Burnham Avenue Railroad Crossing Study

Purpose and Need

December 2023

Prepared for: Village of Burnham

In partnership with: Connecting Cook County – Beyond Transportation

Prepared by: Mott MacDonald

Contents

List of Tables

List of Figures

1. Introduction

The Village of Burnham, in partnership with the Cook County Department of Transportation and Highways (CCDOTH), is conducting a Phase I Study to consider transportation improvements as part of the Burnham Avenue Railroad Crossing study. The following sections provide an overview of the project.

1.1 Existing Conditions

The Burnham Avenue Railroad Crossing study project is located within the City of Chicago and the Village of Burnham in Cook County, IL, as shown in *Figure 1*. Route FAU2943 (Road Name, "Burnham Avenue") is the primary roadway linking the Village of Burnham and the Hegewisch neighborhood in Chicago. Burnham Avenue runs 9 miles north from Lynwood through Lansing, Calumet City, and the Village of Burnham. North of Burnham, Burnham Avenue changes name to S. Avenue O and continues north for 4.5 miles before terminating within Chicago.

The Hegewisch Train Station[1] is owned and operated by Metra and services the Northern Indiana Commuter Transportation District (NICTD) of the South Shore Line (SSL) Train. In 2019, the Hegewisch Train Station had an average weekday ridership of 862 (Metra, 2022). Built in 1991 by Metra, the current station has one side platform and one island platform. Train station users utilize the 6-acre Metra parking lot, which has 723 parking stalls. Intermodal connectors are public roads that provide access to major intermodal terminals and are vital conduits for the timely and reliable delivery of passengers and freight (FHWA, 2023). As shown in *Figure 1*, the Hegewisch Train Station intermodal connector starts at the Torrence Avenue/Sibley Boulevard intersection in Calumet City, IL. It ends at the Hegewisch Train Station

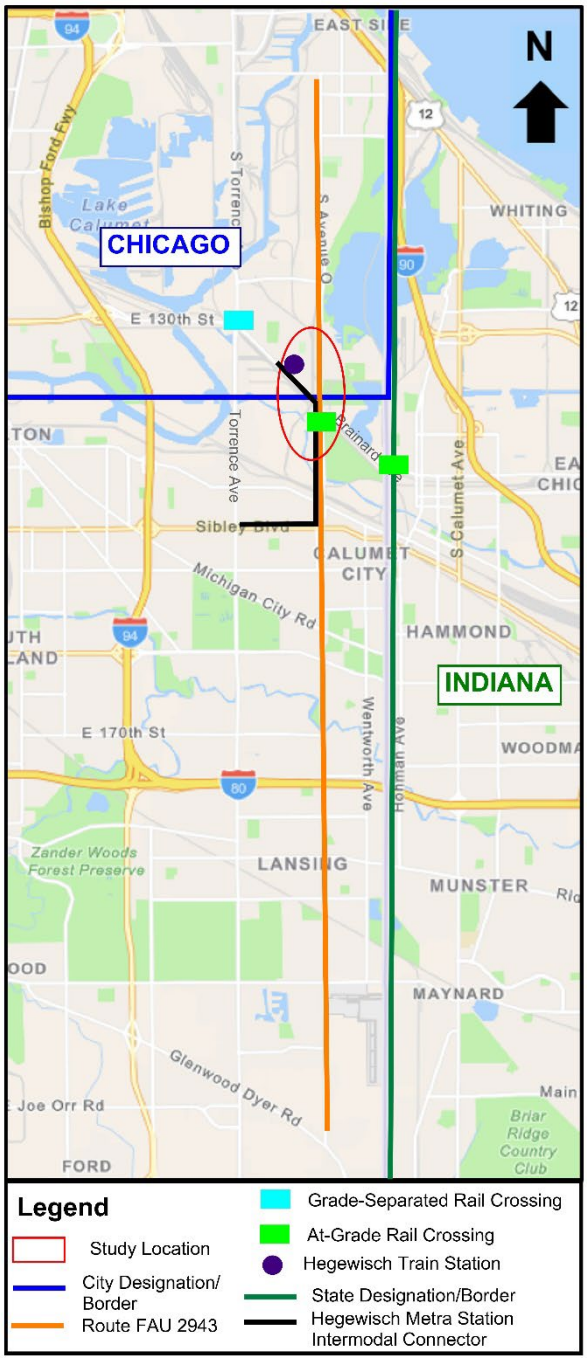

Figure 1. Project Location and Existing Conditions Overview

[1] Although Metra does not have a line here, Metra does own and operate the station and parking lot adjacent to and north of Burger King. NICTD owns the parking lots adjacent to the station as well as the platform itself. This is a unique relationship between NICTD/SSL and Metra (Metra, 2020).

on Brainard Avenue. The Brainard Avenue pedestrian crossing from the Hegewisch Train Station to the Metra parking lot includes a pedestrian traffic signal and a crosswalk.

The following three bus routes provide transit service within the project study area: Pace Bus routes 358 (Torrence) and 364 (159th Street) and Chicago Transit Authority (CTA) bus route 30. In 2022, the annual average daily ridership on CTA bus route 30, Pace bus route 358, and Pace bus route 364 were 1,428, 275, and 874, respectively (RTAMS, 2023). Per Federal guidelines, the threshold for an environmental justice (EJ) population of concern is "more than 50% minority or low-income" (US EPA, 2019). Based on evaluated US Census Bureau Block Group data, the project's minority and low-income populations are 69% and 22%, respectively[2]. Therefore, the Hegewisch Train Station and three transit buses predominantly serve minority users.

At the project location, Route FAU2943 (Road Name, "Burnham Avenue") and Route FAU3592 (Road Name, "Brainard Avenue") are both state routes, minor arterials, and classified as significant routes according to the Illinois Department of Transportation's (IDOT) work zone mobility and safety policy. Burnham Avenue and Brainard Avenue are 4-lane roads with two 10-foot wide travel lanes in each direction. As Burnham Avenue approaches Brainard Avenue, it turns into a 5-lane section with 11-foot-wide lanes and an 11-foot-wide left turn lane with a raised median at the signalized intersection with Brainard Avenue. As Brainard Avenue approaches Burnham Avenue – in both travel directions – it turns into a 5-lane section with 11-foot-wide lanes and an 11-foot-wide left turn lane with a painted flush median at the signalized intersection. A raised concrete island protects and separates the right turn lanes from Burnham Avenue to Brainard Avenue. The existing pedestrian facilities include 4- to 6-foot-wide sidewalks but do not include bicycle facilities. The sidewalk west of Burnham Avenue connects to the Village of Burnham, and the sidewalk north of Brainard Avenue connects to the Hegewisch community of Chicago. There is no sidewalk east of Burnham Avenue or south of Brainard Avenue within the project study area. Burnham Avenue intersects with three parallel at-grade railroad crossings (five total tracks) south of its intersection with Brainard Avenue, as follows:

- A two-track mainline commuter grade crossing (FRA Crossing # 867226H) owned by the Chicago South Shore and South Bend Railroad (CSS) but operated by the NICTD, hereafter referred to as the NICTD crossing.
- A two-track mainline freight grade crossing (FRA Crossing # 478708J) operated by the Norfolk Southern Railroad (NS), hereafter referred to as the NS crossing.
- A single-track mainline industrial line grade crossing (FRA Crossing # 163649L) operated by the CSX Transportation Railroad (CSX), hereafter referred to as the CSX crossing.

Figure 2 shows the existing at-grade crossings, the Burnham Avenue/Brainard Avenue intersection, and the average daily traffic (ADT) per IDOT's 2021 ADT. Observe that Brainard Avenue intersects Burnham Avenue at a 45-degree angle. Also, observe that the NICTD crossing is only 190 feet from the Burnham Avenue/Brainard Avenue intersection and that the NICTD, NS, and CSX crossings (collectively referred to as the rail crossings) are spaced 150 to 260 feet apart. According to the IDOT 2021 ADT dataset, the Burnham Avenue northbound approach ADT is a constant 8,200 from the Burnham Avenue/Brainard Avenue intersection to

[2] The project study group is conducting a detailed EJ analysis per IDOT's guidance memo. The EJ analysis, parallel with other analyses, will ensure the project's Purpose and Need is met.

the Burnham Avenue/Michigan City Road intersection (IDOT, 2023). Therefore, the ADT on the Burnham Avenue northbound approach is representative of the traffic at the rail crossings.

