MEMORANDUM

Salem Parkway/Kroc Center Access Feasibility Study: Draft Transportation Alternatives and Evaluation Report

PREPARED FOR: Salem Parkway/Kroc Center Advisory Groups

PREPARED BY: Sumi Malik, AICP
Dave Simmons, P.E.

DATE: November 17, 2012

Background

This technical memorandum describes the concepts developed for the Salem Parkway/Kroc Center Access Feasibility Study, and the results of the evaluation process performed on the three alternatives that advanced from the concept phase into alternatives. The technical team used evaluation criteria previously established and documented in "Draft Evaluation Framework," dated August 10, 2012. Findings from the evaluation process are included. This memorandum will assist the Technical Advisory Group (TAG) and Stakeholder Advisory Committee (SAC) in weighing benefits and limitations of each alternative and selecting one preferred facility recommendation. This memorandum also includes visualizations to help illustrate the alternatives and planning level cost estimates.

The purpose of this evaluation process is not to be an exhaustive study of each alternative's benefits and impact, but to highlight relative differences between alternatives to aid decision-making.

The evaluation criteria used to evaluate project alternatives contain a mixture of quantitative and qualitative measures. Criteria are organized into eight objectives, listed below:

1. Safety for Users of the Facility
2. Directness of Route
3. Facility integrates with the larger multi-modal system
4. Property and Environmental impacts
5. Transportation and Utility impacts
6. Public Support
7. Cost
8. Ability to Phase Project

The SAC weighted each criterion indicating level of importance. Appendix B contains the evaluation including SAC weighting.

Overview of Concepts Eliminated

Originally, six concepts were developed by the technical team and presented to the TAG and SAC. Three concepts were eliminated by the SAC. These concepts are described below.

Concept PV

Concept PV (Appendix A) provides an overcrossing of both Salem Parkway and the railroad tracks. The west touchdown of this concept would be a ramp, originating near Pleasant View Drive NE, running along the Salem Parkway multi-use path. Concept PV would span over Salem Parkway, Mainline Drive and continue on a bridge above/alongside Pleasant View Drive over the railroad tracks and Bill Frey Drive. The east touchdown point for the trail would be a ramp down at the north parking and landscaped area of the Kroc Center. This concept was eliminated based on the significant impact to overhead high voltage power lines located along the railroad tracks and Pleasant View Drive.

Concept SL

Concept SL (Appendix A) provides an overcrossing of both Salem Parkway and the railroad tracks. The west touchdown of this concept would be a ramp near Brooks Avenue NE, running along the Salem Parkway multi-use path. Concept SL would span over Salem Parkway and Mainline Drive. The trail would continue on an elevated berm over the industrial area, travel on a bridge over the railroad, with the east touchdown point by the Kroc Center made up of a loop ramp that touches down between the railroad tracks and Bill Frey Drive. Users would cross Bill Frey Drive using a crosswalk. This concept was eliminated based on its similarity to Concept SK (described below) which follows a similar alignment and provides similar connectivity.

Concept M

Concept M (Appendix A) provides an at-grade trail adjacent to Mainline Drive and Salem Parkway between Hyacinth Street NE and Cherry Avenue NE. This concept could be combined with components depicted in the other concepts for crossing the Salem Parkway and the railroad tracks. The at-grade trail by itself did not provide a new connection to the Kroc Center. This concept was eliminated by the SAC because it did not provide a new connection between Keizer and the Kroc Center and when combined with other crossing elements of the Parkway and railroad, did not provide a solution that was distinct from the concepts advanced as alternatives.

Descriptions of the Alternatives Forwarded

Three concepts were forwarded to be evaluated as alternatives: Alternatives H, UC, and SK. These alternatives are described below.

Alternative H

Alternative H (Appendix A) implements a bicycle/pedestrian connection that is already planned in the City of Salem's Transportation System Plan (TSP), however the Salem TSP shows this connection as part of the future extension of Salem Industrial Drive street improvements with sidewalks and on-street bike lanes. Alternative H would provide a separated 12-foot wide multi-use path. Alternative H provides an at-grade connection from Hyacinth Street to Bill Frey Drive, including a new bridge across Claggett Creek. Alternative H connects to existing multi-modal facilities: Hyacinth Street NE southeast of Salem Parkway has complete bike lanes and sidewalks on both sides, and north of Salem Parkway, Hyacinth Street NE becomes Verda Lane, which also has sidewalks and bike lanes on both sides up to 18th Ave NE; north of 18th Ave, there are no sidewalks and narrow shoulders or bike lanes. The Alternative H path would be between the Burlington Northern Santa Fe (BNSF) railroad tracks and the Claggett Creek conservation/wetland area, using part of an easement that is reserved for the construction of

Salem Industrial Drive extension to connect to Hyacinth Street NE. It is important to note that Alternative H is not dependant on funding or construction of the planned extension of Salem Industrial Drive NE, nor is the extension of Salem Industrial Drive NE part of Alternative H. See Appendix A for a cross section illustrating the trail next to the railroad tracks and the future roadway.

Starting in the Keizer neighborhoods to the northwest, a bicyclist or pedestrian would use the existing multi-use path along Salem Parkway, cross at the Hyacinth Street NE/Verda Lane NE and Salem Parkway signalized intersection, travel east along Hyacinth Street NE and then turn right onto the Alternative H path. Users would cross Bill Frey Drive at a marked crossing with a median refuge to access the Kroc Center. See Appendix A for a graphic illustrating this crossing. Alternative H has the potential to create activity in the Claggett Creek wetlands area.

The planning level cost estimate for Alternative H is $1.5 to $2.0 million (2012 dollars). Anticipating the future extension of Salem Industrial Drive, a more efficient, long-term approach could be to construct the bridge across Claggett Creek that would accommodate both the path and the future roadway. Constructing the wider bridge for both the path and future extension of Salem Industrial Drive could realize efficiencies by combining the permitting and construction process. The incremental increase in cost to construct Alternative H with a bridge over Claggett Creek that would accommodate both the path and future roadway is approximately $1.8 million. Alternative UC

Alternative UC (Appendix A) provides an overcrossing of Salem Parkway, and an undercrossing of BNSF railroad tracks, and an at-grade multi-use path parallel to the railroad tracks, with an at-grade crossing of Bill Frey Drive to get to the Kroc Center. It is compatible with the planned Salem Industrial Drive extension in the City's TSP. Alternative UC would increase activity at the Claggett Creek wetland area and the bridge over the Salem Parkway would serve as a gateway and visual cue to the Kroc Center area.

