

Memorandum

Date: 9/18/2024
To: Victor Lund, PE, PTOE - St Louis County
From: Adam McGill, PE
RE: CSAH 100 (Main Street) Railroad Crossing (DOT #252305T) Grade Separation Feasibility Study

Introduction

This memorandum documents the feasibility of constructing a grade separated crossing of the Canadian National (CN) railroad tracks (DOT #252305T) on CSAH 100 (Main Street) in Aurora, MN.

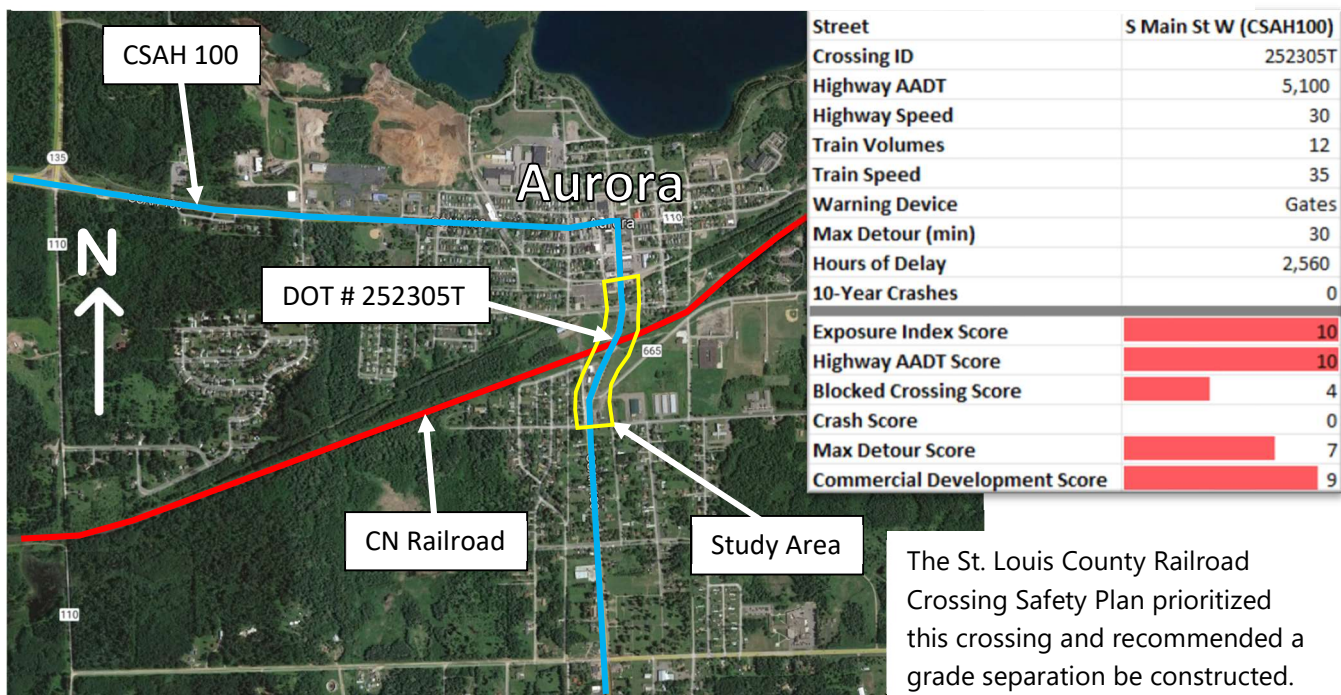
Existing Conditions Context

CSAH 100 (Main Street) in Aurora, MN crosses a single-track CN railroad with an existing at-grade railroad crossing (DOT #252305T), as a two-lane highway with curb and gutter and a posted speed of 30 mph (see location map on the next page). The railroad crossing traffic control is accomplished with two quad gate active warning devices across the approaching roadway driving lanes. The crossing includes a 6-foot-wide sidewalk on both the east and west sides of the roadway without active crossing controls. This railroad crossing is the only connection between Aurora north and south of the CN railroad and is used by pedestrians, bicyclists, ATVs, and snowmobiles, as well as personal, commercial, and emergency vehicles. There are 12 total trains per day traveling at 35 mph through this crossing. CSAH 100 (Main Street) serves as the primary route to access the City of Hoyt Lakes and is a primary truck route that services this region.

1. If this railroad crossing were closed due to an emergency condition (e.g. train derailment), the minimum detour length is 18.8 miles which includes gravel surfaced roads and township roads owned/maintained by Biwabik and White Townships. The minimum detour that exclusively includes paved roads that support truck traffic is 29.1 miles in length. The length of these detours was measured by using common origin and destination points on the immediate north and south side of the railroad crossing.
2. CSAH 100 is a regionally significant route that serves the cities of Aurora and Hoyt Lakes, as well as the surrounding townships and communities. The primary connection for the City of Hoyt Lakes to the rest of the Iron Range is CSAH 100.
3. A grade separation will improve safety for CSAH 100 traffic (vehicles, trucks, pedestrians, bicyclists, ATVs and snowmobiles) by eliminating the opportunity for a crash involving a train and vehicle. According to the FRA Highway-Rail Grade Crossing Accident Prediction System for St. Louis County, Minnesota, this railroad crossing on CSAH 100 (USDOT #252305T) ranks 45 out of 226 crossings which places this railroad crossing in the top 20 percent by risk for a future crash involving a train and vehicle. This ranking is including the fact that this is an active crossing controlled by gates and signals.

4. A grade separation will ensure access for emergency services and the Essentia Northern Pines Hospital which includes a staffed emergency room. The Aurora fire hall is located on the north side of the railroad crossing and the Aurora hospital is located on the south side of the railroad crossing. The East Range EMS is located in the City of Hoyt Lakes which means access to the north side of Aurora would be blocked if the railroad crossing is blocked. Approximately two-thirds of Aurora's population lives on the north side of the railroad crossing.
5. A grade separation will improve CSAH 100 for trucks and freight. CSAH 100 will serve as the future primary access to the NewRange Copper Nickel mine which will likely include trucks transporting hazardous materials. Additionally, CSAH 100 serves as the primary route to access the City of Hoyt Lakes' Laskin Industrial Park located on CR 633.
6. A grade separation will ensure ATVs and snowmobiles can continue to safely cross the railroad track. ATVs and snowmobiles currently utilize this railroad crossing through an unplanned routing network. The CN Railroad has expressed concerns about ATVs and snowmobiles crossing the railroad track.
7. The Mesabi Trail will be extended from the City of Aurora to the City of Hoyt Lakes in 2026 and routed over this railroad crossing.
8. The St. Louis County Railroad Crossing Safety Plan prioritizes this railroad crossing for a grade separation.

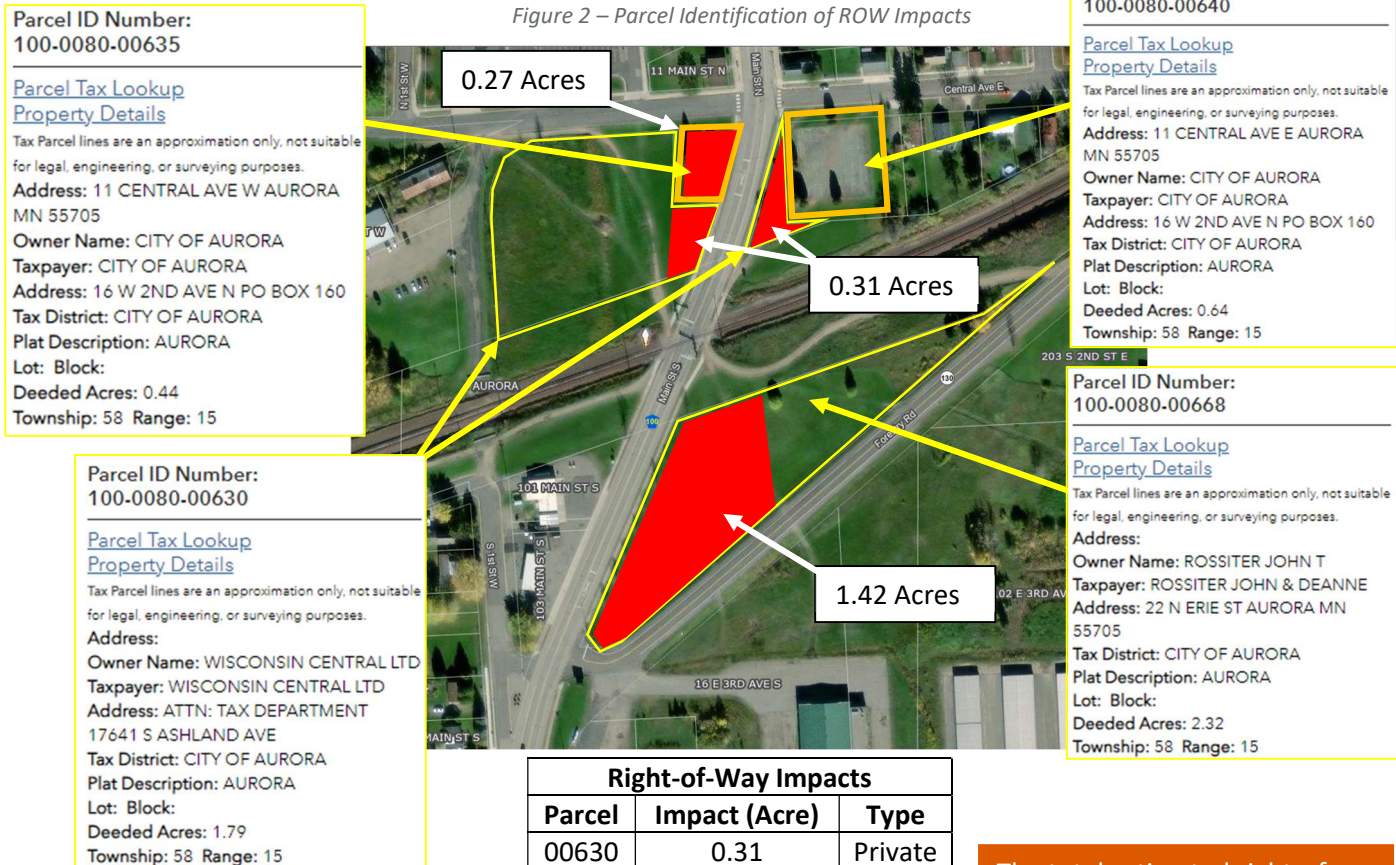
Figure 1 – Study Area and St Louis County Railroad Crossing Inventory Summary



