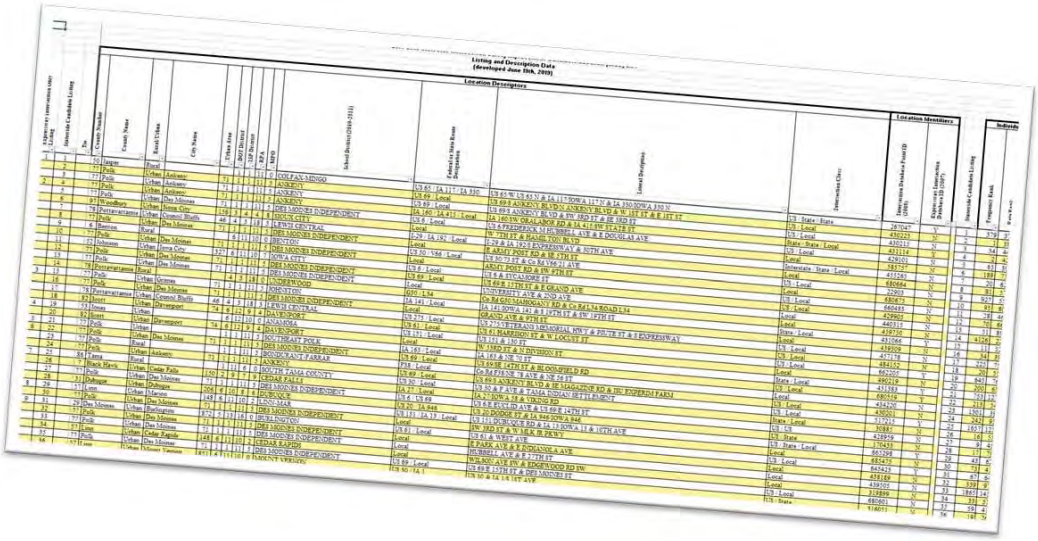
Source: ICAT, 2016 - 2020

"Above/Below Statewide Average for Similar Intersections"

"#X on the Statewide Improvement Candidate Listing"

Historic Intersection Assessment

Intersection Safety Improvement Candidate List (SICL)



Historic Intersection Assessment

Statewide Average – Crash Rates

ACCIDENT AND RELATED DATA FOR RURAL AND MUNICIPAL INTERSECTIONS IN IOWA

Based on 1983 thru 1987 Data ← > 30 yrs old

BY INTERSECTION CLASS

Field Description	RURAL				MUNICIPAL				
	Primary with Primary	Primary with Secondary	Secondary with Secondary	Total Rural	Primary with Primary	Primary with City Street	City Street with City Street	Total Municipal	← Limited Categories
Number of Intersections	93	345	134	572	162	1,129	1,553	2,844	← Limited Sample
Average Number of Accidents / Year	1.6	1.1	0.8	1.1	4.8	4.1	3.0	3.6	
Average Dollar Loss / Year *	$52,200	$44,200	$37,300	$43,900	$53,800	$43,100	$26,800	$34,800	
Average Daily Entering Vehicles	4,500	4,000	2,200	3,600	12,800	12,800	10,500	11,500	
Average Accident Rate / MEV	1.0	0.8	1.0	0.9	1.0	0.9	0.8	0.8	
Lower Limits of Statistical Rates									
90 % Confidence Level (K=1.282)	1.9	1.8	2.8	2.1	1.7	1.6	1.6	1.6	
95 % Confidence Level (K=1.645)	2.1	2.0	3.2	2.4	1.9	1.8	1.8	1.8	
99.5 % Confidence Level (K=2.576)	2.8	2.7	4.1	3.2	2.4	2.3	2.4	2.4	

Crash Rate Issues

1. Low Daily Entering Vehicles
2. Exclusion of zero-crash intersections
3. Assumption of linear relationship
4. Regression to the mean

Safety Performance Functions (SPFs)

Predict average number of crashes per year at a location.

Use of Empirical Bayes statistical method to increase the accuracy and reliability of crash estimates.