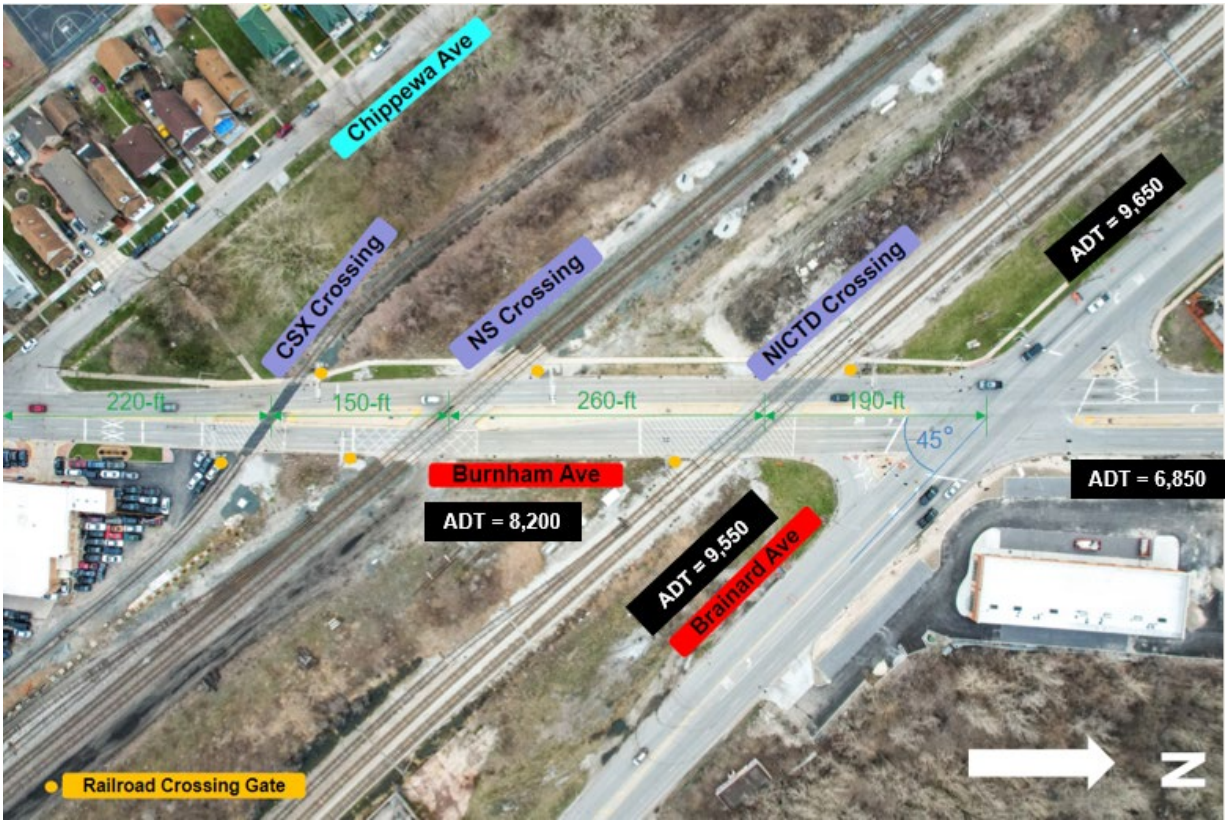

Figure 2. Rail Crossings Along Burnham Avenue Within the Project Study Area

As shown in *Figure 1*, alternatives to using the rail crossings are located one mile to the west at Torrence Avenue (grade-separated crossing) and Homan Avenue in Indiana 1.25 miles east (at-grade railroad crossing). Therefore, using an alternate route to avoid train blockages at the rail crossings along Burnham Avenue can lead to an additional travel distance of 4.5 to 6 miles.

Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966 (23 CFR 774) protects the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless there is no feasible and prudent alternative to the use of the land. The action includes all possible planning to minimize harm to the property resulting from use. *Figure 3* provides an overview of the existing environmental resources and section 4(f) properties. The closest receiving waters to the project is the Grand Calumet River, which is not listed as a biologically significant stream (IDNR, 2020). The base floodplain elevation along the Grand Calumet River is 581 feet (FEMA, 2023). The Forest Preserve District of Cook County (FPDCC) has two adjacent resources: the Powderhorn Prairie and Marsh Nature Preserve and the Burnham Woods Golf Course. The nature preserve and golf course are located within FPDCC's boundaries and are 185 and 168 acres in size, respectively. The nature preserve is an Illinois state-designated Illinois Natural Areas Inventory (INAI) site and contains an 8-acre freshwater forested/shrub wetland adjacent to Brainard Avenue's westbound approach. The Burnham Woods Golf Course is one of ten FPDCC golf courses open to the public (FPDCC, 2023).

Figure 3. Overview of Existing Environmental Resources

1.2 Project Background

In 2016, the rail crossings resulted in over three hours/day of downed gate time (NICTD, 2016). In 2017, the rail crossings on Burnham Avenue were found to cause an average daily downed gate time of over four hours (CMAP, 2017). Because of the proximity of the Burnham Avenue/Brainard Avenue intersection to the rail crossings, the rail crossings encroach into the functional area of the Burnham Avenue/Brainard Avenue intersection. Therefore, the downed gate time results in mobility restrictions and queues on all four intersection approaches (see the "Capacity and System Linkage" section for further explanation). Consequently, the Burnham Avenue Railroad Crossing Study has been long-awaited by many stakeholders who live and travel through the Village of Burnham and the surrounding communities, including residents and commuters who are the most impacted by the roadway delays and mobility restrictions.

The goals of the Burnham Avenue Railroad Crossing Study are consistent with the Chicago Metropolitan Agency for Planning's (CMAP) *GO TO 2050 Comprehensive Regional Plan* (CMAP, 2022). As part of CMAP's efforts to enhance mobility within the northeast region, GO TO 2050 details several mobility recommendations, strategies, and actions related to railroad crossings highlighted in *Table 1.*

Table 1. Critical Mobility Recommendations, Strategies, and Actions (CMAP, 2022)

Recommendation	Strategy	Action
Maintain the region's status as North America's freight hub	Invest strategically in the freight network	Prioritize the region's rail grade crossings and direct funds for improvement, along with a study of feasibility and alternatives to separation
	Mitigate the negative impacts of freight on adjacent areas, particularly Economically Disconnected Areas	Prioritize projects that improve quality of life, such as reducing truck bottlenecks and separating at-grade rail crossings that cause high levels of delay
Leverage the transportation network to promote inclusive growth	Improve access to public rights of way for pedestrians, cyclists, and people with disabilities	Ensure that sidewalks, pedestrian crossings, and bicycling facilities are as available and maintained as adequately in low-income areas as in more affluent areas

In June 2019, the northeast Illinois regional partners assessed the busiest railroads in the region based on four key factors: traffic and congestion (e.g., downed gate time), safety reports (e.g., number of train-vehicle crashes), mobility (e.g., location of nearest grade-separated railroad crossing), and construction feasibility (CMAP, 2019). The assessment identified 47 priority railroad crossings and the rail crossings along Burnham Avenue was one of the 47 assessed priority railroad crossings. The *Invest Here and Invest Everywhere* report (CMAP, 2023) is supported by the northeast Illinois regional partners: the State of Illinois, the City of Chicago, the seven regional counties, the Regional Transportation Authority (RTA), the Chicago Transit Authority (CTA), Metra, Pace, and the Chicago Region Environmental and Transportation Efficiency (CREATE) program. The *Invest Here and Invest Everywhere* report summarizes the 20 highest-priority projects. The rail crossings along Burnham Avenue was one of the 20 highest-priority projects identified in the report, as shown in *Figure 4*. The rail crossings at Burnham Avenue – identified as "Burnham Avenue Grade Separation" in *Figure 4* – are one of

the four priority railroad crossings identified for further evaluation and investment to enhance mobility and make the region's railroad network safer and more efficient. The project's corresponding CMAP Transportation Improvement Program (TIP) number is *07-19-0011,* and the project type is *rail-highway grade separation*. The project was funded for Phase I engineering services in a prior federal fiscal year (FFY). In a future FFY, the project will be funded for Phase II and III services.