Starting in the vicinity of Shady Lane NE in Keizer, the approach ramp for the crossing would be on a berm (with a retaining wall next to Shady Lane) and be elevated over the multi-use path adjacent to Salem Parkway, Salem Parkway, and Mainline Drive and then descend on a berm/fill structure. The bridge over Salem Parkway would be a concrete box girder. East of Salem Parkway and Mainline Drive, Alternative UC's path descends and becomes at-grade briefly in the industrial area south of Salem Parkway. The trail ramps down under the railroad before turning parallel to the railroad and traveling southerly toward Bill Frey Drive. See Appendix A for a ground level perspective of the railroad tracks undercrossing and Appendix A for a profile at the undercrossing. Similar to Alternative H, users would cross Bill Frey Drive at a marked crossing with a median refuge to get to the Kroc Center. See Appendix A for a bird's eye view of the trail.

The planning level cost estimate for Alternative UC is $8.5 to $9.5 million.

Alternative SK

Alternative SK (Appendix A) provides an overcrossing of both Salem Parkway and the railroad tracks. See Appendix A for a bird's eye view of the trail as it crosses over the Parkway. The west touchdown of Alternative SK would be a ramp, originating at Pleasant View Drive NE, running along the Salem Parkway multi-use path. The bridge over Salem Parkway would be a concrete box girder. Like Alternative UC, the single span of Salem Parkway would serve as a gateway

and visual cue to the Kroc Center area. An additional ramp could be constructed to provide access to Mainline Drive (not included in planning level cost estimates and shown in Appendix A with dotted line to indicate it is optional). A berm would support the trail over the industrial area, and the east touchdown point by the Kroc Center would be made up of a loop ramp that touches down between the railroad tracks and Bill Frey Drive. See Appendix A for a cross section of the trail on the berm. See Appendix A for a bird's eye view of the trail as it crosses over the tracks and loops down to Bill Frey Drive. Users of the crossing would be elevated for a span of 3,710 feet, or 0.7 miles. Users would cross Bill Frey Drive using a crosswalk, similar to Alternatives UC and H.

The planning level cost estimate for Alternative SK is $14 - $16 million.

Evaluation of Alternatives

Appendix B contains a matrix for comparing the alternatives, including weighting established by the SAC and rationale for each alternative's evaluation by criterion. Below is an overview of the evaluation, which highlights key findings.

Of the eleven major criteria and sub-criteria, the SAC weighted the following criteria the highest, in order:

- Criterion 1a: Minimizes the potential for vehicle conflicts at facility crossings;
- Criterion 1c: Personal safety and security; and
- Criterion 3: Facility ties in with existing and planned bicycle, pedestrian, transit and roadway system.

Through the weighted evaluation, Alternative H scored the most points, with an overall score of 3.28. Alternative UC scored nearly the same, with a score of 3.27, and Alternative SK scored the least, with a score of 2.51.

Alternative H

Alternative H scores well because it is the least cost, has few property or utility impacts, and from a user's perspective, would have full sight of the path length and would be at ground level, as opposed to an isolated elevated or under crossing that are part of the other two alternatives.

Alternative H scores worst with respect to the criterion with the greatest weight, Criterion 1a: Minimizes the potential for vehicle conflicts at facility crossings, because it is the only alternative with an at-grade crossing of Salem Parkway. The other two alternatives provide a bridge over Salem Parkway. This alternative would also utilize the at-grade signalized crossing at Hyacinth Street. It should be noted that signalized intersections provide a dedicated space for pedestrians to cross (crosswalk) and the signal controls opposing auto traffic movements, which reduces the potential for pedestrian and automobile conflicts relative to unsignalized intersections. Bicyclists from the Salem Parkway path would either cross Salem Parkway using the crosswalk or cross the intersection using the bicycle lanes on Hyacinth St with the flow of automobiles—a signalized intersection similarly reduces the potential for bicyclist and automobile conflicts relative to an unsignalized intersection. Vehicles travel on Salem Parkway at high speeds, and on occasion run red lights traveling westbound on Salem Parkway. Warning signals have been added 1500 feet north of the Salem Parkway/Verda Lane

intersection to alert southbound drivers on the Parkway to the traffic light ahead, but the potential for conflict remains, creating a potential safety concern for pedestrians and cyclists using the crosswalk. Alternative H would increase the number of pedestrians and cyclists using this crosswalk, which increases the potential for conflict associated with this alternative.

While this alternative is lower cost, it does not provide the level of comfort and safety benefits of a grade separated crossing at Salem Parkway. Alternative H would introduce more pedestrians and bicyclist crossing at the Hyacinth Street NE/Verda Lane NE and Salem Parkway intersection, increasing the potential for conflicts. It is the first signalized intersection drivers encounter after exiting Interstate 5, and motor vehicle speeds are high on this section. While some design elements may be feasible to improve the level of comfort and safety for non-motorized users of this intersection, conflict points would remain.

Alternative UC

Alternative UC scores well with respect to Criterion 1a: Minimizes the potential for vehicle conflicts at facility crossings because users would have no controlled at-grade crossings, and only one uncontrolled at-grade crossing at Bill Frey Drive. Alternative UC provides the most direct line of sight for the user between the Salem Parkway off-street path and the path that would be constructed in the Claggett Creek wetlands area. Alternative UC also scores well because it ties in with existing and planned bicycle and pedestrian facilities, including constructing part of the path planned for the Claggett Creek wetlands area.

Alternative UC scores moderately relative to the other two alternatives for Criterion 1c: Personal safety and security. Both the elevated and under crossings are somewhat isolated crossings; however, the section where the elevated crossing transitions to the underground crossing provides an opportunity for a user to get off the path, if necessary. The cost estimate for Alternative UC is higher than the cost estimate for Alternative H and lower than the estimate for Alternative SK.