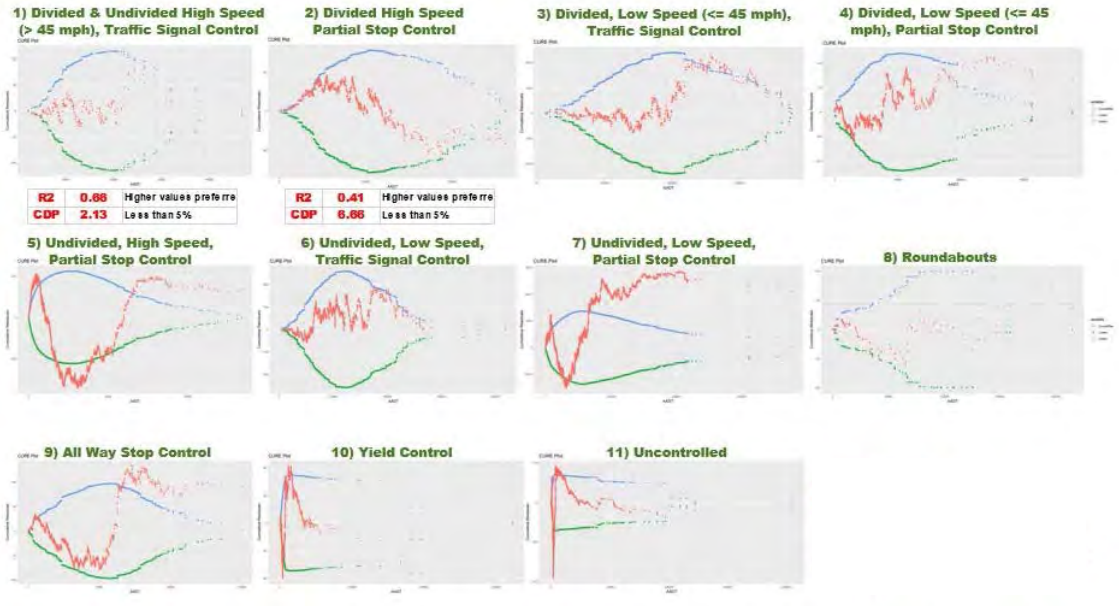
Intersections

Development of SPFs for Paved Intersections:

Category	Descriptions
1	Divided & Undivided, High-Speed (> 45 mph), Traffic Signal Control
2	Divided, High-Speed, Partial Stop Control
3	Divided, Low-Speed (<= 45 mph), Traffic Signal Control
4	Divided, Low-Speed, Partial Stop Control
5	Undivided, High-Speed, Partial Stop Control
6	Undivided, Low-Speed, Traffic Signal Control
7	Undivided, Low-speed, Partial Stop Control
8	Roundabouts
9	All-way Stop Control
10	Yield Control
11	Uncontrolled

Statistics

Plotting the results:

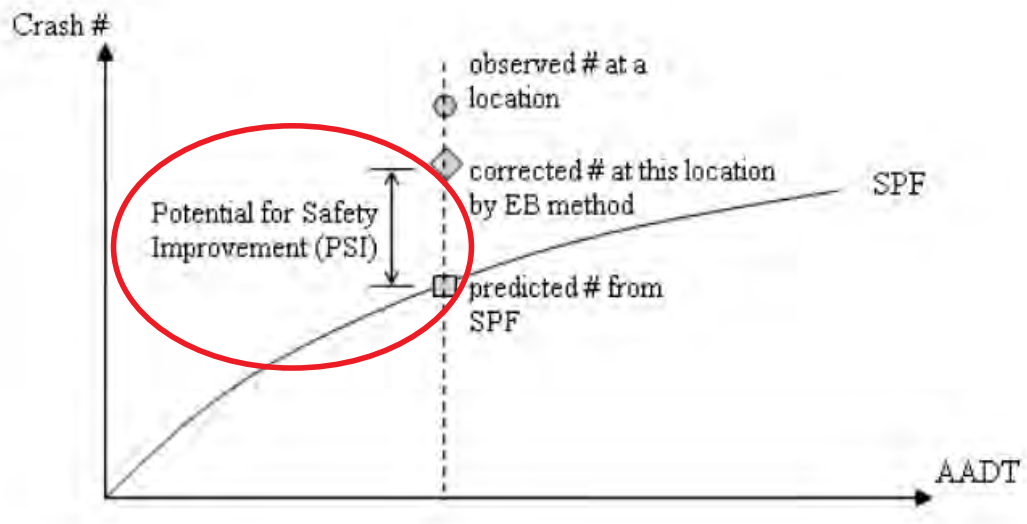


Intersections Part 2

Category ID	# of Intersections	Sub Category ID	Sub Category Description	# of Intersections
1	260	1	High Speed Traffic Signal Control	260
2	1,088	2	Divided High Speed Partial Stop Control (3 legs)	527
		3	Divided High Speed Partial Stop Control (4 legs)	561
3	625	4	Divided Low Speed Traffic Signal Control (3 legs)	121
		5	Divided Low Speed Traffic Signal Control (4 legs)	504
4	1,303	6	Divided Low Speed Partial Stop Control (3 legs)	841
		7	Divided Low Speed Partial Stop Control (4 legs)	462
5	27,975	8	Undivided High Speed Partial Stop Control (1 - 1,500 AADT) (3 legs)	11,826
		9	Undivided High Speed Partial Stop Control (> 1,500 AADT) (3 legs)	4,293
		10	Undivided High Speed Partial Stop Control (4 legs)	11,856
6	1,559	11	Undivided Low Speed Traffic Signal Control (3 legs)	270
		12	Undivided Low Speed Traffic Signal Control (4 legs)	1,289
7	49,277	13	Undivided Low Speed Partial Stop Control (1 - 1,500 AADT) (3 legs)	15,423
		14	Undivided Low Speed Partial Stop Control (1,500 - 5,000 AADT) (3 legs)	7,928
		15	Undivided Low Speed Partial Stop Control (> 5,000 AADT) (3 legs)	4,731
		16	Undivided Low Speed Partial Stop Control (4 legs)	21,195
8	94	17	Roundabouts & Other Circular Intersections	94
9	5,616	18	All Way Stop Control	5,616
10	21,983	19	Uncontrolled	21,983
11	5,528	20	Yield Control	5,528
			Grand Total	**115,308**

Potential for Crash Reduction

SPFs Developed:

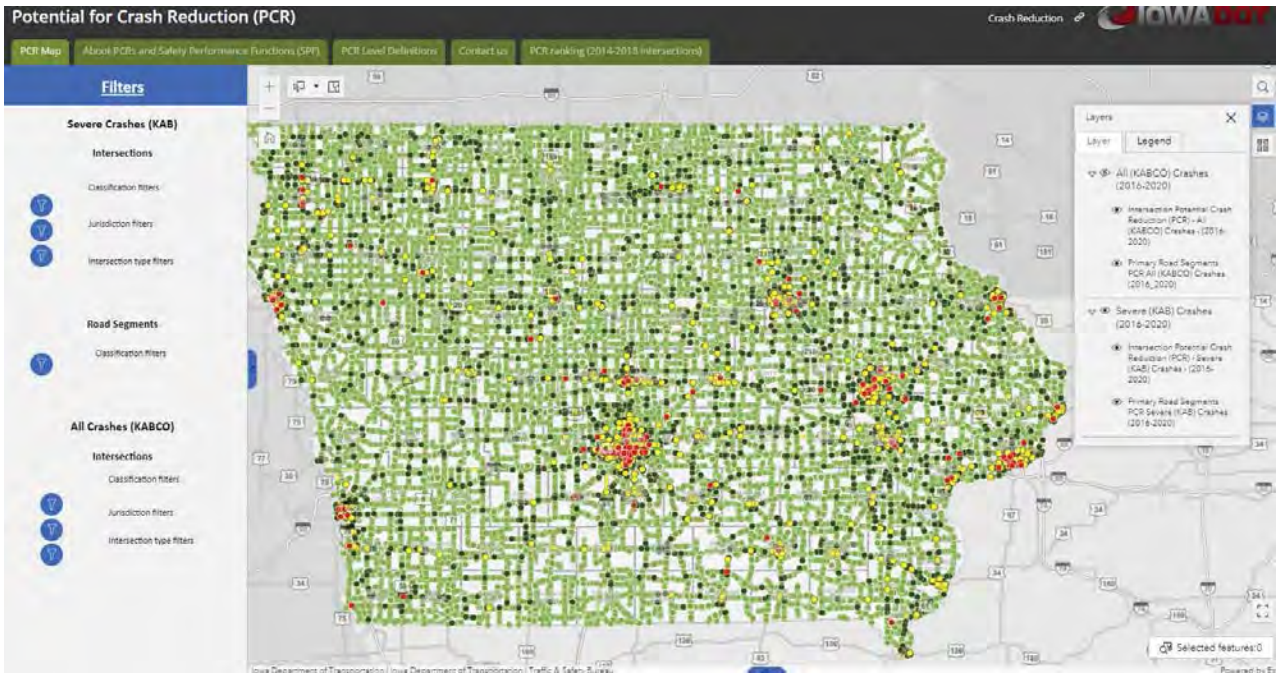


Results

Potential Crash Reduction for all intersections:

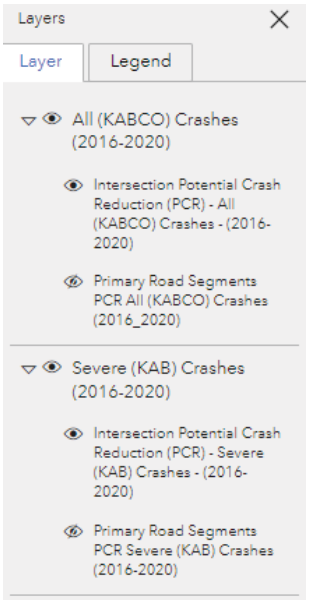
Category ID	INTID	Crashes	Major_AADT	Minor_AADT	Predicted	Residuals	CumulRes	Weight	EB_Estimate	PCR	PCR/Year	Rank
5	2017065299	117	21900	17436	39.0134	77.9866	227.8007	0.1201	107.6368	68.6235	13.7247	1
11	2017066570	69	10475	8319	15.0826	53.9174	136.8551	0.1604	60.3499	45.2673	9.0535	2
7	2017065249	56	19500	3420	8.0101	47.9899	66.6311	0.0977	51.3120	43.3019	8.6604	3
16	2017048333	62	13100	5300	15.9255	46.0745	15.2727	0.0648	59.0150	43.0895	8.6179	4
5	2017065241	72	17100	14500	29.5553	42.4447	59.2879	0.1526	65.5227	35.9668	7.1934	5
5	2017127668	73	25700	7706	32.9146	40.0854	237.7736	0.1392	67.4197	34.5051	6.9010	6
1	2017065368	74	22200	12812	35.3838	38.6162	58.4397	0.1207	69.3401	33.9562	6.7912	7
5	2017048955	70	21884	8794	30.1933	39.8067	137.6326	0.1499	64.0329	33.8406	6.7681	8
5	2017086908	71	20000	12600	32.0080	38.9920	72.6853	0.1426	65.4401	33.4320	6.6864	9
11	2017127527	53	14400	4996	16.1120	36.8880	143.3746	0.1517	47.4027	31.2907	6.2581	10
5	2017074998	66	17000	14600	29.4850	36.5150	20.9479	0.1529	60.4159	30.9309	6.1862	11
11	2017066436	53	12330	9440	18.3862	34.6138	129.2763	0.1355	48.3094	29.9232	5.9846	12
5	2017113744	60	21100	5028	23.7603	36.2397	164.5309	0.1830	53.3671	29.6068	5.9214	13
11	2017136890	51	21772	2200	16.4196	34.5804	85.9094	0.1493	45.8365	29.4169	5.8834	14
1	2017004969	71	23100	14173	38.0983	32.9017	88.4355	0.1130	67.2805	29.1823	5.8365	15
11	2017065298	52	21900	3169	19.2650	32.7350	126.4200	0.1301	47.7400	28.4751	5.6950	16
5	2017065289	60	17100	10500	26.1984	33.8016	85.2042	0.1689	54.2919	28.0935	5.6187	17
11	2017127571	44	17100	1511	11.3048	32.6952	194.0784	0.2032	37.3579	26.0530	5.2106	18
11	2017117542	45	9346	7994	13.4044	31.5956	78.7350	0.1770	39.4087	26.0043	5.2009	19
11	2017052998	48	13400	7600	18.0565	29.9435	61.1766	0.1376	43.8784	25.8219	5.1644	20
15	2017065284	36	17000	1438	6.0111	29.9889	-37.7959	0.1419	31.7444	25.7333	5.1467	21
11	2017139610	46	14600	5000	16.3157	29.6843	189.9928	0.1501	41.5436	25.2279	5.0456	22