Right-Way Impacts

The City of Aurora owns two parcels north of the CN railroad, adjacent to the alignment. Private parcels with anticipated impacts from a grade separation include property owned by Wisconsin Central LTD and John Rossiter.

Figure 2 – Parcel Identification of ROW Impacts



Constraints

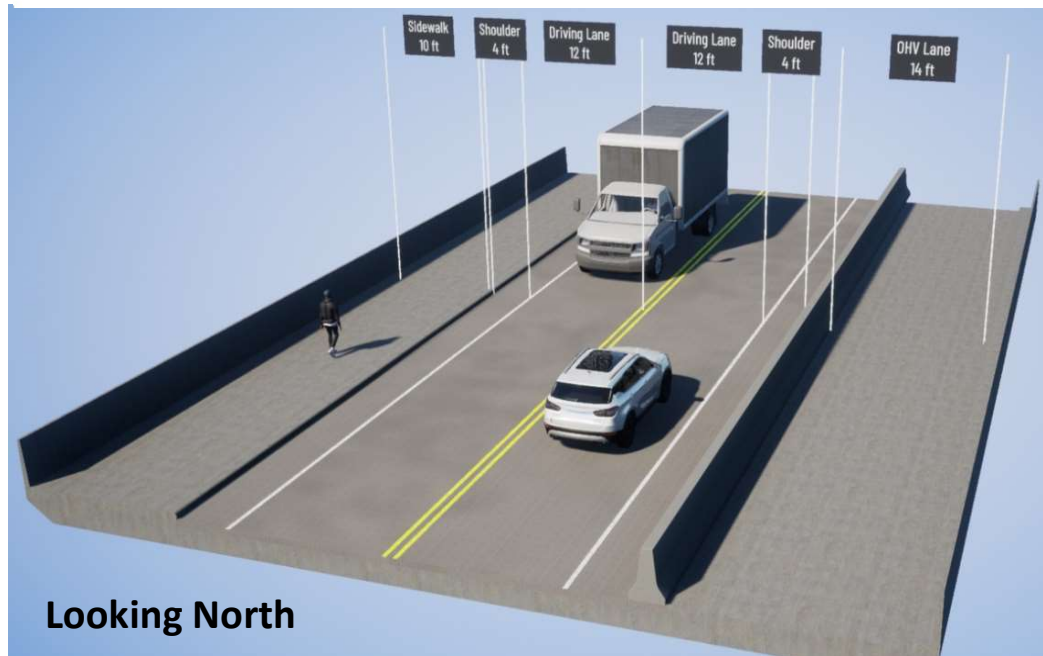
The following constraints were used in this feasibility study to provide criteria with which a feasible corridor would have to function.

- Do not impact building structures.
- Avoid impacts to the pickleball court.
- Avoid Impacts to A&W and the Car Wash properties southwest of the crossing.
- Provide consolidated access to A&W and the Car Wash.
- Provide a 14' ATV/Snowmobile trail on the bridge deck.
- Provide a 10' Shared Use Path on the bridge deck.
- Per Minnesota Administrative Rules 8820.9956 "Minimum Vertical Clearances for Underpasses" 22 feet of vertical clearance is needed above the rail tracks.
- 35 mph design speed.
- 5% maximum approaching grade. The AASHTO Policy on Geometric Design of Highways and Streets, Table 7-4a, Maximum Grades for Arterials in Urban Areas provides a maximum grade of 7% for level terrain and a design speed of 35 mph.

Typical Section

The typical section utilized in the feasibility study included two 12-foot vehicular travel lanes with 4-foot shoulders, a 10-foot shared use path west of the roadway and a 14-foot ATV/snowmobile (OHV) trail separated by a barrier east of the roadway (see below). The 14-foot OHV lane is intended to accommodate a snowmobile trail groomer.

Figure 3 – CSAH 100 Bridge Cross Section

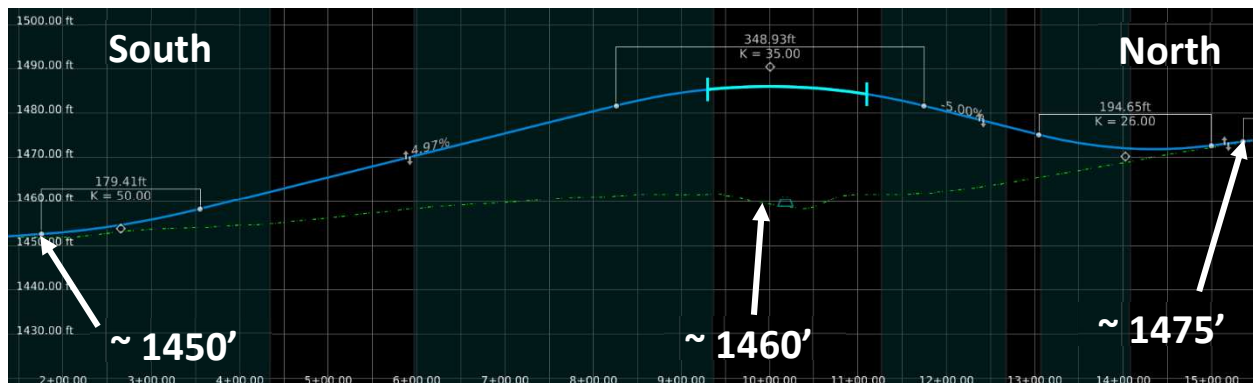


Profile View

The proposed plan view layout shown on page 5 accomplishes the maximum 5% approaching grade to the railroad separation while providing a 25-foot grade difference between the top of the tracks and the top of the bridge deck. Assuming the bridge deck and beam section will be less than 3 feet thick, as a conservative estimate, there will be greater than a 22-foot separation provided (see below).

The left side of the profile represents the approach south of the railroad crossing, and the right side represents the north approach near downtown Aurora. Please note that the natural elevation increase from south to north lends itself well to accommodate a shorter tie-in north of the railroad, minimizing impacts to the developed area north of Central Avenue.