Alternative SK

Alternative SK scores well with respect to Criterion 1a: Minimizes the potential for vehicle conflicts at facility crossings because users would have no controlled at-grade crossings, and only one uncontrolled at-grade crossing at Bill Frey Drive. Alternative SK scores well with respect to Criterion 4b: Minimizes impacts to nearby wetlands, Claggett Creek, and other natural resources in the study area because it is the furthest away from those resources.

While the crossing is fairly direct between the intersection of Brooks Avenue, Candlewood Drive, and the Kroc Center, the crossing itself is circuitous because of the two ramps at each touchdown point. It scores the worst with respect to Criterion 1c: Personal Safety and Security because the user would be isolated on ramps and elevated structures for the entire crossing, with no options to exit the path, and little sight distance of the entire crossing due to the ramps. Alternative SK is also the highest cost.

Comparison of Travel Distances

The table below compares travel distances to the Kroc Center from a starting location where Brooks Ave (in Keizer) meets the multi-use path parallel to Salem Parkway. Appendix C provides illustrations of the travel distances.

Alternative	Feet	Miles
Alt H	6,490	1.23
Alt UC	4,360	0.83
Alt SK	3,920	0.74
No build - via Salem Industrial Drive	8,815	1.67
No build - via Hyacinth/Portland Rd.	11,957	2.27

Next Steps

The Project Management Team (PMT), the TAG and SAC will review and revise this draft evaluation report. The evaluation is not a decision-making tool itself, but provides an evaluation of alternatives against objective criteria to facilitate a discussion of each of the alternatives' strengths and weaknesses. These alternatives and evaluation results will also be presented at a public workshop for feedback. Ultimately, the SAC will recommend a preferred alternative and the project team will refine the engineering, estimate costs, and develop graphics.

Appendices

A – Concept and Alternative Figures
B – Evaluation Matrix
C – Travel Distances from midpoint of Salem Parkway multi-use path to Kroc Center
D – Sample Photographs of Bridges

Appendix A – Figures

Appendix A – Concept and Alternative Figures

List Figures

PLEASANT VIEW DR. NE

SHADY LN. NE

SALEM PKWY.

PLEASANT VIEW DR. NE

TOTAL PATH
LENGTH: 2100'

14' x 1040'
BRIDGE

BILL FREY DR. NE

KROC
CENTER

BNSF RAILROAD TRACKS

PV 5+00

PV 10+00

PV 15+00

PV 20+00

SCALE IN FEET
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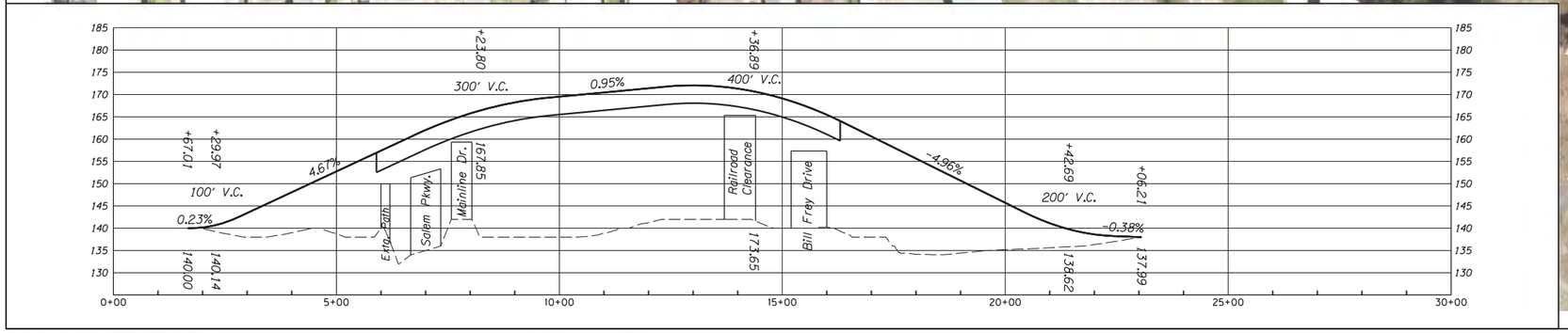