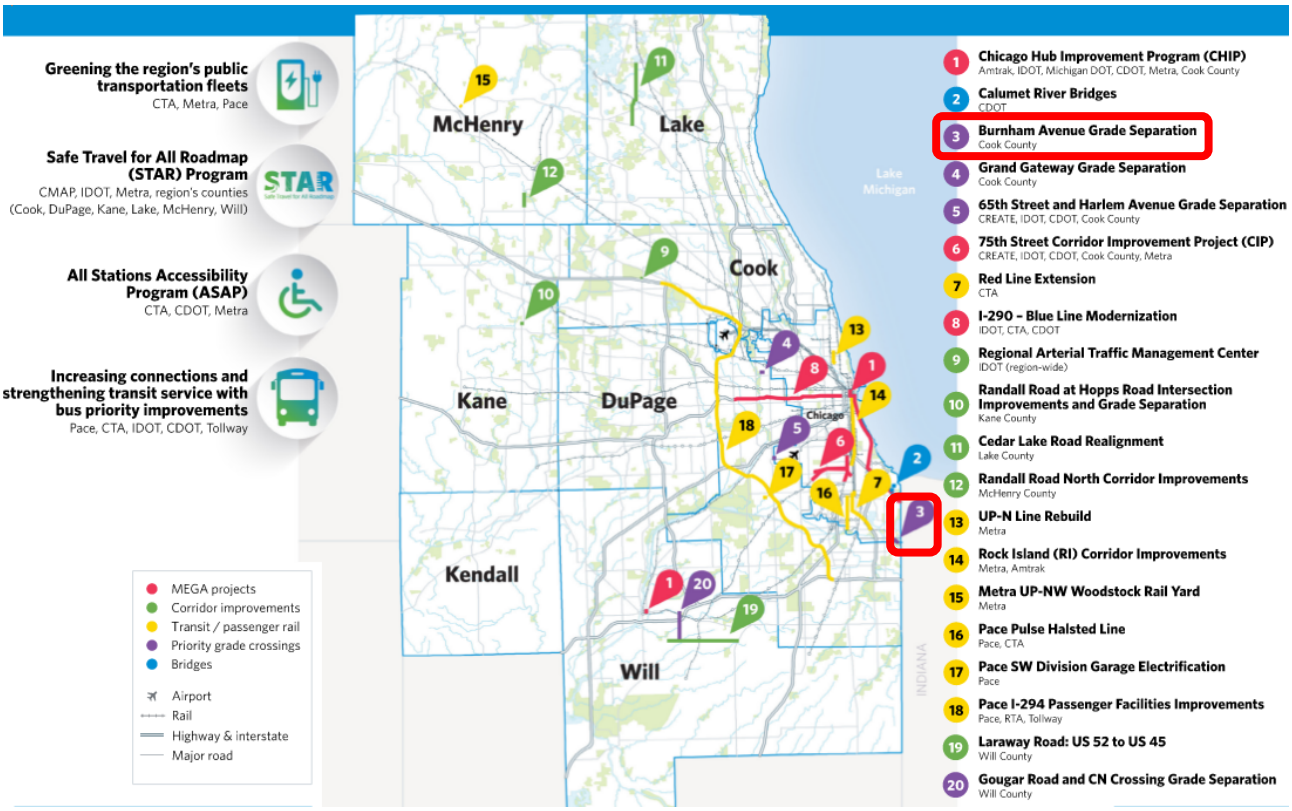

Figure 4. Northeastern Illinois Priority Investments (CMAP, 2023)

1.3 Project Study Area

The project study area is bounded by 135th Street to the north, the Illinois/Indiana state border to the east, 143rd Street to the south, and S. Baltimore Avenue to the west, as shown in *Figure 5*. The project study area reflects the area of influence for investigation and includes major origin/destination points for the rail crossings. *Figure 6* provides an overview of the project study area's key features. Note that the NS north/south spur grade crossing (FRA Crossing # 522456E) has traffic signals along Brainard Avenue at the spur but no railroad crossing gates. Three trains per day use the NS spur grade crossing (USDOT, 2023).

Figure 5. Project Study Area

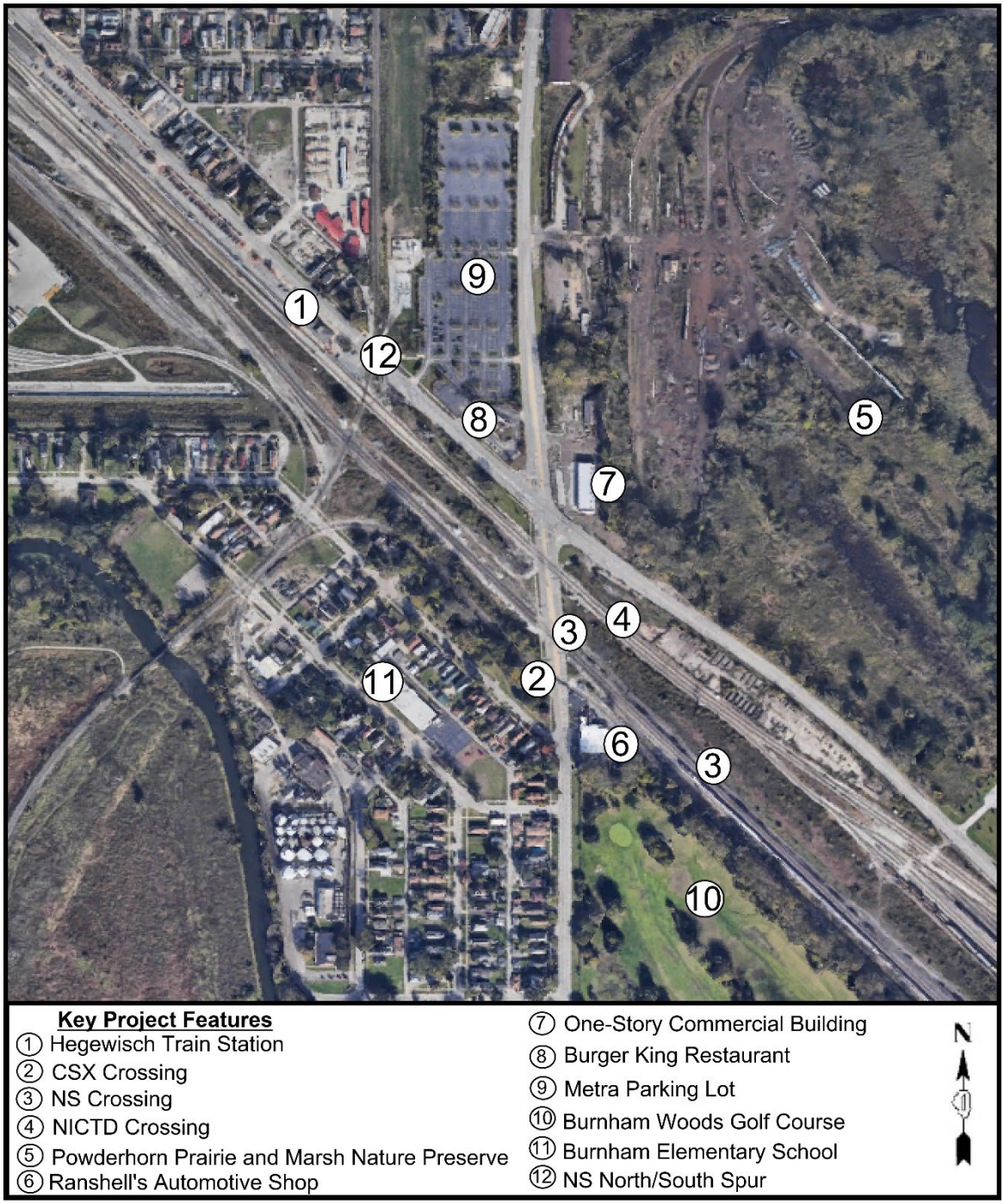

Figure 6. Key Project Features Map

2. Project Purpose

The purpose of the project is to reduce delays and improve mobility, safety, and operations for all roadway users in the project study area, specifically proximate residents of the City of Chicago and the Village of Burnham, at the existing at-grade railroad crossings where Burnham Avenue intersects with five railroad tracks (involving three controlled crossings) located just south of Brainard Avenue.