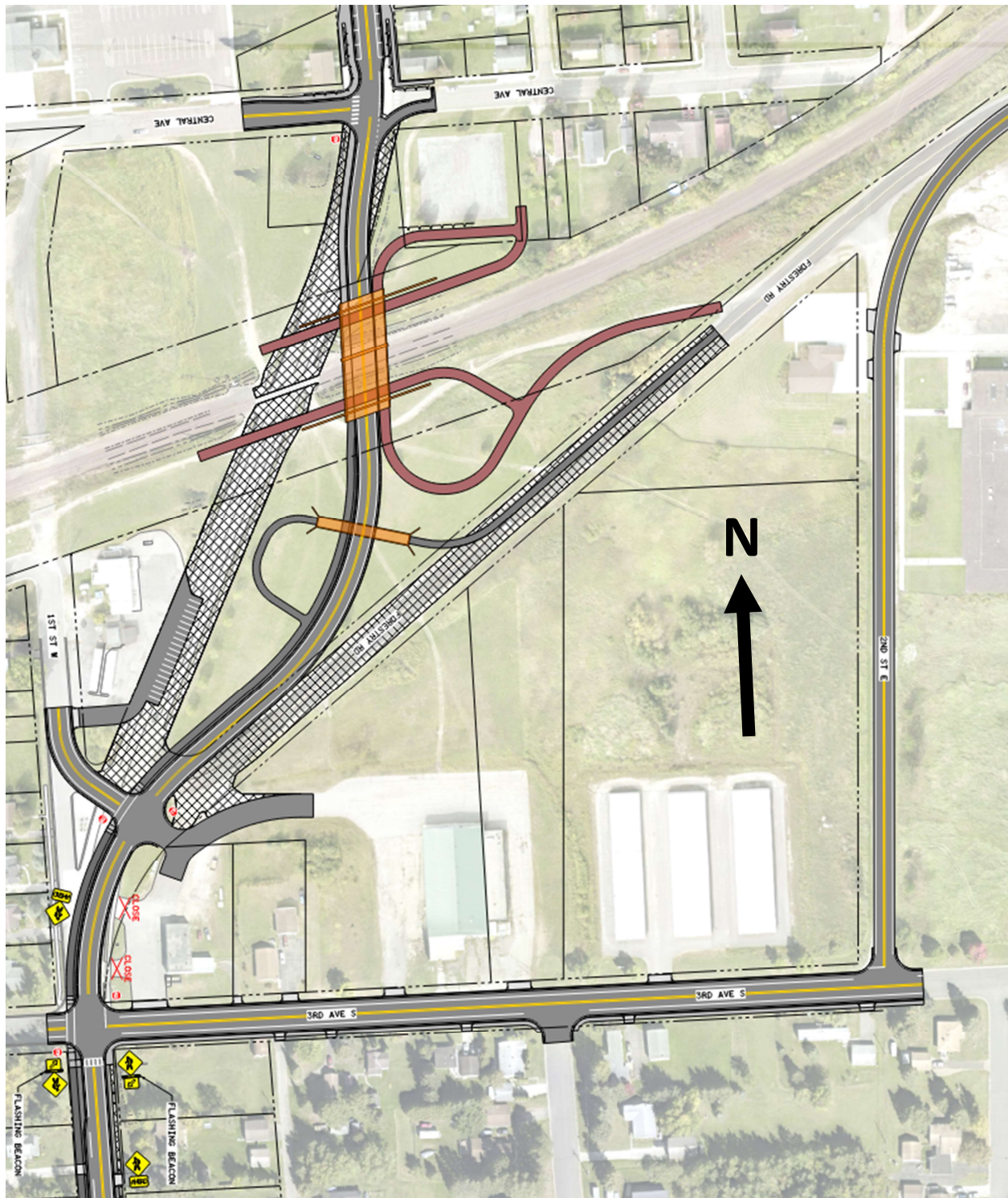
Figure 4 – CSAH 100 Profile View



Plan View Layout

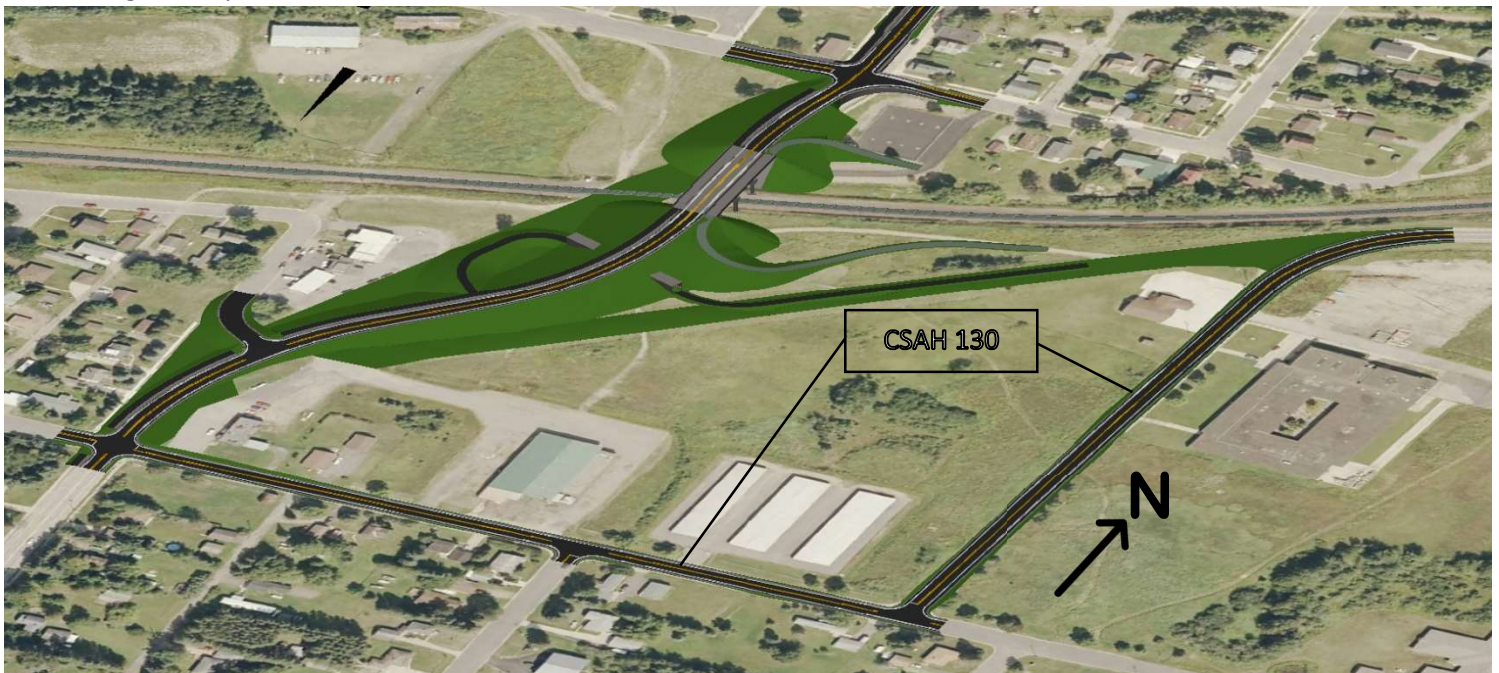
The preliminary layout accommodates the proposed typical section and all the constraints previously identified. As shown below, the east leg of Central Avenue will be disconnected at Main Street and Forestry Road (CSAH 130) and would be rerouted along 2nd Street East to 3rd Avenue South. The reroute of CSAH 130 (Forestry Road) would require St. Louis County to acquire ownership of 2nd Street East and a portion of 3rd Avenue South.

Figure 5 – CSAH 100 Grade Crossing Layout



Perspective Layout

The perspective view allows for a more intuitive visual of the footprint and impacts of the proposed grade separation.



Bridge Design Assumptions

The following assumptions were made in the bridge design to limit footprint impacts and provide a continuous transportation network that was impacted by the railroad grade separation.

- Utilize retaining walls north of Central Avenue to eliminate impacts to building structures and ROW.
- Forestry Road will be rerouted along 2nd Street East and 3rd Avenue South to CSAH 100 (Main Street).
- Pavement, aggregate base, and lighting will be approximately the same between the existing at-grade crossing and the grade separation crossing and will not be included in the cost analysis assuming a reconstruct as the base condition.
- Shall meet the minimum vertical and horizontal clearances required by the railroad. Comply with railroad requirements and dimensions for protection walls, fencing, bridge barrier walls, aerial utilities, pier walls, and routing of the ATV and Snowmobile trails.

Benefit-Cost Ratio:

A 30-year Benefit-Cost Analysis (BCA) was completed to justify implementing the grade separation crossing over the existing at-grade crossing. The BCA compared various costs and benefits between keeping the existing at-grade crossing (named the No-Build Scenario) and constructing the grade separated crossing (named the Build Scenario). The BCA does not include any improvements that would be included in the CSAH 100 project (i.e., road pavement, lighting, aggregate base). The BCA included the following breakdown of costs and benefits:

- Crash cost savings of build scenario based on 10 years of crash history.
- Vehicle operating costs from railroad maintenance closure detour.
- Travel time costs from railroad maintenance closure detour.
- Travel time costs from current at-grade railroad crossing.

- Emissions cost from railroad crossing.
- Non-motorized amenities benefit from multimodal path.
- Construction and right-of-way costs.
- Remaining value of facilities (residual value).
- Maintenance costs.