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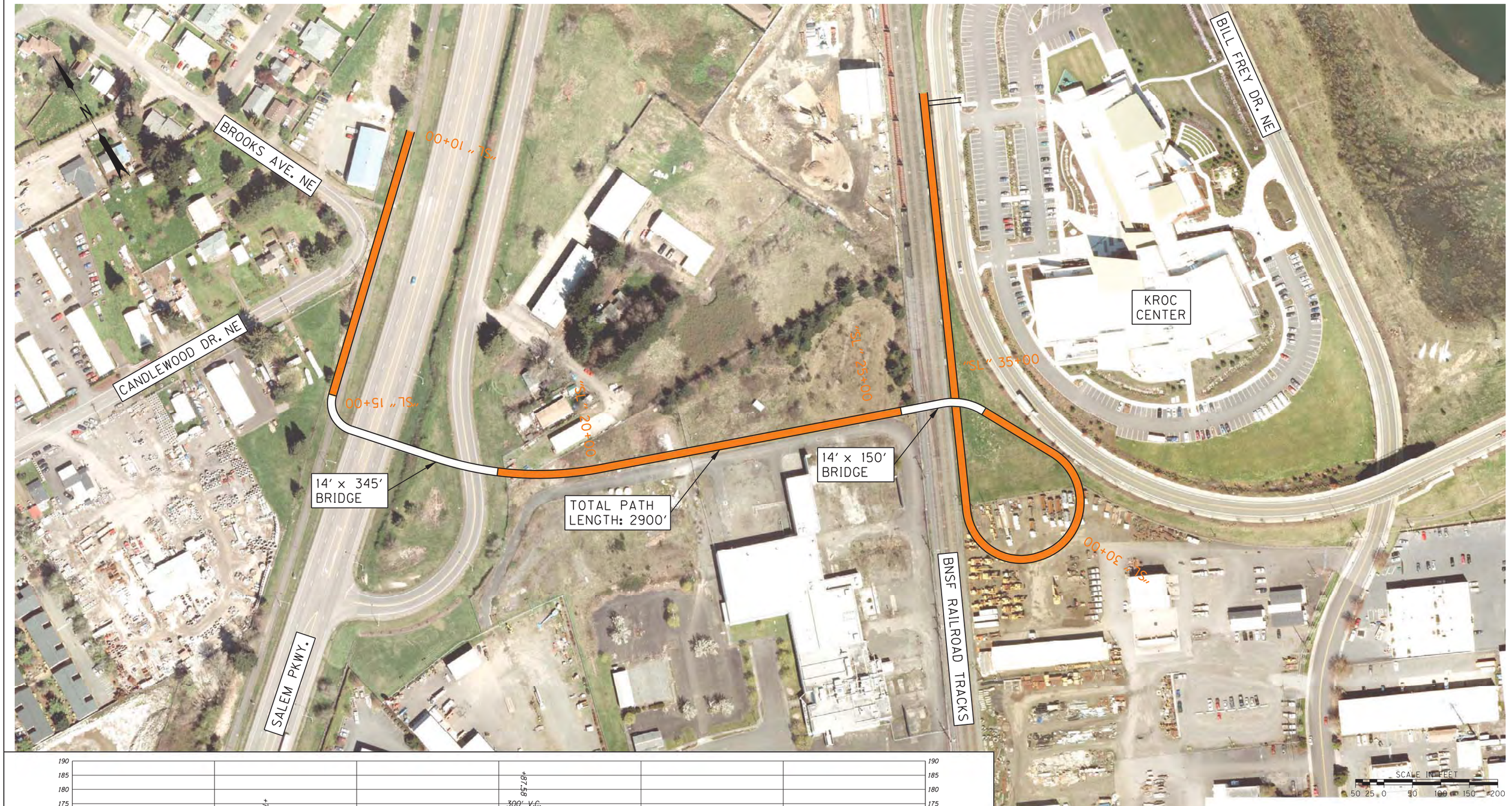

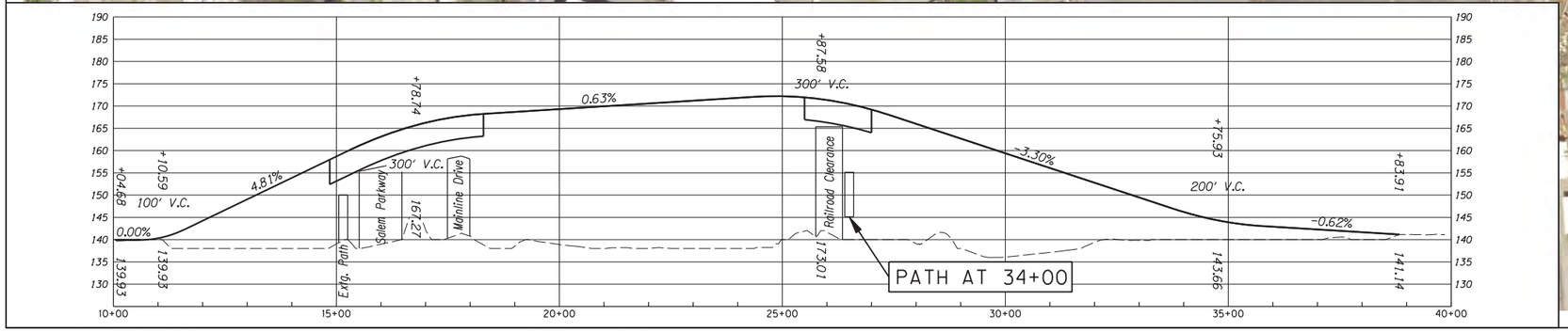

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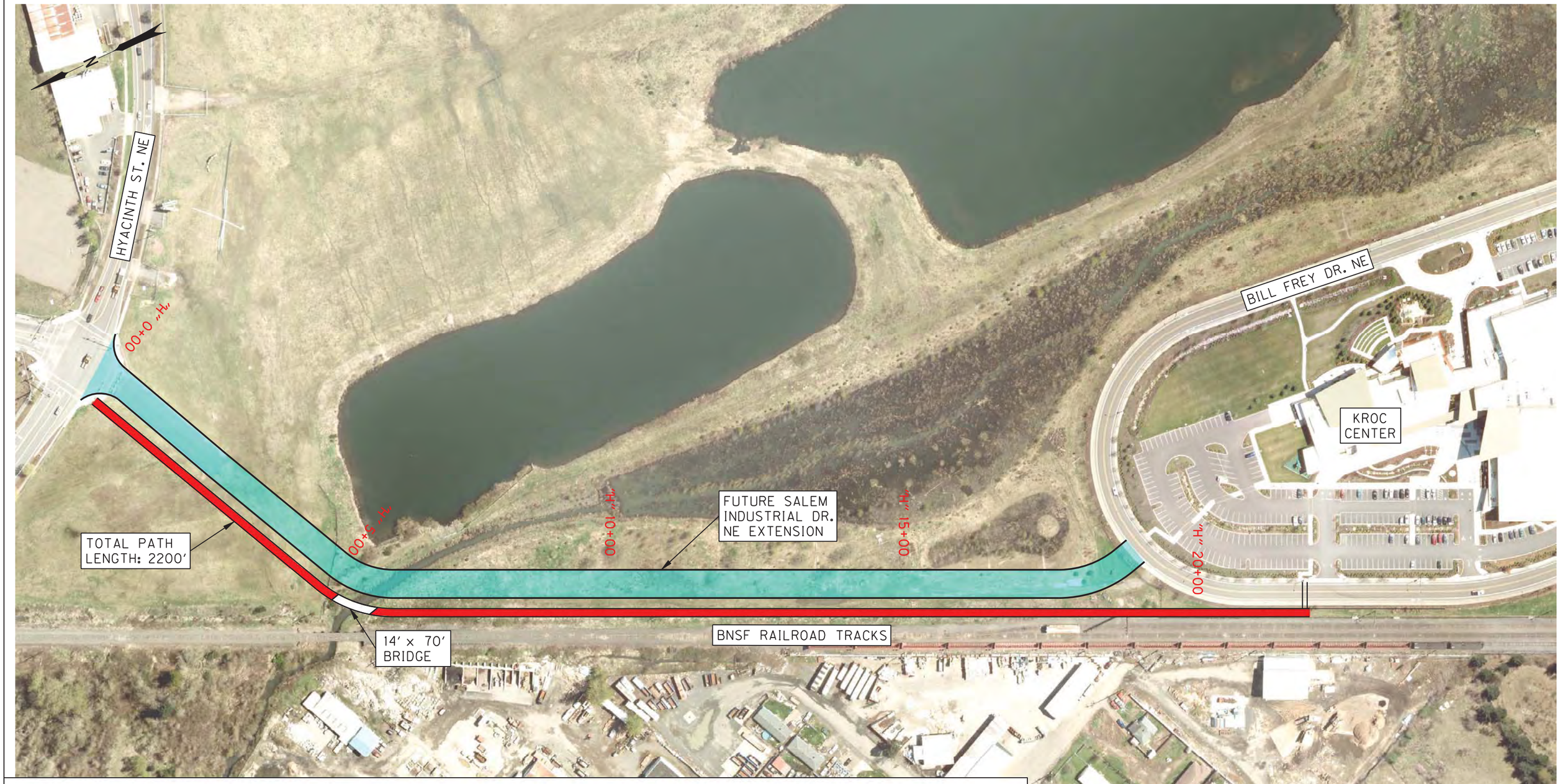