3. Project Need

The need of the project is to improve transportation and multimodal demands (i.e., mobility and congestion) and safety. The project study area's rail crossings cause over four hours of downed gate time. When a train uses one of the rail crossings, the railroad-induced congestion can take more than six minutes to clear. Using an alternate route during the PM peak hour can add 22 minutes or more to the travel time. In 2050, the projected traffic growth is anticipated to result in a railroad-induced congestion clearance time of sixteen minutes or more. Presently, the railroad-induced congestion:

- Prevents the local medical facilities, police, and fire departments from providing timely emergency service.
- Delays local CTA and Pace buses from providing timely service to the over 120 annual average daily riders within the project study area.
- Degrades the Burnham Avenue/Brainard Avenue intersection operations, delaying roadway users and negatively impacting proximate residents' quality of life.
- Leads to high levels of traffic stress and delays for Hegewisch Metra station users and the over 150 daily non-vehicle roadway users that pass through the project study area.
- Proposes a train-roadway user safety concern as two fatality crashes and eight injuries crashes involved roadway users attempting to go around the downed gates.
- Contributes to the severity and number of crashes, as 43% of the total crashes and 50% of the moderate and severe injury crashes are related to the rail crossings.

The following sections describe the project need in more detail.

3.1 Transportation and Multimodal Demands

Mobility describes the ease with which roadway users travel to and from their destination. A standard measure of mobility is travel time, which is impacted by railroad-induced congestion. The rail crossings in the project study area cause an average daily downed gate time of over four hours (CMAP, 2017).

CMAP's existing data shows that the NICTD crossing carries passenger and freight trains in the project study area. The NS and CSX crossings only carry freight trains with varied schedules. The NICTD crossing operates with a fixed schedule; 43 trains use the NICTD crossing each weekday. During peak and off-peak hours, on average, a train is dispatched and utilizes the NICTD crossing every 30 or 90 minutes, respectively (NICTD, 2023).

In addition to vehicles, the downed gate time and railroad-induced congestion affect:

- Emergency service providers,
- Vehicle roadway users,
- Mass transit (i.e., Pace and CTA) providers,
- Non-vehicle roadway users.

The following sections describe how the downed gate time and railroad-induced congestion affect each roadway user mentioned above.

Emergency Services

Emergency services are integral to public safety and help foster a strong sense of community. The emergency services in or near the project study area include police, medical, and fire responders, as shown in *Figure 7*.

For police services, the Village of Burnham Police works alongside the City of Chicago District 4 – South Chicago to keep the community secure and provide emergency responses when needed. According to the Village of Burnham, citations are issued to semi-trucks carrying heavy loads or hazardous materials that improperly stop, stand, or park near the rail crossings (Burnham, 2023).

Mutual response agreements exist between the Village of Burnham with the City of Calumet City, the Village of Dolton, and the Village of Riverdale. *Figure 7* shows the six fire stations that service the project study area per the mutual response agreements. According to the Village of Burnham, all responding mutual aid partners utilize the rail crossing as part of their route to an incident for Burnham (Burnham, 2023). From 2017 to 2021, the mutual aid partners responded to 101 incidents.

Four major medical facilities serve the project study area. However, according to the Village of Burnham, the medical facilities only respond in the event of a major catastrophe. The local pre-emergency personnel (i.e., the fire departments, Buds Ambulance Service, and the police departments) utilize the rail crossings to respond to most medical emergencies. The railroad-induced congestion can force emergency response vehicles to take alternate routes to medical facilities. Ambulances get delayed at this intersection by up to six minutes when they follow GPS directions, leading to delayed medical care. Based on Google Maps distances, when the NS or CSX crossings are in use, an alternate route can add 11 minutes or more to the total travel time; which is paramount during an emergency.

In conclusion, because of the downed gate time and resulting delays, the emergency services in or near the project study area are inhibited from responding to calls in a time-efficient manner. Thus, the project's need addresses improving emergency service delays.