Key assumptions used to calculate costs and benefits for the BCA are in **Table 1**. **Table 2** shows the estimated quantities for the Build Scenario.

Table 1: Benefit-Cost Analysis Traffic Assumptions

Variable	Value
Railroad crossings (trains/day)	12
Blockage time per train (min)	5
Vehicle crossings (vehicles/day)	4,355
Railroad maintenance (days/year)	7
Traffic Growth rate	0.75%
Non-motorized trips (trips/year)	4,000

Table 2: Grade Separation Cost Estimates (2024)

Bid Item	Unit	Unit Bid Price	Estimated Quantity	Estimated Cost
Approach Embankment Earthwork	Cu Yd	\$15	61,500	\$922,500
Retaining Wall	Sq Ft	\$150	2,100	\$315,000
Bridge	Sq Ft	\$350	11,160	\$3,906,000
Railroad Protective Services	LSum	\$330,000	1	\$330,000
CSAH 130 Reconstruction	Lin Ft	\$550	2400	\$1,320,000
Forestry Road Obliteration	LSum	\$75,000	1	\$75,000
Box Culvert Pedestrian Underpass	Lin Ft	\$2500	128	\$320,000
Subtotal				\$7,188,500
Contingency	%	20%	-	\$1,437,700
Total				\$8,626,200

Results of the calculations from the BCA are in **Table 3** and **Table 4** and derived from the assumptions stated above. Resulting Benefit-Cost Ratio (BCR) of the grade separation over the CN railway is estimated to be **1.20**, so benefits are greater than the cost of the construction of the grade separation crossing by 20%. While safety benefits based on historic risk are low, future safety risk mitigation is expected to add even more value to the proposed construction of a CSAH 100 railroad grade separation.

Table 3: Benefit-Cost Analysis: User Benefits (2022 \$)

Safety Benefits	Operating Benefits	Detour Travel Time Benefits	Railroad Crossings Delay Benefits	Emissions Benefits	Amenities Benefits	Total User Benefits
\$14,488	\$5,051,466	\$798,241	\$2,699,262	\$281,266	\$16,126	\$8,797,850

Table 4: Benefit-Cost Analysis: Residual Value & Maintenance value (2022 \$)

Residual Value	Net Maintenance Cost	Total Benefit	Estimated Construction Cost	Benefit Cost Ratio
\$965,630	-\$59,649	\$9,703,831	\$8,115,255	1.20

Attachment A - Benefit Cost Analysis Results

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Benefit-Cost Analysis Overview

Discounted Benefits (3.1%/2% CO2) to 2022 Dollars

Calendar Year	Safety Benefits	Vehicle Delay from Traveled Train Crossings	Travel Time Savings from RR Closures	Sum of Travel Time Savings	Vehicle Operating Benefits	Emissions Benefits	Amenities Benefits	Total User Benefits	Residual Value	Operating & Maintenance	Total Benefit
2027	\$660	\$123,012	\$36,378	\$159,390	\$230,208	\$9,174	\$1,127	\$400,560	\$0	-\$4,492	\$396,067
2028	\$645	\$120,287	\$35,572	\$155,860	\$225,109	\$9,045	\$1,061	\$391,720	\$0	-\$4,199	\$387,522
2029	\$631	\$117,615	\$34,782	\$152,397	\$220,108	\$9,021	\$999	\$383,157	\$0	-\$3,924	\$379,233
2030	\$617	\$114,995	\$34,007	\$149,002	\$215,204	\$8,752	\$941	\$374,517	\$0	-\$3,667	\$370,850
2031	\$603	\$112,426	\$33,247	\$145,673	\$210,397	\$8,622	\$886	\$366,181	\$0	-\$3,427	\$362,753
2032	\$590	\$109,907	\$32,502	\$142,410	\$205,683	\$8,465	\$834	\$357,983	\$0	-\$3,203	\$354,780
2033	\$577	\$107,439	\$31,772	\$139,211	\$201,063	\$8,335	\$786	\$349,972	\$0	-\$2,994	\$346,978
2034	\$564	\$105,019	\$31,057	\$136,076	\$196,535	\$8,194	\$740	\$342,109	\$0	-\$2,798	\$339,312
2035	\$551	\$102,648	\$30,356	\$133,003	\$192,098	\$8,055	\$696	\$334,404	\$0	-\$2,615	\$331,790
2036	\$448	\$100,324	\$29,668	\$129,993	\$187,749	\$7,918	\$656	\$326,764	\$0	-\$2,444	\$324,321
2037	\$449	\$98,048	\$28,995	\$127,043	\$183,489	\$7,794	\$617	\$319,391	\$0	-\$2,284	\$317,107
2038	\$448	\$95,817	\$28,336	\$124,153	\$179,315	\$7,649	\$581	\$312,146	\$0	-\$2,134	\$310,012
2039	\$448	\$93,632	\$27,689	\$121,322	\$175,226	\$7,517	\$547	\$305,060	\$0	-\$1,995	\$303,065
2040	\$447	\$91,492	\$27,057	\$118,549	\$171,220	\$7,397	\$515	\$298,128	\$0	-\$1,864	\$296,264
2041	\$446	\$89,396	\$26,437	\$115,832	\$167,298	\$7,268	\$485	\$291,329	\$0	-\$1,742	\$289,587
2042	\$444	\$87,343	\$25,830	\$113,173	\$163,456	\$7,150	\$457	\$284,680	\$0	-\$1,628	\$283,052
2043	\$443	\$85,333	\$25,235	\$110,568	\$159,694	\$7,025	\$430	\$278,160	\$0	-\$1,522	\$276,638
2044	\$440	\$83,365	\$24,653	\$108,018	\$156,011	\$6,910	\$405	\$271,784	\$0	-\$1,422	\$270,362
2045	\$438	\$81,438	\$24,083	\$105,521	\$152,404	\$6,788	\$382	\$265,532	\$0	-\$1,329	\$264,203
2046	\$435	\$79,551	\$23,525	\$103,076	\$148,874	\$6,676	\$359	\$259,421	\$0	-\$1,242	\$258,178
2047	\$432	\$77,704	\$22,979	\$100,683	\$145,418	\$6,565	\$338	\$253,437	\$0	-\$1,161	\$252,276
2048	\$429	\$75,897	\$22,445	\$98,341	\$142,035	\$6,456	\$318	\$247,580	\$0	-\$1,085	\$246,495
2049	\$426	\$74,128	\$21,921	\$96,049	\$138,724	\$6,340	\$300	\$241,839	\$0	-\$1,014	\$240,825
2050	\$423	\$72,396	\$21,409	\$93,806	\$135,484	\$6,234	\$282	\$236,228	\$0	-\$948	\$235,281
2051	\$419	\$70,702	\$20,908	\$91,610	\$132,313	\$6,121	\$266	\$230,729	\$0	-\$886	\$229,843
2052	\$415	\$69,044	\$20,418	\$89,462	\$129,211	\$6,009	\$250	\$225,348	\$0	-\$828	\$224,520
2053	\$411	\$67,422	\$19,938	\$87,361	\$126,175	\$5,899	\$236	\$220,082	\$0	-\$774	\$219,309
2054	\$407	\$65,835	\$19,469	\$85,304	\$123,206	\$5,762	\$222	\$214,901	\$0	-\$723	\$214,178
2055	\$403	\$64,283	\$19,010	\$83,293	\$120,300	\$5,627	\$209	\$209,832	\$0	-\$676	\$209,156
2056	\$398	\$62,764	\$18,561	\$81,325	\$117,458	\$5,496	\$197	\$204,874	\$965,630	-\$631	\$1,169,873
Total	\$14,488	\$2,699,262	\$798,241	\$3,497,503	\$5,051,466	\$218,266	\$16,126	\$8,797,850	\$965,630	-\$59,649	\$9,703,831
									Capital Expenditures		\$8,115,255
									Benefit/Cost Ratio		1.20