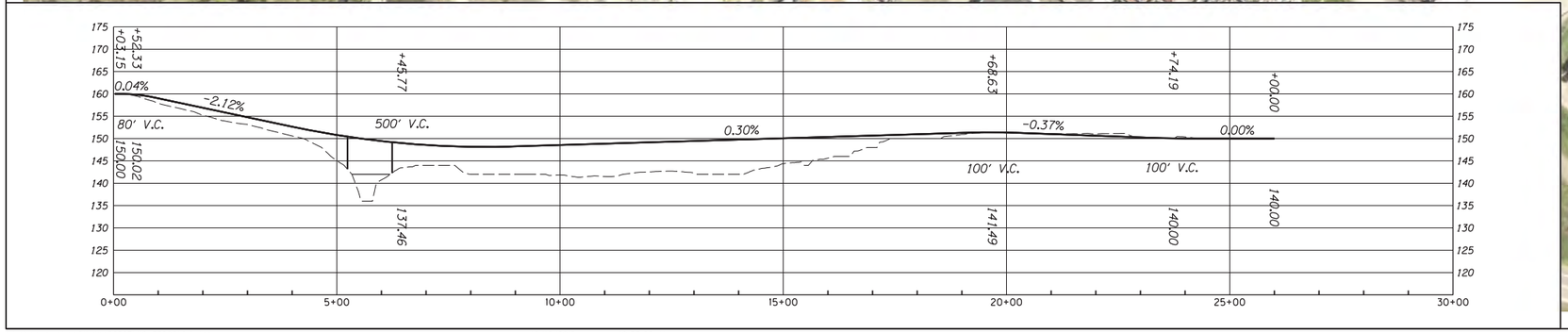

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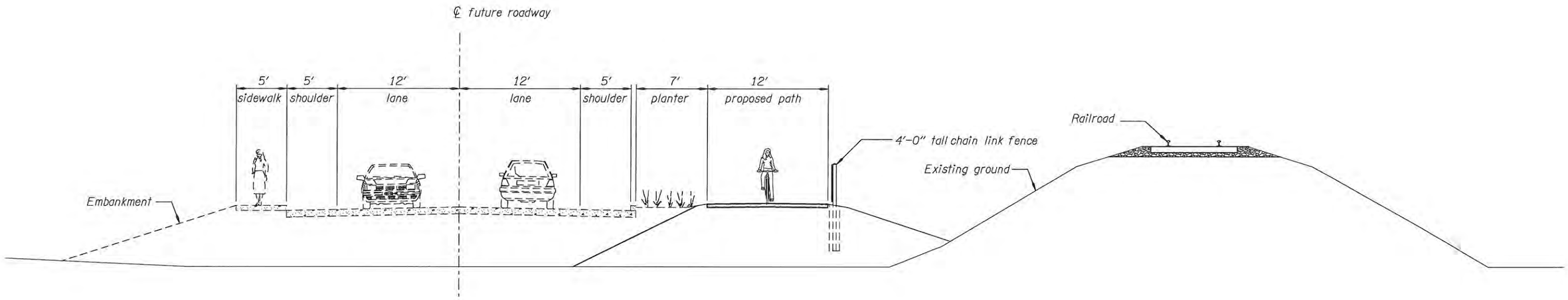

SECTION SOUTH OF CLAGGETT CREEK

Scale: 1"=10'