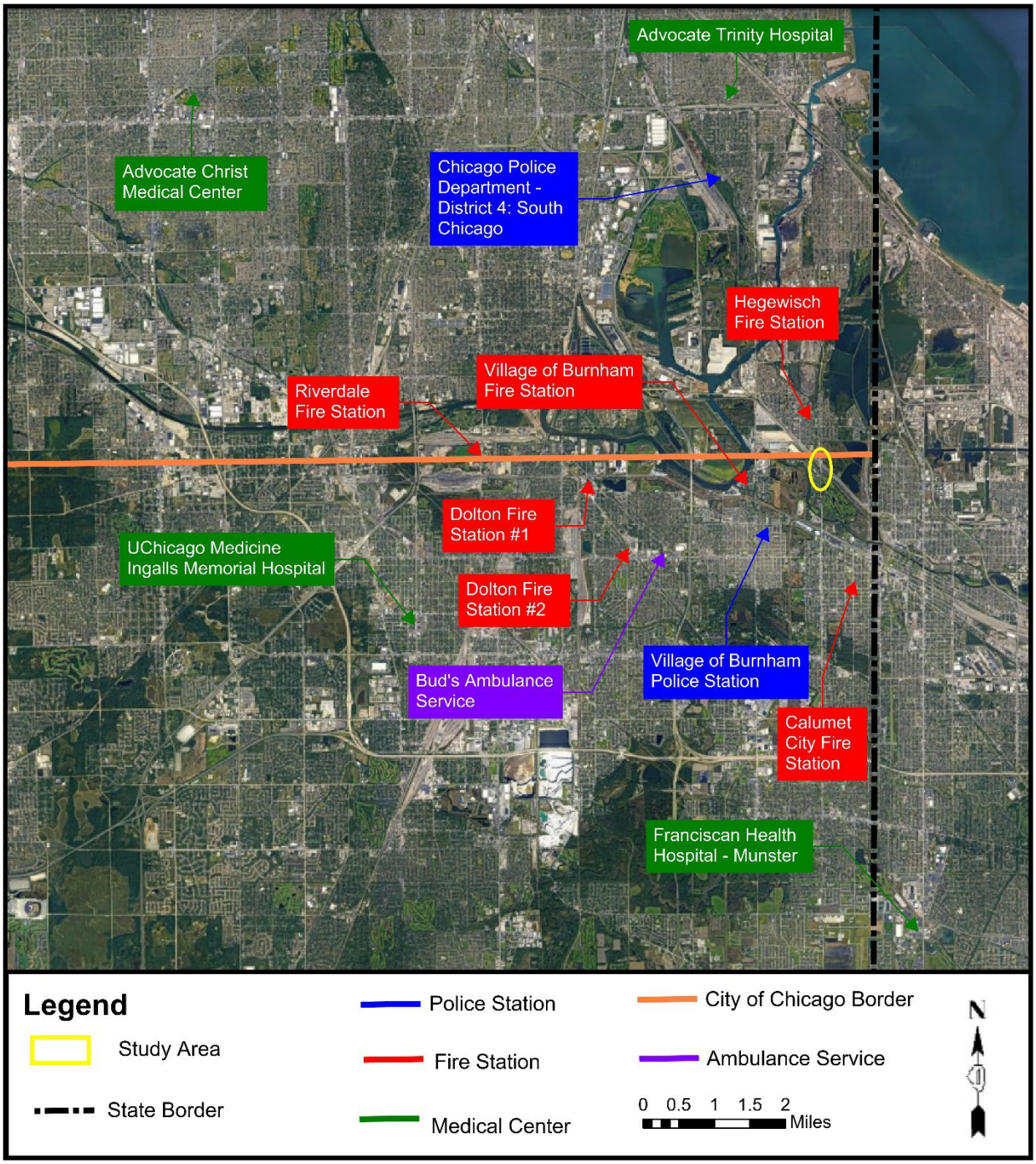

Figure 7. Emergency Services

Capacity and System Linkage

Turning movement counts (TMCs) and intersection videos were collected at 16 intersections within the project study area on Tuesday, March 15, 2022, over 13 hours (from 6 am to 7 pm). For the purpose of substantiating the project need, the following sections focus on the TMCs and data related to the Burnham Avenue/Brainard Avenue intersection.

In March 2022, the IDOT 2022 ADTs were not yet available. Therefore, the 2022 ADT for Burnham Avenue and Brainard Avenue were estimated based on IDOT 2021 ADTs and the March 2022 TMCs. Projected 2050 ADTs were obtained from CMAP for the Future No-Build scenario. *Table 2* shows the existing and projected ADTs and the overall traffic growth from 2022 to 2050 (Growth). From 2022 to 2050, the Burnham Avenue northbound approach traffic – where the rail crossings are located – is projected to grow by 44%.

Table 2. Existing and Future/Projected Traffic and Overall Traffic Growth Rates

Scenario	Year	Data Type	Burnham Ave		Brainard Ave	
			South Leg	*North Leg*	*East Leg*	*West Leg*
Existing	2022	ADT	9,600	8,810	13,650	12,770
Future No-Build	2050	ADT	13,860	10,500	17,700	14,300
		Growth	44.4%	19.2%	29.7%	12.0%

ADT = Average Daily Traffic

Growth = Overall Traffic Growth from 2022 to 2050

Level of Service (LOS) Analysis

Level of Service (LOS) is a measure of traffic conditions that represents the quality of service from a traveler's perspective. LOS ranges from A to F, as shown in *Table 3*. In urban settings, such as the project study area, proposed improvements are designed with a target LOS C, but LOS D is considered acceptable with justification.

Table 3. Intersection Level of Service (LOS) Criteria by Intersection Type (NAS, 2022)

LOS	Control Delay (s/veh)	Description
	Signalized Intersection	
A	≤ 10	Free-flow conditions: Most vehicles do not stop at the intersection.
B	> 10 - 20	Some vehicles stop at the intersection.
C	> 20 - 35	Most vehicles stop, and individual cycle failures+ may occur.
D	> 35 - 55	Many vehicles stop, and individual cycle failures are noticeable.
E	> 55 - 80	Individual cycle failures are frequent.
F	> 80	Force-flow conditions: Most cycles fail to clear the queue.

+ A cycle failure occurs when one or more queued vehicle(s) cannot depart due to insufficient capacity during the cycle.

A traditional intersection LOS analysis follows the HCM methodology for estimating delays due to traffic control and does not consider the influence of at-grade railroad crossings. The HCM recommends utilizing alternative methods or tools to analyze the LOS more accurately for at-grade railroad crossings. The following paragraphs briefly describe the alternative method used.

Representative train crossing times and frequencies were determined based on the March 2022 intersection videos and existing CMAP data (CMAP, 2017) to compute the project study area intersection LOS and consider the rail crossings, as shown in *Table 4*. Consistent with HCM methodology, the project study area was simulated using the PM peak hour volume[3].

[3] Since 1 train/day uses the CSX crossing and the train does not cross during the PM peak hour, the traffic simulation is based on the impact of the NICTD and NS crossings.

Table 4. Summary of LOS Analysis Data by Rail Crossing

Data Type	NICTD Crossing	NS Crossing
Number of trains per day	47	52
Downed gate times		
Lower Bound (min:sec)	0:30	1:10
Upper Bound (min:sec)	2:15	9:27
Median (min:sec)	1:12	6:38

Table 5 summarizes the traffic operations analysis results for the Burnham Avenue/Brainard Avenue intersection operations and the worst intersection approach[4] under 2022 and 2050 PM peak hour traffic for the existing project conditions. When trains are not using the rail crossings, the Burnham Avenue/Brainard Avenue intersection operates at an acceptable LOS C. However, when trains use the rail crossings, the existing (2022) and future (2050) worst approaches operate at LOS E and LOS F, respectively.

Table 5. Summary of Burnham/Brainard Avenue Intersection LOS Analysis Results

Year *(No-Build Scenario)*	**Movement**	**Level of Service (LOS)**	
		No Train	*Train*
2022	*Overall Intersection*	C	D
	*Worst Approach**	C	E
2050	*Overall Intersection*	C	E
	*Worst Approach**	C	F

*The worst approach was the Burnham Avenue northbound approach

Maximum Queue Length Analysis

While intersection LOS identifies impacts at a refined and average scale, maximum vehicle queue lengths can measure worst-case traffic operation conditions along roadway segments. The downed gate time (*Table 4*) represents the time when no roadway users can safely (and legally) travel across the rail crossings. The downed gates result in queues on all approaches as 50% of the intersection movements become restricted[5]. Consequently, vehicles at the Burnham/Brainard intersection can experience delays that add up to six minutes or more to the total travel time. The existing (2022) and future (2050) peak hour maximum queue lengths, both when there are no trains and when trains are using the rail crossings, are graphically presented in *Figure 9. Figure 9* also highlights the blocked local roads and commercial driveways.

As shown in *Figure 9,* the downed gates significantly increase the maximum queue lengths. The Burnham Avenue northbound approach is the most severely impacted, with queues blocking access to the Automotive Shop – in both directions – and access to Chippewa Avenue and 140th Street in the northbound direction. In the future (2050), with no improvements, the queues

[4] An approach is a set of lanes at an intersection that accommodates all movements (i.e., left, thru, and right) approaching from a given direction. For the Burnham/Brainard intersection, there are four approaches: northbound, southbound, eastbound, and westbound. Therefore, the term "worst intersection approach" refers to the approach that experiences the most delay.

[5] Restricted movements: Northbound = left, thru, and right. Southbound = thru. Eastbound = right. Westbound = left.

could block access to 141st Street. The Brainard Avenue eastbound approach queues block access to Burger King, the Metra parking lot, and the Hegewisch Train Station.

Figure 8. Maximum Vehicle Queues for the 2022 and 2050 PM Peak Hour Period

When a train uses the NS crossing, roadway users at the Burnham Avenue/Brainard Avenue intersection may experience a delay of up to six minutes before the queues clear in 2022. In 2050, it may take more than 16 minutes for the queues to clear and for the roadway network to return to its normal operation levels of LOS C. As mentioned in the "Existing Conditions" section, there are two alternative routes to using the rail crossings (see *Figure 1*). Based on Google Maps distances, when the rail crossings are in use during the PM peak hour, the alternative routes can add 22 minutes or more to the travel time.

In conclusion, although existing and future conditions result in acceptable LOS, intersection operations degrade when trains use the rail crossings. Currently (2022), vehicles experience delays of up to six minutes or more than 22 minutes if an alternate route is used. In the future (2050), roadway users on Burnham Avenue are projected to experience force-flow conditions (LOS F) when a train uses the rail crossings. Due to the downed gate time and railroad-induced congestion, roadway users and proximate residents may experience delays lasting 16 minutes or longer, blocking access to two local roads and five commercial properties – resulting in residential, commercial, and Hegewisch Train Station ingress/egress mobility restrictions.