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Safety Benefits Summary

Calendar Year	Base Condition- NO BUILD							BUILD							Total Safety Savings	Discounted 3.1% to 2022 Dollars
	Annual Forecast Killed Crashes	Annual Forecast Incapacitating Crashes	Annual Forecast Non-incapacitating Crashes	Annual Forecast Possible Injury Crashes	Annual Forecast No Injury Crashes	Annual Forecasted Crashes	Total Estimated Monetized Damages	Annual Forecast Killed Crashes	Annual Forecast Incapacitating Crashes	Annual Forecast Non-incapacitating Crashes	Annual Forecast Possible Injury Crashes	Annual Forecast No Injury Crashes	Annual Forecasted Crashes	Total Estimated Monetized Damages		
2027	0.00	0.00	0.10	0.00	0.31	0.41	\$ 25,492	0.00	0.00	0.10	0.00	0.15	0.26	\$ 24,724	\$ 768	\$ 660
2028	0.00	0.00	0.10	0.00	0.31	0.41	\$ 25,705	0.00	0.00	0.10	0.00	0.15	0.26	\$ 24,931	\$ 775	\$ 645
2029	0.00	0.00	0.10	0.00	0.31	0.42	\$ 25,918	0.00	0.00	0.10	0.00	0.16	0.26	\$ 25,137	\$ 781	\$ 631
2030	0.00	0.00	0.11	0.00	0.32	0.42	\$ 26,131	0.00	0.00	0.11	0.00	0.16	0.26	\$ 25,344	\$ 788	\$ 617
2031	0.00	0.00	0.11	0.00	0.32	0.42	\$ 26,344	0.00	0.00	0.11	0.00	0.16	0.26	\$ 25,550	\$ 794	\$ 603
2032	0.00	0.00	0.11	0.00	0.32	0.43	\$ 26,557	0.00	0.00	0.11	0.00	0.16	0.27	\$ 25,757	\$ 801	\$ 590
2033	0.00	0.00	0.11	0.00	0.32	0.43	\$ 26,770	0.00	0.00	0.11	0.00	0.16	0.27	\$ 25,963	\$ 807	\$ 577
2034	0.00	0.00	0.11	0.00	0.33	0.43	\$ 26,983	0.00	0.00	0.11	0.00	0.16	0.27	\$ 26,170	\$ 813	\$ 564
2035	0.00	0.00	0.11	0.00	0.33	0.44	\$ 27,196	0.00	0.00	0.11	0.00	0.16	0.27	\$ 26,376	\$ 820	\$ 551
2036	0.00	0.00	0.11	0.00	0.33	0.44	\$ 27,270	0.00	0.00	0.11	0.00	0.17	0.28	\$ 26,583	\$ 827	\$ 448
2037	0.00	0.00	0.11	0.00	0.33	0.44	\$ 27,498	0.00	0.00	0.11	0.00	0.17	0.28	\$ 26,789	\$ 709	\$ 449
2038	0.00	0.00	0.11	0.00	0.33	0.45	\$ 27,727	0.00	0.00	0.11	0.00	0.17	0.28	\$ 26,996	\$ 731	\$ 448
2039	0.00	0.00	0.11	0.00	0.34	0.45	\$ 27,955	0.00	0.00	0.11	0.00	0.17	0.28	\$ 27,202	\$ 753	\$ 448
2040	0.00	0.00	0.11	0.00	0.34	0.45	\$ 28,183	0.00	0.00	0.11	0.00	0.17	0.28	\$ 27,409	\$ 775	\$ 447
2041	0.00	0.00	0.11	0.00	0.34	0.46	\$ 28,412	0.00	0.00	0.11	0.00	0.17	0.29	\$ 27,615	\$ 797	\$ 446
2042	0.00	0.00	0.12	0.00	0.35	0.46	\$ 28,640	0.00	0.00	0.12	0.00	0.17	0.29	\$ 27,822	\$ 818	\$ 444
2043	0.00	0.00	0.12	0.00	0.35	0.46	\$ 28,868	0.00	0.00	0.12	0.00	0.17	0.29	\$ 28,028	\$ 840	\$ 443
2044	0.00	0.00	0.12	0.00	0.35	0.47	\$ 29,097	0.00	0.00	0.12	0.00	0.18	0.29	\$ 28,235	\$ 862	\$ 440
2045	0.00	0.00	0.12	0.00	0.35	0.47	\$ 29,325	0.00	0.00	0.12	0.00	0.18	0.29	\$ 28,441	\$ 884	\$ 438
2046	0.00	0.00	0.12	0.00	0.36	0.48	\$ 29,554	0.00	0.00	0.12	0.00	0.18	0.30	\$ 28,648	\$ 906	\$ 435
2047	0.00	0.00	0.12	0.00	0.36	0.48	\$ 29,782	0.00	0.00	0.12	0.00	0.18	0.30	\$ 28,854	\$ 928	\$ 432
2048	0.00	0.00	0.12	0.00	0.36	0.48	\$ 30,010	0.00	0.00	0.12	0.00	0.18	0.30	\$ 29,061	\$ 950	\$ 429
2049	0.00	0.00	0.12	0.00	0.36	0.49	\$ 30,239	0.00	0.00	0.12	0.00	0.18	0.30	\$ 29,267	\$ 971	\$ 426
2050	0.00	0.00	0.12	0.00	0.37	0.49	\$ 30,467	0.00	0.00	0.12	0.00	0.18	0.31	\$ 29,474	\$ 993	\$ 423
2051	0.00	0.00	0.12	0.00	0.37	0.49	\$ 30,695	0.00	0.00	0.12	0.00	0.18	0.31	\$ 29,680	\$ 1,015	\$ 419
2052	0.00	0.00	0.12	0.00	0.37	0.50	\$ 30,924	0.00	0.00	0.12	0.00	0.19	0.31	\$ 29,887	\$ 1,037	\$ 415
2053	0.00	0.00	0.13	0.00	0.38	0.50	\$ 31,152	0.00	0.00	0.12	0.00	0.19	0.31	\$ 30,093	\$ 1,059	\$ 411
2054	0.00	0.00	0.13	0.00	0.38	0.50	\$ 31,381	0.00	0.00	0.13	0.00	0.19	0.31	\$ 30,300	\$ 1,081	\$ 407
2055	0.00	0.00	0.13	0.00	0.38	0.51	\$ 31,609	0.00	0.00	0.13	0.00	0.19	0.32	\$ 30,506	\$ 1,103	\$ 403
2056	0.00	0.00	0.13	0.00	0.38	0.51	\$ 31,837	0.00	0.00	0.13	0.00	0.19	0.32	\$ 30,713	\$ 1,124	\$ 398
Total	0.0	0	3.4	0.0	10.3	13.8	\$ 857,724	0.00	0.00	3.45	0.00	5.17	8.62	\$ 831,553	\$ 26,170	\$ 14,488

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Travel Time Benefits from Railroad Maintenance Closures

Calendar Year	Base Condition- No Build		Build Condition		Total Travel Time Savings	Discounted 3.1% to 2022 dollars
	Annual Forecasted Vehicle Hours Traveled	Total Estimated Monetized Damages	Annual Forecasted Vehicle Hours Traveled	Total Estimated Monetized Damages		
2027	1,294	\$ 42,377	0	\$ -	\$ 42,377	\$ 36,378
2028	1,304	\$ 42,723	0	\$ -	\$ 42,723	\$ 35,572
2029	1,315	\$ 43,069	0	\$ -	\$ 43,069	\$ 34,782
2030	1,325	\$ 43,415	0	\$ -	\$ 43,415	\$ 34,007
2031	1,336	\$ 43,761	0	\$ -	\$ 43,761	\$ 33,247
2032	1,346	\$ 44,106	0	\$ -	\$ 44,106	\$ 32,502
2033	1,357	\$ 44,452	0	\$ -	\$ 44,452	\$ 31,772
2034	1,368	\$ 44,798	0	\$ -	\$ 44,798	\$ 31,057
2035	1,378	\$ 45,144	0	\$ -	\$ 45,144	\$ 30,356
2036	1,389	\$ 45,490	0	\$ -	\$ 45,490	\$ 29,668
2037	1,399	\$ 45,836	0	\$ -	\$ 45,836	\$ 28,995
2038	1,410	\$ 46,182	0	\$ -	\$ 46,182	\$ 28,336
2039	1,420	\$ 46,528	0	\$ -	\$ 46,528	\$ 27,689
2040	1,431	\$ 46,874	0	\$ -	\$ 46,874	\$ 27,057
2041	1,441	\$ 47,219	0	\$ -	\$ 47,219	\$ 26,437
2042	1,452	\$ 47,565	0	\$ -	\$ 47,565	\$ 25,830
2043	1,463	\$ 47,911	0	\$ -	\$ 47,911	\$ 25,235
2044	1,473	\$ 48,257	0	\$ -	\$ 48,257	\$ 24,653
2045	1,484	\$ 48,603	0	\$ -	\$ 48,603	\$ 24,083
2046	1,494	\$ 48,949	0	\$ -	\$ 48,949	\$ 23,525
2047	1,505	\$ 49,295	0	\$ -	\$ 49,295	\$ 22,979
2048	1,515	\$ 49,641	0	\$ -	\$ 49,641	\$ 22,445
2049	1,526	\$ 49,986	0	\$ -	\$ 49,986	\$ 21,921
2050	1,537	\$ 50,332	0	\$ -	\$ 50,332	\$ 21,409
2051	1,547	\$ 50,678	0	\$ -	\$ 50,678	\$ 20,908
2052	1,558	\$ 51,024	0	\$ -	\$ 51,024	\$ 20,418
2053	1,568	\$ 51,370	0	\$ -	\$ 51,370	\$ 19,938
2054	1,579	\$ 51,716	0	\$ -	\$ 51,716	\$ 19,469
2055	1,589	\$ 52,062	0	\$ -	\$ 52,062	\$ 19,010
2056	1,600	\$ 52,408	0	\$ -	\$ 52,408	\$ 18,561
Total	43,403	\$ 1,421,771	0	\$ -	\$ 1,421,771	\$ 798,241