PCR Site



Available Layers

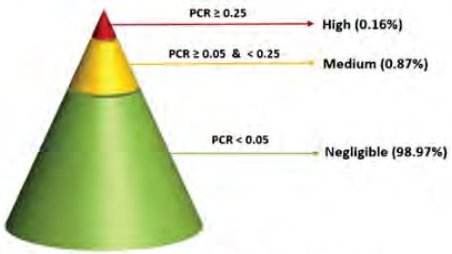
1. Intersections - *statewide*
2. Primary Routes - *done*
3. Rural/Secondary two-lane – *in development*
4. …



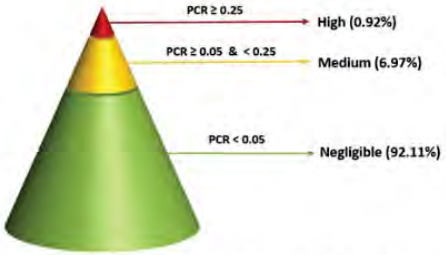
PCR Levels

PCR Levels for Severe Crashes (KAB) (2016-2020)

Paved Road Intersections



Primary Road Segments



Severe Crashes (KAB) PCR/year Bins

PCR/year Bin	# of Intersections	Bin %	PCR Level
PCR >= 0.25	179	0.16%	High
PCR >= 0.05 & < 0.25	1,002	0.87%	Medium
PCR > 0 & < 0.05	4,793	98.97%	Negligible
PCR <= 0	109,334		
Total	115,308	100%	

Severe Crashes (KAB) PCR/mile/year Bins

PCR/mile/year Bin	# of Segments	% Segments	Segment Length (mi)	% Length	Bin %	PCR Level
PCR >=0.25	164	2.67%	82	0.92%	0.92%	High
PCR >= 0.05 & < 0.25	635	10.33%	619	6.97%	6.97%	Medium
PCR > 0 & < 0.05	897	14.59%	2634	29.66%	92.11%	Negligible
PCR <= 0	4,450	72.40%	5547	62.45%		
Total	6,146	100.00%	8882	100%	100%	