Mass Transit Services

The Burnham Avenue northbound approach and the Brainard Avenue eastbound approach are a part of the Hegewisch Train Station intermodal connector (see *Figure 1)*. Therefore, these avenues are critical to the commuters within the project study area. Pace Suburban Bus and the CTA provide transit service to commuters within the project study area, as shown in *Figure 8*. The over four hours of downed gate time and railroad-induced congestion affect two Pace Bus routes – routes 358 (Torrence) and 364 (159th Street) – and CTA bus route 30.

CTA bus route 30 starts in Avalon Park, Chicago (about 9 miles from the rail crossings) and ends in the Hegewisch neighborhood of Chicago. The bus does not traverse the rail crossings but utilizes the southbound and eastbound approaches of the Burnham Avenue/Brainard Avenue intersection. Therefore, CTA bus route 30 is impacted by the railroad-induced congestion (see *Figure 9* for reference). Pace bus route 358 begins and ends at the Chicago Heights Transportation Center (about 15 miles from the rail crossings). Pace bus route 364 begins and ends at the Harvey Transportation Center/Park and Ride (approximately 7.8 miles from the rail crossings). Pace bus route 364 provides only weekend service to the project study area. Pace bus routes 358 and 364 experience service delays when trains use the rail crossings. The buses are forced to wait for the railroad-induced congestion to clear before continuing along their fixed scheduled route at normal travel speeds, which negatively impacts riders at every stop within the bus routes. With a total average annual daily ridership of over 120 passengers within the project study area and a minority and low-income population of 69% and 22%, respectively, the railroad-induced congestion leads to mass transit delays that extend beyond the project study area due to delayed connections along each transit service's complete route.

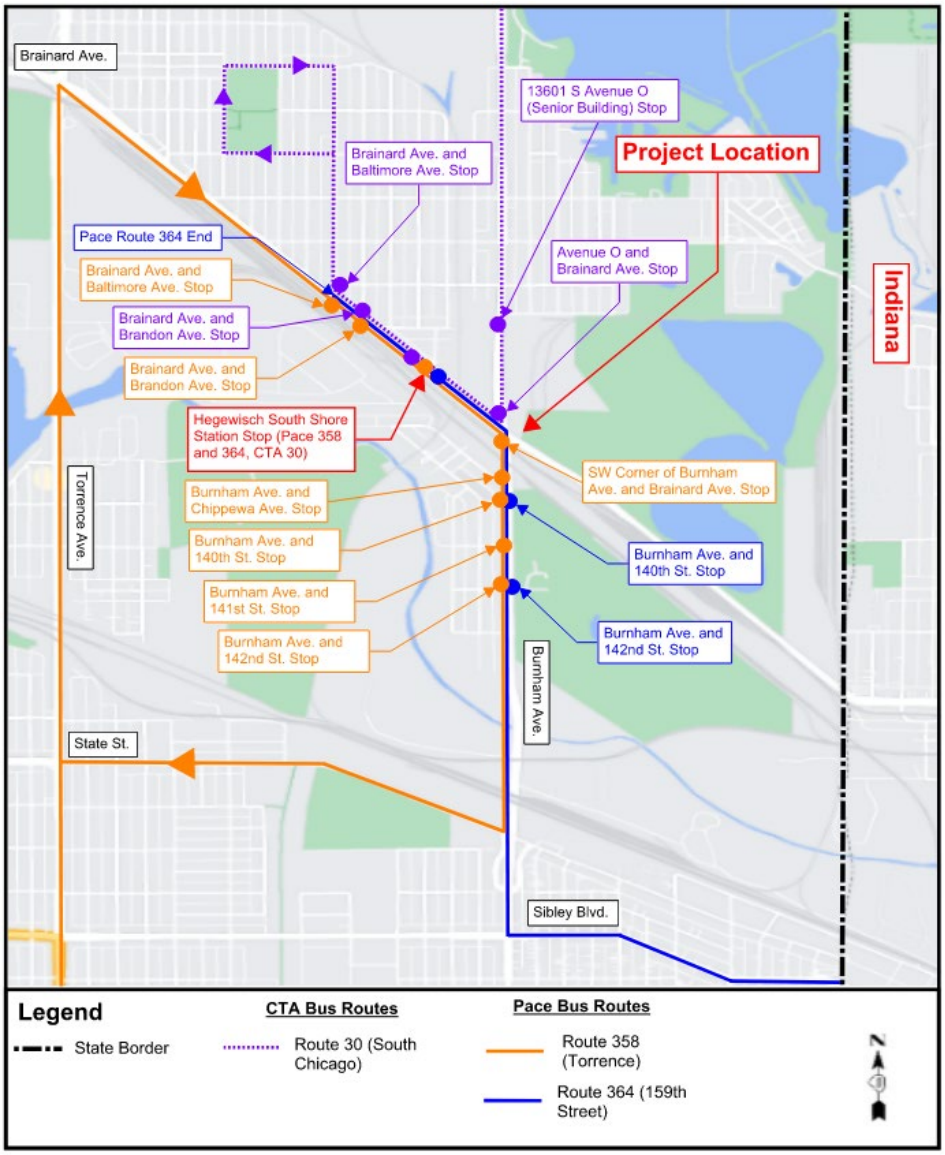

Figure 9. CTA and Pace Bus Routes

Non-Vehicle Roadway Users

Creating "Complete Streets," which serve all anticipated roadway users – including pedestrians, bicyclists, persons with mobility impairments, and transit riders – is an important goal to help achieve a modern, efficient, and sustainable transportation system. Transportation barriers can discourage mobility, encourage single-occupancy vehicle trips, or entirely prevent trips for pedestrians, bicyclists, and mobility-impaired users. The IDOT Complete Streets Policy states that "bicycle and pedestrian ways shall be given full consideration in the planning and development of transportation facilities" (IDOT, 2010).

Six pedestrians and 10 bicyclists were observed at the Burnham Avenue/Brainard Avenue intersection during the March 2022 16-hour traffic counts. The Brainard Avenue mid-block pedestrian signal is approximately 750-feet northwest of the Burnham Avenue/Brainard Avenue

intersection. One hundred and twenty-five pedestrians and 19 bicyclists were observed at the mid-block pedestrian signal during the March 2022 count. As mentioned in the "Existing Conditions" section, Burnham Avenue and Brainard Avenue have two 10-foot wide travel lanes in each direction and a 4- to 6-foot-wide sidewalk but do not include bicycle facilities. Therefore, bicyclists traveling through the project study area must either share the travel lanes with the vehicles or the sidewalk with pedestrians. Bicycle lanes are recommended at a posted speed of 40 mph and an existing ADT of 9,600 (BDE Figure 17-2.A). Based on calculations per IDOT's bike LOS calculator (BDE Form 1703), the existing conditions result in a bike LOS E or worse. Consequently, bicyclists that utilize Burnham Avenue or Brainard Avenue within the project study area experience high levels of traffic stress.

Transportation and Multimodal Demands Conclusion

Ultimately, the over four hours of downed gate time and railroad-induced congestion lead to mobility restrictions that result in longer and less reliable travel times for all roadway users. Therefore, to fully actualize the objectives of IDOT's Complete Streets guidelines, there is a need to improve mobility and congestion so all vehicle and non-vehicle roadway users can have reliable travel times and safely cross the rail crossings.

3.2 Safety

The rail crossings at Burnham Avenue create inherent conflict points between trains and users of the existing roadway and pedestrian facilities. Therefore, improving overall safety at the rail crossings is critical to the project need.

Roadway User Crash Summary

From 1976 to 2023, the Federal Railroad Administration (FRA) recorded 26 train-roadway user crashes at the rail crossings, as summarized in *Table 6* (USDOT, 2023). The two recorded fatalities involved a passenger car struck by a train while attempting to go around the downed gates. 88% (7 out 8) of the recorded vehicle injuries involved a passenger car or truck struck by a train while attempting to go around the downed gates. The other recorded vehicle injury involved a passenger car struck by a train while stopped on the crossing. Two of the three non-vehicle injuries involved a pedestrian struck by a train while stopped on the crossing. The third non-vehicle injury involved a motorcycle struck by a train while attempting to go around the downed gate. According to the FRA data, from 2015 to July 13, 2023, one train-vehicle crash occurred on the NICTD crossing in 2022. The crash did not result in a fatality or injury.