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Travel Time Benefits from Train Crossings						
Calendar Year	Base Condition- No Build		Build Condition		Total Travel Time Savings	Discounted 3.1% to 2022 dollars
	Annual Forecasted Vehicle Hours Traveled	Total Estimated Monetized Damages	Annual Forecasted Vehicle Hours Traveled	Total Estimated Monetized Damages		
2027	4,375	\$ 143,299	0	\$ -	\$ 143,299	\$ 123,012
2028	4,410	\$ 144,468	0	\$ -	\$ 144,468	\$ 120,287
2029	4,446	\$ 145,638	0	\$ -	\$ 145,638	\$ 117,615
2030	4,482	\$ 146,807	0	\$ -	\$ 146,807	\$ 114,995
2031	4,517	\$ 147,977	0	\$ -	\$ 147,977	\$ 112,426
2032	4,553	\$ 149,147	0	\$ -	\$ 149,147	\$ 109,907
2033	4,589	\$ 150,316	0	\$ -	\$ 150,316	\$ 107,439
2034	4,624	\$ 151,486	0	\$ -	\$ 151,486	\$ 105,019
2035	4,660	\$ 152,656	0	\$ -	\$ 152,656	\$ 102,648
2036	4,696	\$ 153,825	0	\$ -	\$ 153,825	\$ 100,324
2037	4,732	\$ 154,995	0	\$ -	\$ 154,995	\$ 98,048
2038	4,767	\$ 156,164	0	\$ -	\$ 156,164	\$ 95,817
2039	4,803	\$ 157,334	0	\$ -	\$ 157,334	\$ 93,632
2040	4,839	\$ 158,504	0	\$ -	\$ 158,504	\$ 91,492
2041	4,874	\$ 159,673	0	\$ -	\$ 159,673	\$ 89,396
2042	4,910	\$ 160,843	0	\$ -	\$ 160,843	\$ 87,343
2043	4,946	\$ 162,012	0	\$ -	\$ 162,012	\$ 85,333
2044	4,982	\$ 163,182	0	\$ -	\$ 163,182	\$ 83,365
2045	5,017	\$ 164,352	0	\$ -	\$ 164,352	\$ 81,438
2046	5,053	\$ 165,521	0	\$ -	\$ 165,521	\$ 79,551
2047	5,089	\$ 166,691	0	\$ -	\$ 166,691	\$ 77,704
2048	5,124	\$ 167,860	0	\$ -	\$ 167,860	\$ 75,897
2049	5,160	\$ 169,030	0	\$ -	\$ 169,030	\$ 74,128
2050	5,196	\$ 170,200	0	\$ -	\$ 170,200	\$ 72,396
2051	5,231	\$ 171,369	0	\$ -	\$ 171,369	\$ 70,702
2052	5,267	\$ 172,539	0	\$ -	\$ 172,539	\$ 69,044
2053	5,303	\$ 173,708	0	\$ -	\$ 173,708	\$ 67,422
2054	5,339	\$ 174,878	0	\$ -	\$ 174,878	\$ 65,835
2055	5,374	\$ 176,048	0	\$ -	\$ 176,048	\$ 64,283
2056	5,410	\$ 177,217	0	\$ -	\$ 177,217	\$ 62,764
Total	146,768	\$ 4,807,740	0	\$ -	\$ 4,807,740	\$ 2,699,262

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Vehicle Operation Benefits from Detour for Railroad Crossing Closure

Calendar Year	Project Analysis Year	Base Condition- No Build		Build Condition		Total Travel Time Savings	Discounted 3.1% to 2022 dollars
		Annual Forecasted Vehicle Miles Traveled	Total Estimated Monetized Damages	Annual Forecasted Vehicle Miles Traveled	Total Estimated Monetized Damages		
2027	1	490,799	\$ 268,173	0	\$ -	\$ 268,173	\$ 230,208
2028	2	494,805	\$ 270,361	0	\$ -	\$ 270,361	\$ 225,109
2029	3	498,811	\$ 272,550	0	\$ -	\$ 272,550	\$ 220,108
2030	4	502,817	\$ 274,739	0	\$ -	\$ 274,739	\$ 215,204
2031	5	506,823	\$ 276,928	0	\$ -	\$ 276,928	\$ 210,397
2032	6	510,829	\$ 279,117	0	\$ -	\$ 279,117	\$ 205,683
2033	7	514,835	\$ 281,306	0	\$ -	\$ 281,306	\$ 201,063
2034	8	518,841	\$ 283,494	0	\$ -	\$ 283,494	\$ 196,535
2035	9	522,846	\$ 285,683	0	\$ -	\$ 285,683	\$ 192,098
2036	10	526,852	\$ 287,872	0	\$ -	\$ 287,872	\$ 187,749
2037	11	530,858	\$ 290,061	0	\$ -	\$ 290,061	\$ 183,489
2038	12	534,864	\$ 292,250	0	\$ -	\$ 292,250	\$ 179,315
2039	13	538,870	\$ 294,439	0	\$ -	\$ 294,439	\$ 175,226
2040	14	542,876	\$ 296,627	0	\$ -	\$ 296,627	\$ 171,220
2041	15	546,882	\$ 298,816	0	\$ -	\$ 298,816	\$ 167,298
2042	16	550,888	\$ 301,005	0	\$ -	\$ 301,005	\$ 163,456
2043	17	554,894	\$ 303,194	0	\$ -	\$ 303,194	\$ 159,694
2044	18	558,900	\$ 305,383	0	\$ -	\$ 305,383	\$ 156,011
2045	19	562,906	\$ 307,572	0	\$ -	\$ 307,572	\$ 152,404
2046	20	566,912	\$ 309,760	0	\$ -	\$ 309,760	\$ 148,874
2047	21	570,918	\$ 311,949	0	\$ -	\$ 311,949	\$ 145,418
2048	22	574,923	\$ 314,138	0	\$ -	\$ 314,138	\$ 142,035
2049	23	578,929	\$ 316,327	0	\$ -	\$ 316,327	\$ 138,724
2050	24	582,935	\$ 318,516	0	\$ -	\$ 318,516	\$ 135,484
2051	25	586,941	\$ 320,705	0	\$ -	\$ 320,705	\$ 132,313
2052	26	590,947	\$ 322,894	0	\$ -	\$ 322,894	\$ 129,211
2053	27	594,953	\$ 325,082	0	\$ -	\$ 325,082	\$ 126,175
2054	28	598,959	\$ 327,271	0	\$ -	\$ 327,271	\$ 123,206
2055	29	602,965	\$ 329,460	0	\$ -	\$ 329,460	\$ 120,300
2056	30	606,971	\$ 331,649	0	\$ -	\$ 331,649	\$ 117,458
Total		16,466,549	\$ 8,997,322	0	\$ -	\$ 8,997,322	\$ 5,051,466

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Emissions benefits from Train Crossings