PCR : Potential for Crash Reduction

Using PCRs

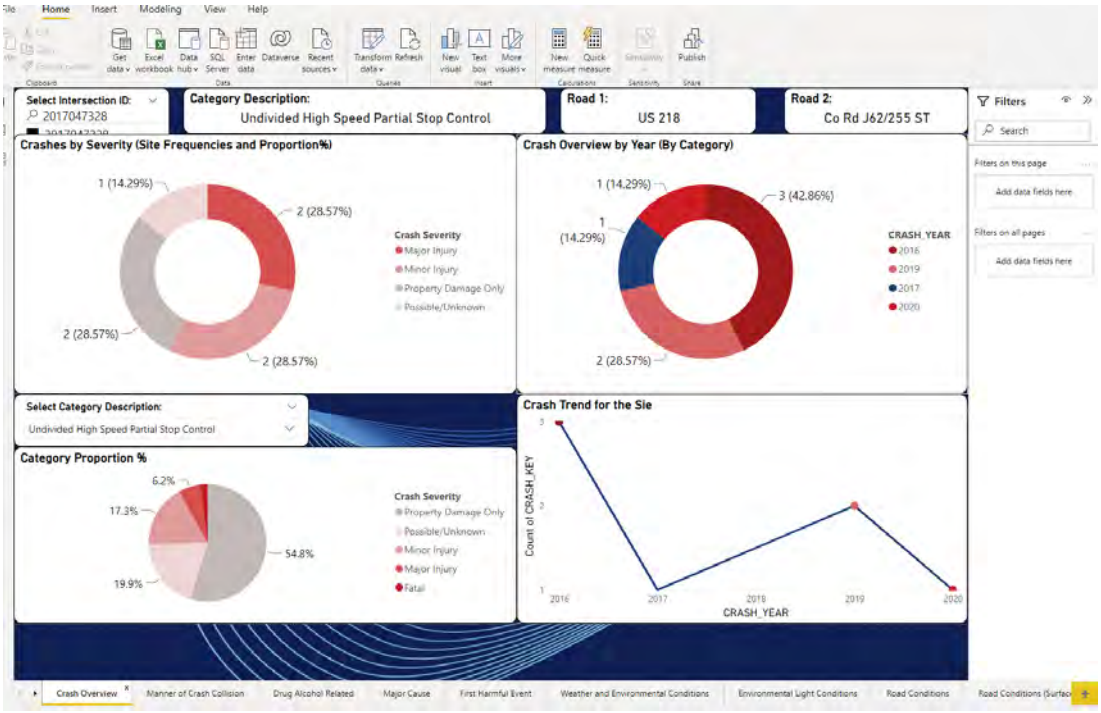
1. Network Screening
   https://iowadot.maps.arcgis.com/apps/MapSeries/index.html?appid=6920b9b36fa54caa90c25bd6dcdd0c7e
   Future: *pcr.iowadot.gov*
2. Project Evaluation
   https://icat.iowadot.gov/
   Also dashboards
3. Countermeasure Comparison
   https://iowadot.gov/traffic/pdfs/CRFListVersion.pdf