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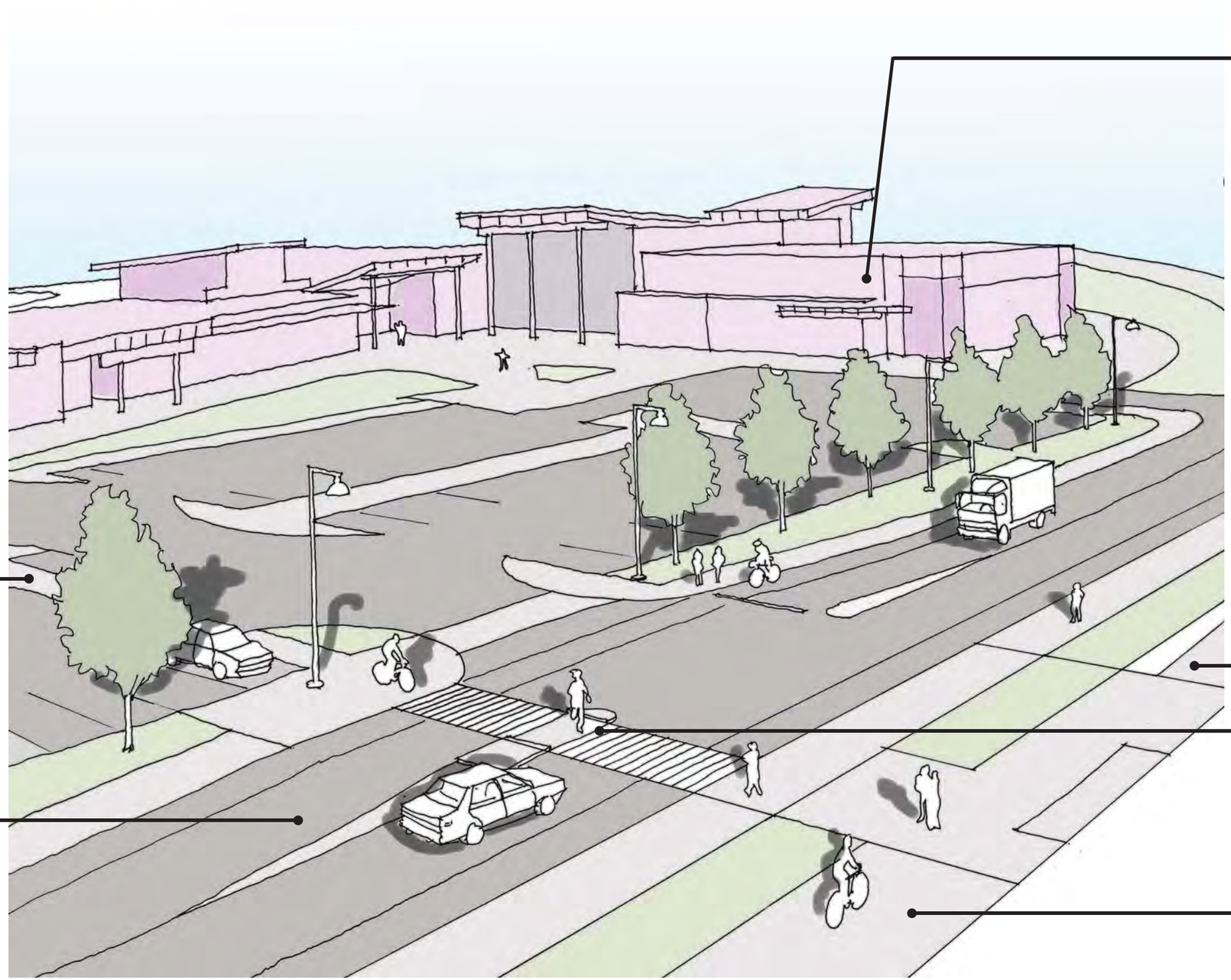

Perspective of Crosswalk – Alternative H, UC, SK

Salem Parkway/Kroc Center Access Feasibility Study

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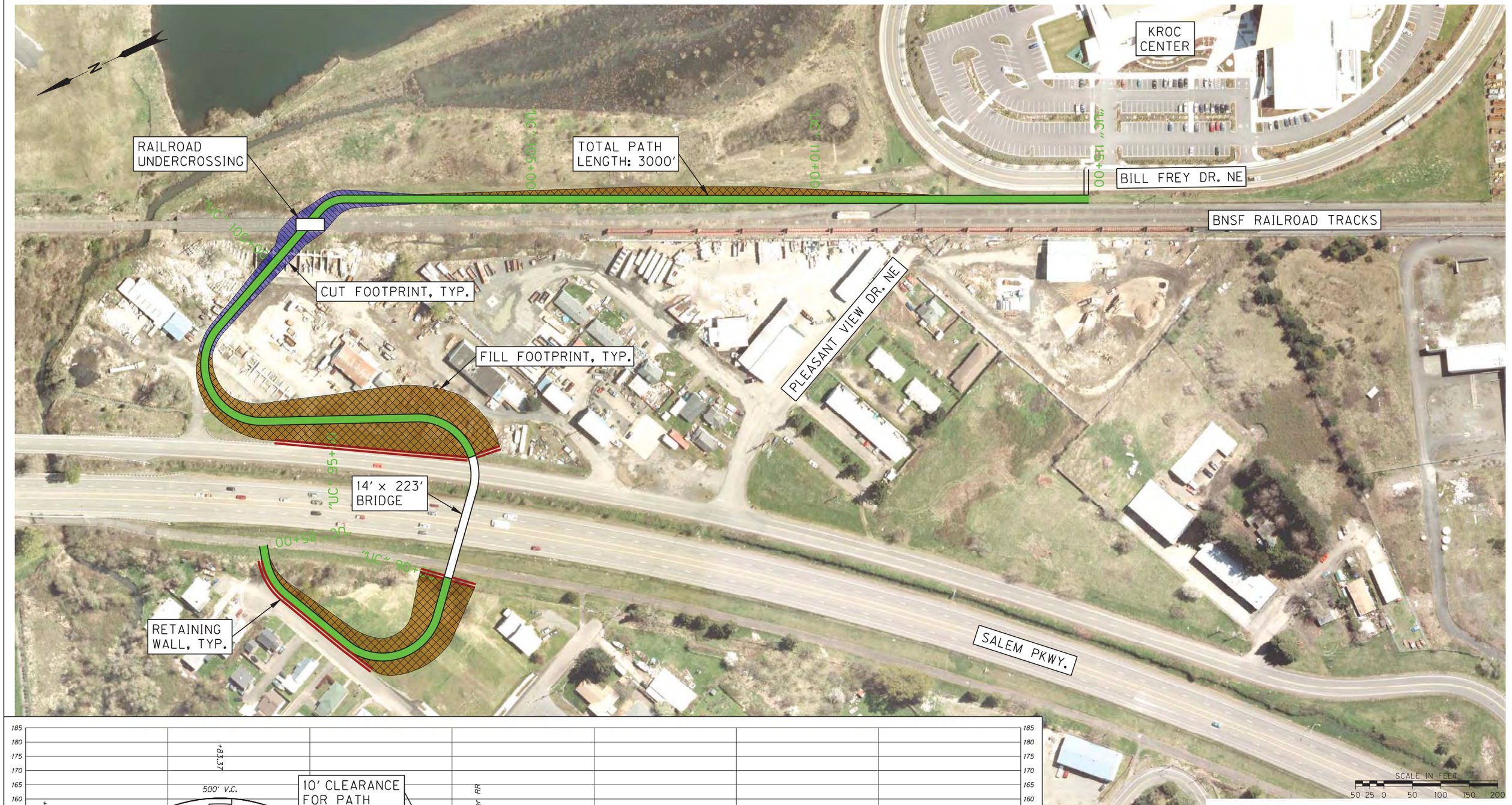