Calendar Year	Delay (hours)			Delay Annual Benefit By Vehicle Classification		Annual Fuel Savings			NO _x Savings	SO _x Savings	PM _{2.5} Savings	CO ₂ Savings	NO _x Monetized Value	SO _x Monetized Value	PM _{2.5} Monetized Value	CO ₂ Monetized Value	Monetized value of NO _x savings	Monetized value of SO _x savings	Monetized value of PM _{2.5} savings	Monetized value of CO ₂ savings	CO2 Emissions Discounted 2% to 2022 Dollars	NOX, SOX, PM2.5 Discounted 3.1% to 2022 Dollars	Fuel Savings Discounted 3.1% to 2022 Dollars	Total Emissions and Fuel Savings	Total Discounted (3.1%/2%) to 2022 Dollars Savings
	No-BUILD	BUILD	Delay Benefit (annual)	All-Purpose	Truck	All-Purpose, gasoline (gallons)	Truck, diesel (gallons)	Driver Savings	metric ton	metric ton	metric ton	metric ton	\$/metric ton	\$/metric ton	\$/metric ton	\$/metric ton	\$	\$	\$	\$					
2027	4,376	0	4,376	4,232	144	1,650	92	\$ 6,272	0.02	0	0.00	16	\$ 21,000	\$ 57,400	\$ 993,500	\$ 245	\$ 415	\$ -	\$ 158	\$ 3,824	\$ 3,298.78	\$ 491.56	\$ 5,384.01	\$10,669	\$9,174
2028	4,411	0	4,411	4,265	146	1,663	93	\$ 6,321	0.02	0	0.00	16	\$ 21,300	\$ 58,700	\$ 1,011,900	\$ 250	\$ 424	\$ -	\$ 162	\$ 3,933	\$ 3,293.76	\$ 487.95	\$ 5,263.20	\$10,840	\$9,045
2029	4,445	0	4,445	4,299	147	1,676	94	\$ 6,371	0.02	0	0.00	16	\$ 21,700	\$ 60,100	\$ 1,030,600	\$ 263	\$ 435	\$ -	\$ 166	\$ 4,170	\$ 3,390.37	\$ 485.89	\$ 5,144.78	\$11,142	\$9,021
2030	4,480	0	4,480	4,332	148	1,689	95	\$ 6,420	0.02	0	0.00	16	\$ 22,000	\$ 61,500	\$ 1,049,600	\$ 257	\$ 445	\$ -	\$ 171	\$ 4,106	\$ 3,241.44	\$ 482.10	\$ 5,028.73	\$11,142	\$8,752
2031	4,514	0	4,514	4,365	149	1,702	95	\$ 6,469	0.02	0	0.00	16	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 262	\$ 448	\$ -	\$ 175	\$ 4,218	\$ 3,232.91	\$ 473.62	\$ 4,915.01	\$11,311	\$8,622
2032	4,549	0	4,549	4,398	150	1,715	96	\$ 6,519	0.02	0	0.00	16	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 265	\$ 452	\$ -	\$ 177	\$ 4,299	\$ 3,198.89	\$ 462.88	\$ 4,803.58	\$11,446	\$8,465
2033	4,583	0	4,583	4,432	151	1,728	97	\$ 6,568	0.02	0	0.00	16	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 270	\$ 455	\$ -	\$ 178	\$ 4,413	\$ 3,188.27	\$ 452.36	\$ 4,694.41	\$11,614	\$8,335
2034	4,617	0	4,617	4,465	152	1,741	98	\$ 6,617	0.02	0	0.00	16	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 274	\$ 458	\$ -	\$ 179	\$ 4,512	\$ 3,164.86	\$ 442.05	\$ 4,587.46	\$11,767	\$8,194
2035	4,652	0	4,652	4,498	154	1,754	98	\$ 6,667	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 278	\$ 462	\$ -	\$ 181	\$ 4,612	\$ 3,140.78	\$ 431.96	\$ 4,482.69	\$11,921	\$8,055
2036	4,686	0	4,686	4,532	155	1,767	99	\$ 6,716	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 282	\$ 465	\$ -	\$ 182	\$ 4,713	\$ 3,116.06	\$ 422.07	\$ 4,380.08	\$12,076	\$7,918
2037	4,721	0	4,721	4,565	156	1,780	100	\$ 6,765	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 287	\$ 469	\$ -	\$ 183	\$ 4,832	\$ 3,101.56	\$ 412.39	\$ 4,279.59	\$12,249	\$7,794
2038	4,755	0	4,755	4,598	157	1,793	100	\$ 6,815	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 290	\$ 472	\$ -	\$ 185	\$ 4,918	\$ 3,064.89	\$ 402.90	\$ 4,181.18	\$12,389	\$7,649
2039	4,790	0	4,790	4,632	158	1,806	101	\$ 6,864	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 294	\$ 476	\$ -	\$ 186	\$ 5,022	\$ 3,038.50	\$ 393.62	\$ 4,084.82	\$12,547	\$7,517
2040	4,824	0	4,824	4,665	159	1,819	102	\$ 6,913	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 299	\$ 479	\$ -	\$ 187	\$ 5,144	\$ 3,021.73	\$ 384.53	\$ 3,990.48	\$12,724	\$7,397
2041	4,858	0	4,858	4,698	160	1,832	103	\$ 6,963	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 303	\$ 482	\$ -	\$ 189	\$ 5,250	\$ 2,994.18	\$ 375.63	\$ 3,898.11	\$12,884	\$7,268
2042	4,893	0	4,893	4,731	161	1,845	103	\$ 7,012	0.02	0	0.00	17	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 308	\$ 486	\$ -	\$ 190	\$ 5,375	\$ 2,975.88	\$ 366.91	\$ 3,807.69	\$13,062	\$7,150
2043	4,927	0	4,927	4,765	163	1,858	104	\$ 7,061	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 312	\$ 489	\$ -	\$ 191	\$ 5,483	\$ 2,947.32	\$ 358.39	\$ 3,719.19	\$13,225	\$7,025
2044	4,962	0	4,962	4,798	164	1,871	105	\$ 7,111	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 317	\$ 493	\$ -	\$ 193	\$ 5,610	\$ 2,927.64	\$ 350.04	\$ 3,632.56	\$13,405	\$6,910
2045	4,996	0	4,996	4,831	165	1,884	106	\$ 7,160	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 321	\$ 496	\$ -	\$ 194	\$ 5,720	\$ 2,898.21	\$ 341.87	\$ 3,547.78	\$13,570	\$6,788
2046	5,031	0	5,031	4,865	166	1,897	106	\$ 7,209	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 326	\$ 499	\$ -	\$ 195	\$ 5,849	\$ 2,877.31	\$ 333.87	\$ 3,464.82	\$13,753	\$6,676
2047	5,065	0	5,065	4,898	167	1,910	107	\$ 7,259	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 331	\$ 503	\$ -	\$ 197	\$ 5,979	\$ 2,855.76	\$ 326.05	\$ 3,383.64	\$13,937	\$6,565
2048	5,099	0	5,099	4,931	168	1,923	108	\$ 7,308	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 336	\$ 506	\$ -	\$ 198	\$ 6,111	\$ 2,833.59	\$ 318.40	\$ 3,304.20	\$14,123	\$6,456
2049	5,134	0	5,134	4,964	169	1,936	108	\$ 7,357	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 340	\$ 510	\$ -	\$ 199	\$ 6,225	\$ 2,802.61	\$ 310.91	\$ 3,226.49	\$14,292	\$6,340
2050	5,168	0	5,168	4,998	171	1,949	109	\$ 7,407	0.02	0	0.00	18	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 345	\$ 513	\$ -	\$ 201	\$ 6,359	\$ 2,779.50	\$ 303.58	\$ 3,150.46	\$14,480	\$6,234
2051	5,203	0	5,203	5,031	172	1,962	110	\$ 7,456	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 349	\$ 517	\$ -	\$ 202	\$ 6,476	\$ 2,748.02	\$ 296.42	\$ 3,076.08	\$14,650	\$6,121
2052	5,237	0	5,237	5,064	173	1,975	111	\$ 7,505	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 353	\$ 520	\$ -	\$ 203	\$ 6,593	\$ 2,716.41	\$ 289.40	\$ 3,003.33	\$14,822	\$6,009
2053	5,271	0	5,271	5,098	174	1,988	111	\$ 7,555	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 357	\$ 523	\$ -	\$ 205	\$ 6,712	\$ 2,684.71	\$ 282.55	\$ 2,932.18	\$14,995	\$5,899
2054	5,306	0	5,306	5,131	175	2,001	112	\$ 7,604	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 357	\$ 527	\$ -	\$ 206	\$ 6,756	\$ 2,623.54	\$ 275.84	\$ 2,862.58	\$15,092	\$5,762
2055	5,340	0	5,340	5,164	176	2,014	113	\$ 7,653	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 357	\$ 530	\$ -	\$ 207	\$ 6,800	\$ 2,563.65	\$ 269.28	\$ 2,794.53	\$15,190	\$5,627
2056	5,375	0	5,375	5,197	177	2,027	114	\$ 7,703	0.02	0	0.00	19	\$ 22,000	\$ 61,500	\$ 1,069,000	\$ 357	\$ 534	\$ -	\$ 209	\$ 6,843	\$ 2,505.02	\$ 262.87	\$ 2,727.97	\$15,288	\$5,496
Total	146,269	0	146,269	141,442	4,827	55,162	3,089	\$ 209,617	0.66	0	0.01	522	Yearly Value Given in Table A-6 of FHWA RAISE BCA Guidance				\$ 14,483	\$ -	\$ 5,645	\$ 160,860	\$ 89,226	\$ 11,288	\$ 117,752	\$ 390,606	\$ 218,266

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Pedestrian and Bicyclist Amenities Benefits