THANK YOU

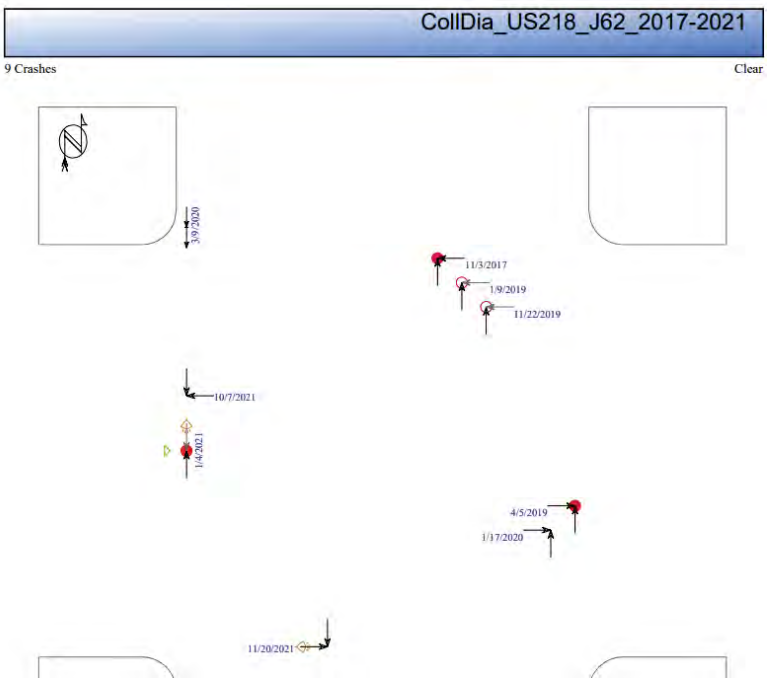
Greg.Karssen@iowadot.us

Greg Karssen, P.E. Iowa DOT, Traffic and Safety Bureau

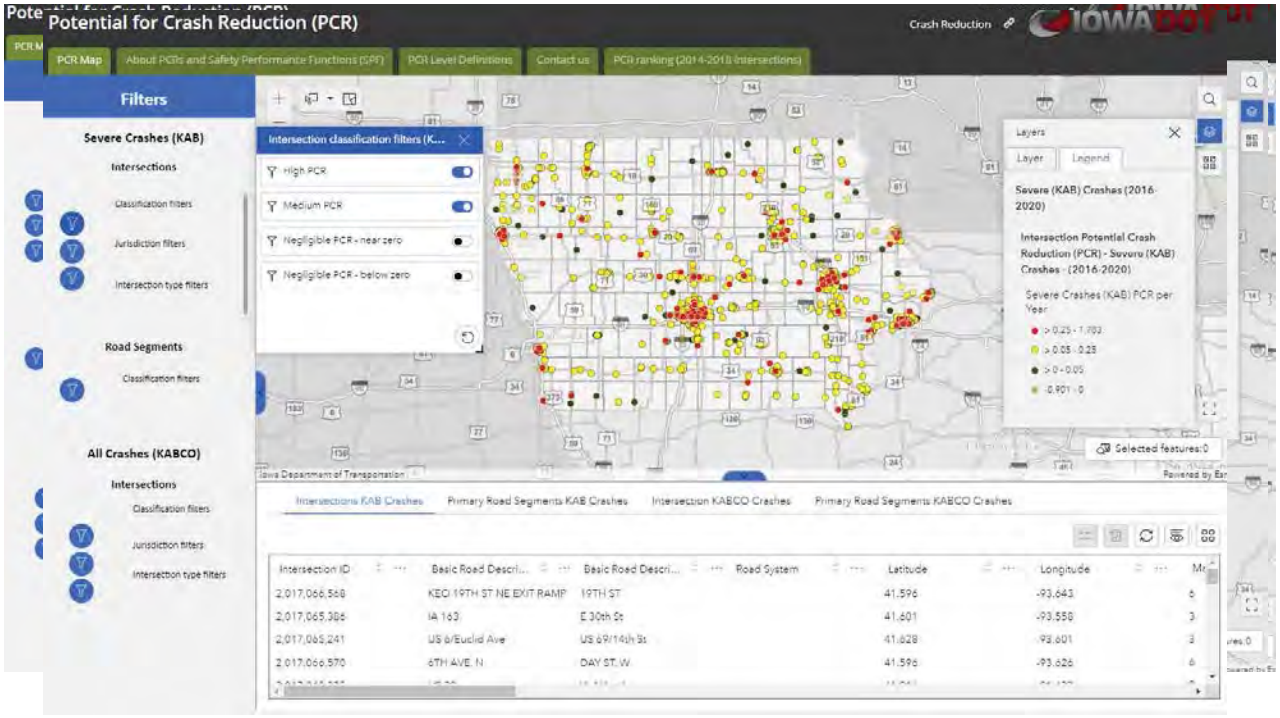
Dashboard Tool – Compare Site/Category



Collision Diagram – from ICAT



PCR Site


Potential for Crash Reduction (PCR)
Crash Reduction
PCR Map
About PCRs and Safety Performance Functions (SPF)
PCR Level Definitions
Contact us
PCR ranking (2014-2018) Intersections
Filters
Severe Crashes (KAB)
Intersections
Classification filters
Jurisdiction filters
Intersection type filters
Road Segments
Classification filters
All Crashes (KABCO)
Intersections
Classification filters
Jurisdiction filters
Intersection type filters
Intersection classification filters (K...
High PCR
Medium PCR
Negligible PCR - near zero
Negligible PCR - below zero
Layers
Layer
Legend
Severe (KAB) Crashes (2016-2020)
Intersection Potential Crash Reduction (PCR) - Severe (KAB) Crashes - (2016-2020)
Severe Crashes (KAB) PCR per Year
Selected features: 0
Intersections KAB Crashes
Primary Road Segments KAB Crashes
Intersection KABCO Crashes
Primary Road Segments KABCO Crashes
Intersection ID
Basic Road Descri...
Basic Road Descri...
Road System
Latitude
Longitude
2,017,066,568
KEOI 19TH ST NE EXIT RAMP
19TH ST
41.596
-93.643
2,017,065,306
IA 163
E 30th St
41.601
-93.550
2,017,065,241
US 6/Euclid Ave
US 69/14th St
41.628
-93.601
2,017,066,570
6TH AVE N
DAY ST W
41.596
-93.626