Table 6. Summary of FRA Train-Roadway User Crashes by Crossing[1]

Data Type	NS Crossing		NICTD Crossing		Total	
	Vehicle	Non-Vehicle	Vehicle	Non-Vehicle	Vehicle	Non-Vehicle
Fatalities	1	0	1	0	2	0
(Year)	*(1981)*		*(1989)*			
Injuries	1	3	7	0	8	3
(Years)	*(1994)*	*(1977, 2007, 2015)*	*(1976, 1977, 1980, 1981, 1983x2, 1992)*			
Crashes	7[A]	3[B]	16[C]	0	23	3

[1] No vehicle or non-vehicle crashes were reported at the CSX crossing.
[A] NS crossing vehicle crash years = 1976, 1981, 1983, 1984, 1989, 1994, 2015.
[B] NS crossing non-vehicle crash years = 1977, 2007, 2015.
[C] NICTD crossing vehicle crash years = 1976x2,1977x2, 1978, 1980, 1981x3, 1983x3, 1989, 1992, 1994, 2022.

Despite only one recorded train-roadway user crash since 2015, the March 2022 intersection videos indicate that a safety concern still exists. The March 2022 videos showed multiple unsafe vehicular movements when the gates were down. These included vehicles weaving around the downed gates and median islands, making mid-intersection U-turns, and bypassing stopped vehicle queues to make left or right turns. Therefore, the IDOT crash data analysis is inclusive of the rail crossings' influence area to further substantiate the need. The rail crossings' influence area is defined as the maximum extent of vehicle queue lengths on Burnham Avenue and Brainard Avenue, as shown in *Figure 9*.

IDOT Crash Data Analysis

IDOT provided vehicle crash data for a 5-year study period from 2017 to 2021 – 56 vehicle crashes were recorded within the rail crossing's influence area. Of the 56 crashes, 13% (7 crashes) were classified as directly related to the rail crossings[6]. In addition, 30% (17 crashes) were front-to-rear crashes that were indirectly related to the rail crossings. These front-to-rear crashes are indirectly related to the rail crossings because they are attributed to delays and unexpected stops[7]. As discussed in Section 3.1, traffic analyses indicate that the over four hours of downed gate time at the rail crossings is the leading cause of traffic congestion and unexpected stops at the signalized intersection of Burnham Avenue and Brainard Avenue and results in railroad-induced congestion at LOS F. No substantive relationship was found between the crashes and the rail crossings for the remaining crashes. Therefore, the remaining crashes – 32 in total – were considered non-related to the rail crossings. *Figure 10* presents the IDOT vehicle crash map in relation to the rail crossings.

[6] The crash description includes the rail crossings and/or the gates as the recorded traffic control device. The gates as the recorded traffic control device indicates that the gates were down during these crashes, and the crashes were within close proximity to the rail crossings.
[7] Per the Highway Safety Manual (HSM), "unexpected stops on approach" is a typical contributing factor for rear-end crashes at signalized intersections (HSM 6.2.2).

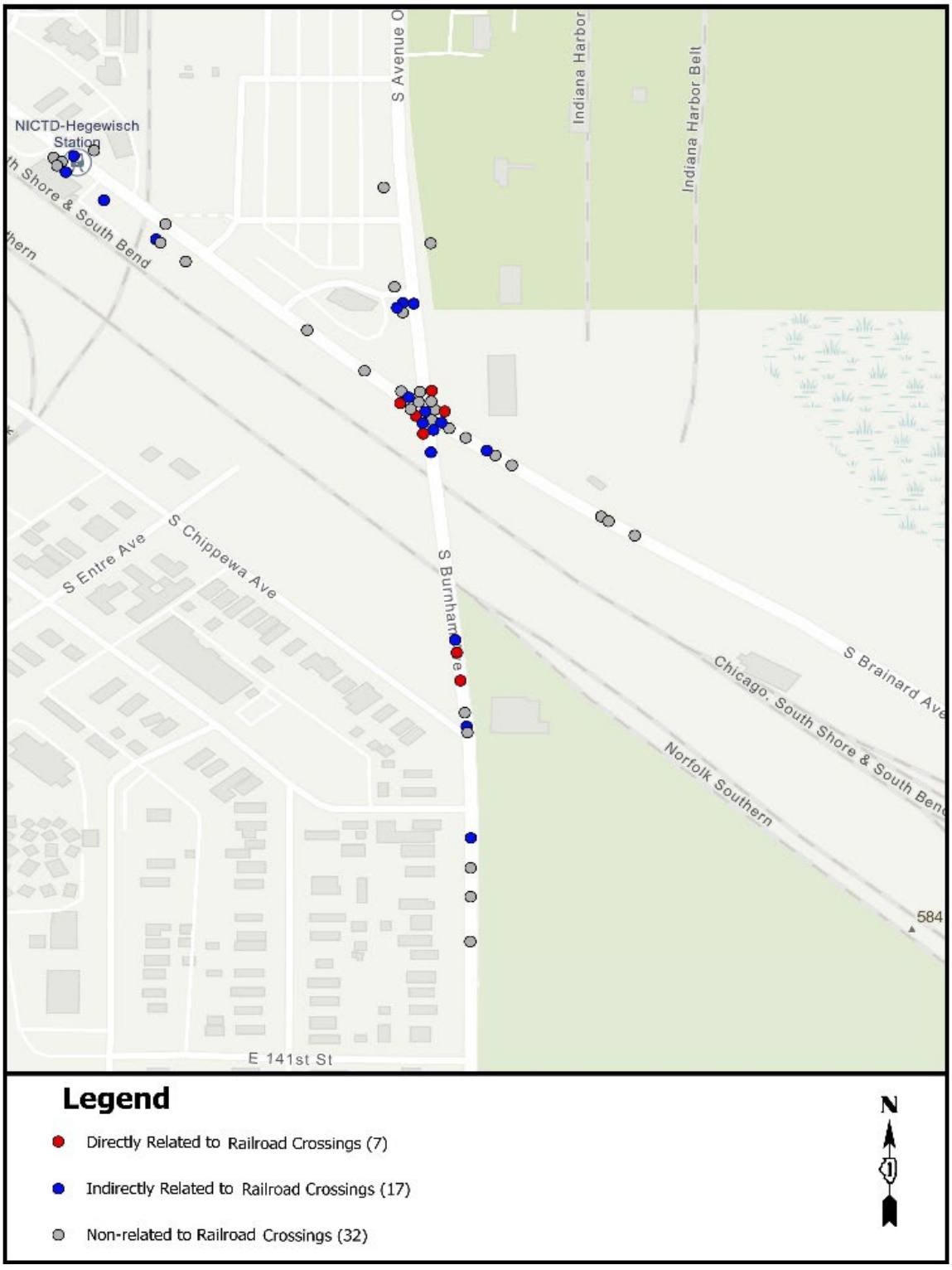

Figure 10. Crash Location Map in Relation to the Rail Crossings

Figure 11 and *Table 7* summarize the various crashes by collision and injury type within the rail crossings' influence area. One fatal crash was identified during the study period that involved a

passenger car hitting a fixed object. The fatal crash had no apparent connection to the rail crossings. 33% of the severe and moderate injury crashes were directly related to the rail crossings. In addition, 17% of the severe and moderate injury crashes were indirectly related to the rail crossings.