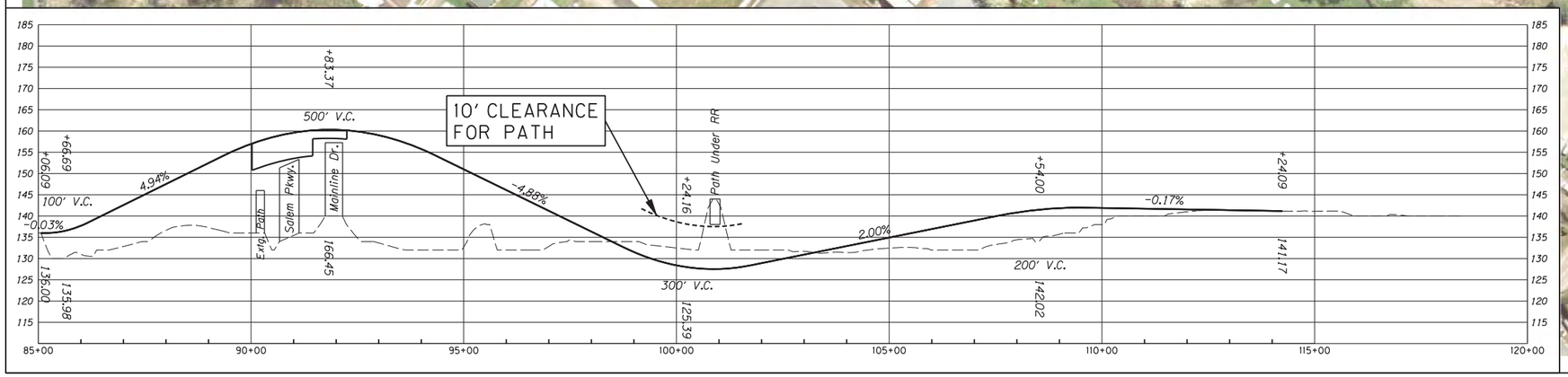

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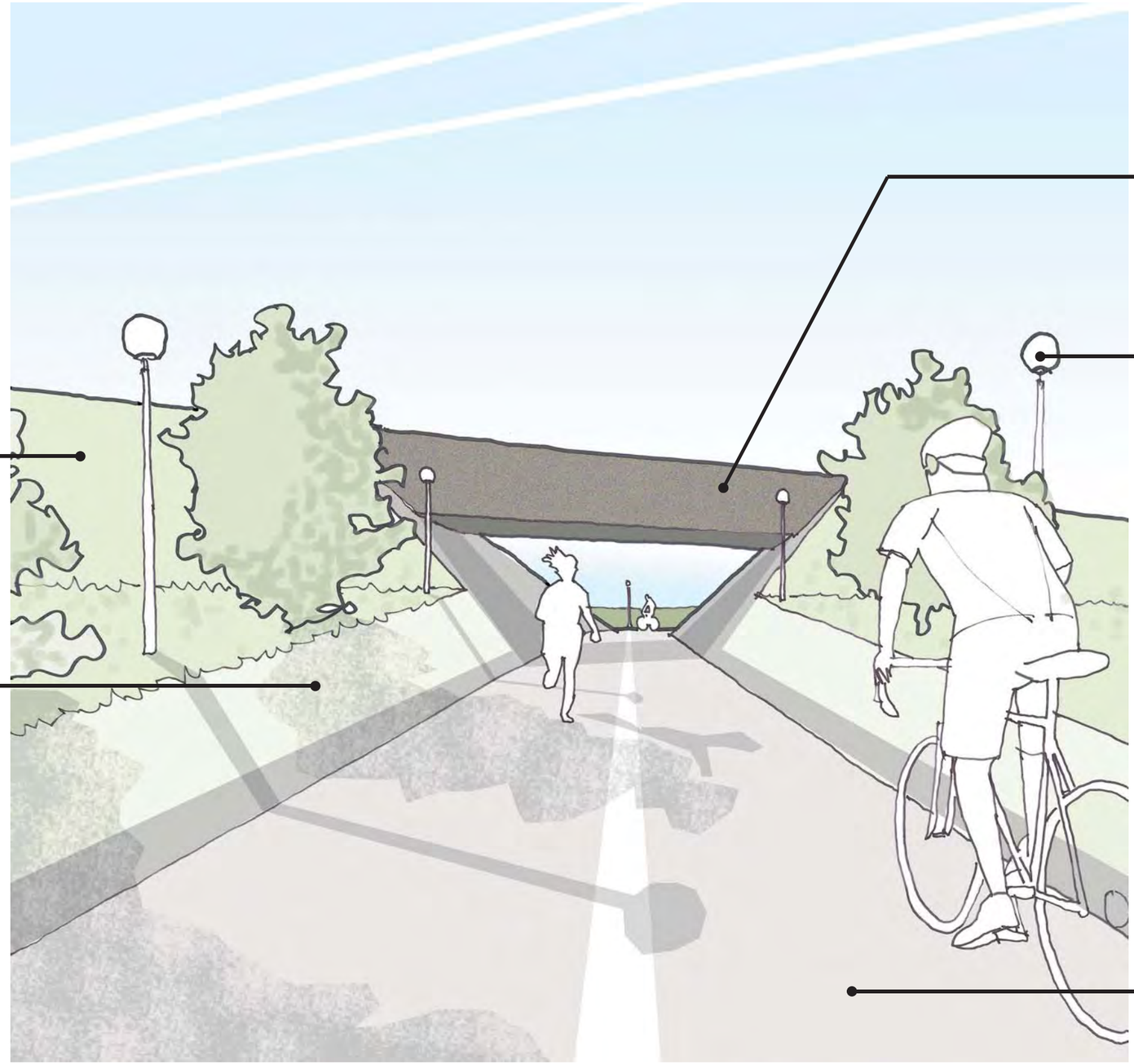