Calendar Year	Pedestrian Amenities					Bicycle Amenities				Total Amenities Savings	Discounted 3.1% to 2022 Dollars
	Width of New Pathway (feet)	Average Trip Length	Number of Annual Trips	Value per Person-Mile Walked	Pedestrian Amenities Benefits	Average Trip Length	Number of Annual Trips	Value per Cycle-Mile	Cycling Amenities Benefits		
	(feet)	(miles)	(trips/year)	\$	\$	(miles)	(trips/year)	\$	\$		
2027	10	0.3	3,000	\$ 0.11	\$ 990	0.3	1,000	\$ 1.97	\$ 591	\$1,581	\$1,127
2028	10	0.3	3,023	\$ 0.11	\$ 997	0.3	1,008	\$ 1.97	\$ 595	\$1,593	\$1,061
2029	10	0.3	3,045	\$ 0.11	\$ 1,005	0.3	1,015	\$ 1.97	\$ 600	\$1,605	\$999
2030	10	0.3	3,068	\$ 0.11	\$ 1,012	0.3	1,023	\$ 1.97	\$ 604	\$1,617	\$941
2031	10	0.3	3,091	\$ 0.11	\$ 1,020	0.3	1,030	\$ 1.97	\$ 609	\$1,629	\$886
2032	10	0.3	3,114	\$ 0.11	\$ 1,028	0.3	1,038	\$ 1.97	\$ 613	\$1,641	\$834
2033	10	0.3	3,138	\$ 0.11	\$ 1,035	0.3	1,046	\$ 1.97	\$ 618	\$1,653	\$786
2034	10	0.3	3,161	\$ 0.11	\$ 1,043	0.3	1,054	\$ 1.97	\$ 623	\$1,666	\$740
2035	10	0.3	3,185	\$ 0.11	\$ 1,051	0.3	1,062	\$ 1.97	\$ 627	\$1,678	\$696
2036	10	0.3	3,209	\$ 0.11	\$ 1,059	0.3	1,070	\$ 1.97	\$ 632	\$1,691	\$656
2037	10	0.3	3,233	\$ 0.11	\$ 1,067	0.3	1,078	\$ 1.97	\$ 637	\$1,704	\$617
2038	10	0.3	3,257	\$ 0.11	\$ 1,075	0.3	1,086	\$ 1.97	\$ 642	\$1,716	\$581
2039	10	0.3	3,281	\$ 0.11	\$ 1,083	0.3	1,094	\$ 1.97	\$ 646	\$1,729	\$547
2040	10	0.3	3,306	\$ 0.11	\$ 1,091	0.3	1,102	\$ 1.97	\$ 651	\$1,742	\$515
2041	10	0.3	3,331	\$ 0.11	\$ 1,099	0.3	1,110	\$ 1.97	\$ 656	\$1,755	\$485
2042	10	0.3	3,356	\$ 0.11	\$ 1,107	0.3	1,119	\$ 1.97	\$ 661	\$1,769	\$457
2043	10	0.3	3,381	\$ 0.11	\$ 1,116	0.3	1,127	\$ 1.97	\$ 666	\$1,782	\$430
2044	10	0.3	3,406	\$ 0.11	\$ 1,124	0.3	1,135	\$ 1.97	\$ 671	\$1,795	\$405
2045	10	0.3	3,432	\$ 0.11	\$ 1,133	0.3	1,144	\$ 1.97	\$ 676	\$1,809	\$382
2046	10	0.3	3,458	\$ 0.11	\$ 1,141	0.3	1,153	\$ 1.97	\$ 681	\$1,822	\$359
2047	10	0.3	3,484	\$ 0.11	\$ 1,150	0.3	1,161	\$ 1.97	\$ 686	\$1,836	\$338
2048	10	0.3	3,510	\$ 0.11	\$ 1,158	0.3	1,170	\$ 1.97	\$ 691	\$1,850	\$318
2049	10	0.3	3,536	\$ 0.11	\$ 1,167	0.3	1,179	\$ 1.97	\$ 697	\$1,863	\$300
2050	10	0.3	3,563	\$ 0.11	\$ 1,176	0.3	1,188	\$ 1.97	\$ 702	\$1,877	\$282
2051	10	0.3	3,589	\$ 0.11	\$ 1,184	0.3	1,196	\$ 1.97	\$ 707	\$1,892	\$266
2052	10	0.3	3,616	\$ 0.11	\$ 1,193	0.3	1,205	\$ 1.97	\$ 712	\$1,906	\$250
2053	10	0.3	3,643	\$ 0.11	\$ 1,202	0.3	1,214	\$ 1.97	\$ 718	\$1,920	\$236
2054	10	0.3	3,671	\$ 0.11	\$ 1,211	0.3	1,224	\$ 1.97	\$ 723	\$1,934	\$222
2055	10	0.3	3,698	\$ 0.11	\$ 1,220	0.3	1,233	\$ 1.97	\$ 729	\$1,949	\$209
2056	10	0.3	3,726	\$ 0.11	\$ 1,230	0.3	1,242	\$ 1.97	\$ 734	\$1,964	\$197
Total			100,509		\$ 33,168		33,503		\$ 19,800	\$52,968	\$16,126

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Capital Costs/Residual Values

Calendar Year	Initial Capital Costs (2024 \$)	Percent of Capital Expenditures	Asset Life	2056 Remaining Value	Present Value disocunted 3.1% to 2022 dollars
Final Design Engineering	\$ 198,000	2%	0	\$ 0	\$ 0
Right-of-Way	\$ 30,000	0%	100	\$ 21,000	\$ 7,437
Major Structures	\$ 4,541,000	53%	60	\$ 2,270,500	\$ 804,131
Excavation/Removals	\$ 207,000	2%	0	\$ -	\$ -
Grading and Drainage	\$ 922,500	11%	50	\$ 369,000	\$ 130,687
Sub-base and Base	\$ 264,000	3%	40	\$ 66,000	\$ 23,375
Surface	\$ 726,000	8%	30	\$ -	\$ -
Remaining "Other" Project Cost	\$ 1,737,700	20%	0	\$ -	\$ -
Total Project Cost	\$ 8,626,200	100%	N/A	\$ 2,726,500	\$ 965,630

Saint Louis County CSAH 100 Railroad Grade Separation Feasibility

Operating & Maintenance costs

Calendar Year	No Build	Build	Total Net Operating Benefit in 2022 Dollars	Discounted 3.1% to 2022 Dollars
2027	\$2,000	\$8,301	-\$6,301	-\$4,492
2028	\$2,000	\$8,301	-\$6,301	-\$4,199
2029	\$2,000	\$8,301	-\$6,301	-\$3,924
2030	\$2,000	\$8,301	-\$6,301	-\$3,667
2031	\$2,000	\$8,301	-\$6,301	-\$3,427
2032	\$2,000	\$8,301	-\$6,301	-\$3,203
2033	\$2,000	\$8,301	-\$6,301	-\$2,994
2034	\$2,000	\$8,301	-\$6,301	-\$2,798
2035	\$2,000	\$8,301	-\$6,301	-\$2,615
2036	\$2,000	\$8,301	-\$6,301	-\$2,444
2037	\$2,000	\$8,301	-\$6,301	-\$2,284
2038	\$2,000	\$8,301	-\$6,301	-\$2,134
2039	\$2,000	\$8,301	-\$6,301	-\$1,995
2040	\$2,000	\$8,301	-\$6,301	-\$1,864
2041	\$2,000	\$8,301	-\$6,301	-\$1,742
2042	\$2,000	\$8,301	-\$6,301	-\$1,628
2043	\$2,000	\$8,301	-\$6,301	-\$1,522
2044	\$2,000	\$8,301	-\$6,301	-\$1,422
2045	\$2,000	\$8,301	-\$6,301	-\$1,329
2046	\$2,000	\$8,301	-\$6,301	-\$1,242
2047	\$2,000	\$8,301	-\$6,301	-\$1,161
2048	\$2,000	\$8,301	-\$6,301	-\$1,085
2049	\$2,000	\$8,301	-\$6,301	-\$1,014
2050	\$2,000	\$8,301	-\$6,301	-\$948
2051	\$2,000	\$8,301	-\$6,301	-\$886
2052	\$2,000	\$8,301	-\$6,301	-\$828
2053	\$2,000	\$8,301	-\$6,301	-\$774
2054	\$2,000	\$8,301	-\$6,301	-\$723
2055	\$2,000	\$8,301	-\$6,301	-\$676
2056	\$2,000	\$8,301	-\$6,301	-\$631
Total			-\$189,026	-\$59,649

Facility	Quantity	Year	Maintenance Costs	2022 Annual Unit Cost
No Build				
Railroad Crossing	1	2024	\$ 2,000	\$ 2,000
Total No-Build				\$ 2,000
Bridge	1	2014	\$ 6,804	\$ 8,301
Total Build				\$ 8,301