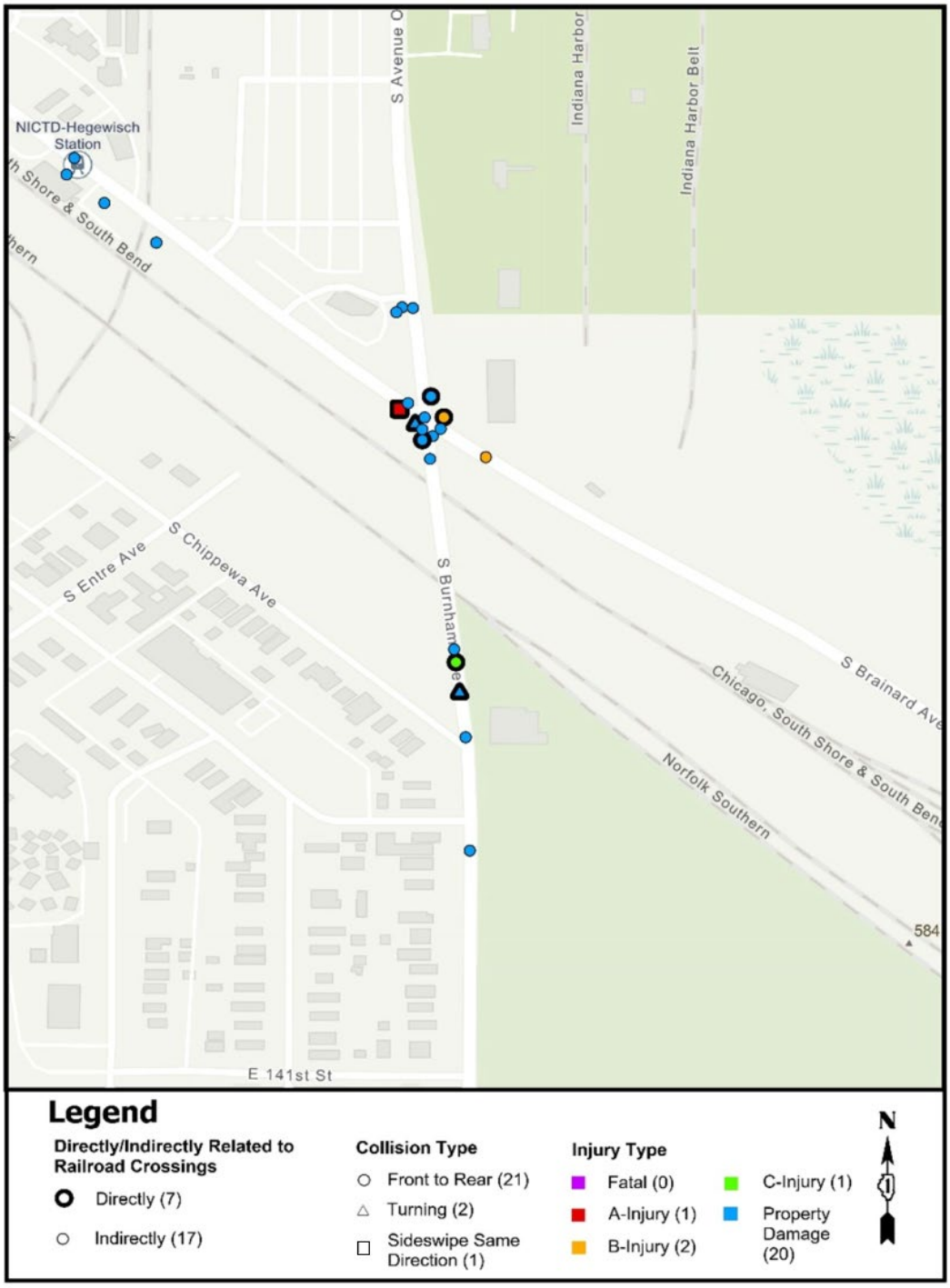

Figure 11. Collision and Injury Type Map in Relation to the Rail Crossings

Table 7. Summary of IDOT Fatalities and Injuries in Relation to the Rail Crossings

Injury Type	No. of Crashes			Total	% of Crashes
	Directly Related	Indirectly Related	Non-Related		
Fatal Crashes	0	0	1	1	2%
Type "A" (Severe Injury)	1	0	2	3	5%
Type "B" (Moderate Injury)	1	1	1	3	5%
Type "C" (Possible Injury)	1	0	5	6	11%
Property Damage Only (PDO)	4	16	23	43	77%
Total	**7**	**17**	**32**	**56**	**100%**

Safety Conclusion

In conclusion, there is a safety need since the over four hours of downed gate time and railroad-induced congestion at the rail crossings contribute to the severity and number of crashes within the rail crossings' influence area. In addition, if no improvements are made, and the Burnham Avenue northbound approach traffic grows at the 2050 CMAP-projected rate of 44.4%, the number of rail crossing-related crashes will likely worsen over time.

4. References

Burnham. 2023. Questions with Answers for Burnham/Brainard Project. The Village of Burnham (Burnham). Burnham, IL.

CMAP. 2017.CMAP Data Hub: Motorist Grade Crossing Delay. The Chicago Metropolitan Agency for Planning (CMAP). Retrieved August 16, 2022.

CMAP. 2019. Northeastern Illinois Priority Grade Crossings. The Chicago Metropolitan Agency for Planning (CMAP). Chicago, IL.

CMAP. 2022. ON TO 2050 Plan. The Chicago Metropolitan Agency for Planning (CMAP). Chicago, IL.

CMAP. 2023. Northeastern Illinois Infrastructure Initiative: Invest Here and Invest Everywhere. The Chicago Metropolitan Agency for Planning (CMAP). Chicago, IL.

FEMA. 2023. FEMA Flood Map Service Center (Last Updated August 19, 2008). The Federal Emergency Management Agency (FEMA). Accessed September 27, 2023.

FHWA. 2023. National Highway System (NHS): Intermodal Connectors – Illinois (Last Updated June 22, 2018). The US Department of Transportation Federal Highway Administration (FHWA). Accessed February 23, 2023.

FPDCC. 2023. FPDCC Map. The Forest Preserve District of Cook County (FPDCC). Accessed November 20, 2023.

IDOT. 2010. Illinois Complete Street Law (Illinois Highway Code: Sec. 4-220). The Illinois Department of Transportation. Springfield, IL.

IDOT. 2023. Getting Around Illinois: Annual Average Daily Traffic. The Illinois Department of Transportation. Springfield, IL.

IDNR. 2023. Biological Significant Streams: Mapping Tool (Last Updated July 5, 2020). The Illinois Department of Natural Resources (IDNR). Accessed August 2, 2023.

Metra. 2022. 2020 State of the System Report. Metra: Division of Strategic Planning and Performance. Retrieved July 25, 2023.

NAS. 2022. National Academies of Sciences, Engineering, and Medicine (NAS). Highway Capacity Manual 7th Edition: A Guide for Multimodal Mobility Analysis. Washington, DC.

NICTD. 2016. Proposed Bicycle Path Across NICTD Railroad Tracks. The Northern Indiana Commuter Transportation District (NICTD). Retrieved July 17, 2023.

NICTD. 2023. My South Shore Line: Train Schedules (Last Updated November 15, 2022). The Northern Indiana Commuter Transportation District (NICTD). Accessed February 23, 2023.

RTAMS. 2023a. CTA Ridership.RTAMS: CTA Ridership. The Regional Transportation Authority Mapping and Statistics (RTAMS). Retrieved April 13, 2023.

RTAMS. 2023b. RTAMS: Pace Bus Routes: 358 Torrence. The Regional Transportation Authority Mapping and Statistics (RTAMS). Retrieved April 13, 2023.

RTAMS. 2023c. RTAMS: Pace Bus Routes: 364 159th Street. The Regional Transportation Authority Mapping and Statistics (RTAMS). Retrieved April 13, 2023.

USDOT, 2023. Highway-Rail Grade Crossing Accident Data. The United States Department of Transportation (USDOT). Retrieved July 14, 2023.

US EPA. 2019. Community Guide to Environmental Justice and NEPA Methods. The United States Environmental Protection Agency (US EPA). Retrieved March 23, 2023.