Perspective of undercrossing – Alternative UC

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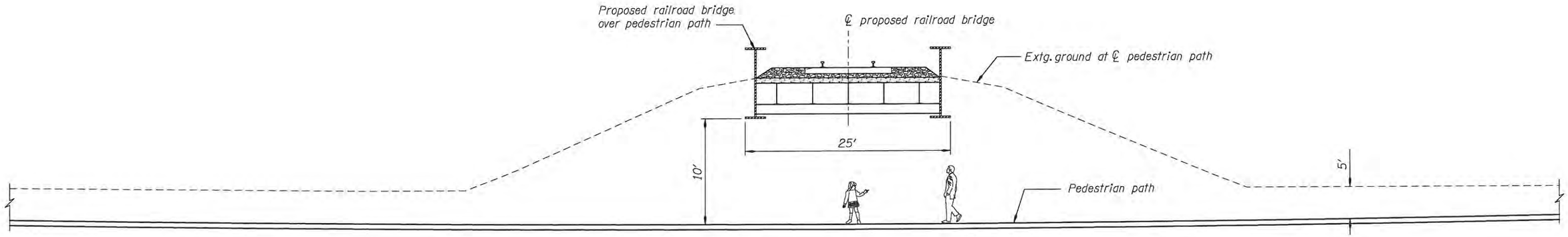

SECTION AT PROPOSED RAILROAD UNDERCROSSING

Scale: 1"=10'

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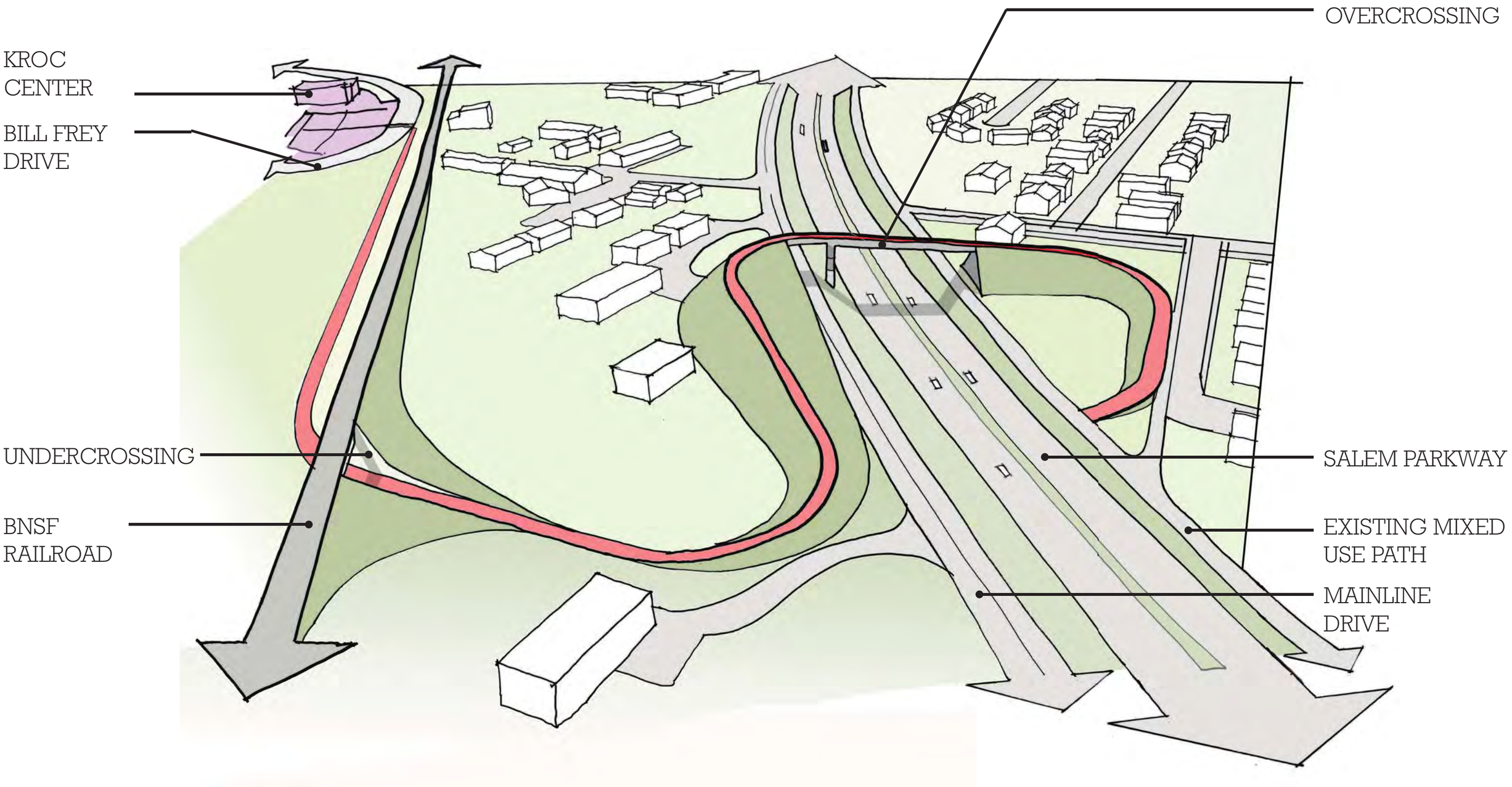

Birds eye view – Alternative UC

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"SK" 20+00

PLEASANT VIEW DR. NE

BILL FREY DR. NE

KROC CENTER

OPTIONAL LOOP RAMP TO MAINLINE DRIVE

RETAINING WALL, TYP.

FILL FOOTPRINT, TYP.

14' x 310' BRIDGE

SALEM PKWY.

TOTAL PATH LENGTH: 3000'

14' x 400' BRIDGE

OPTIONAL CONNECTION TO BILL FREY DRIVE

BNSF RAILROAD TRACKS

SCALE IN FEET

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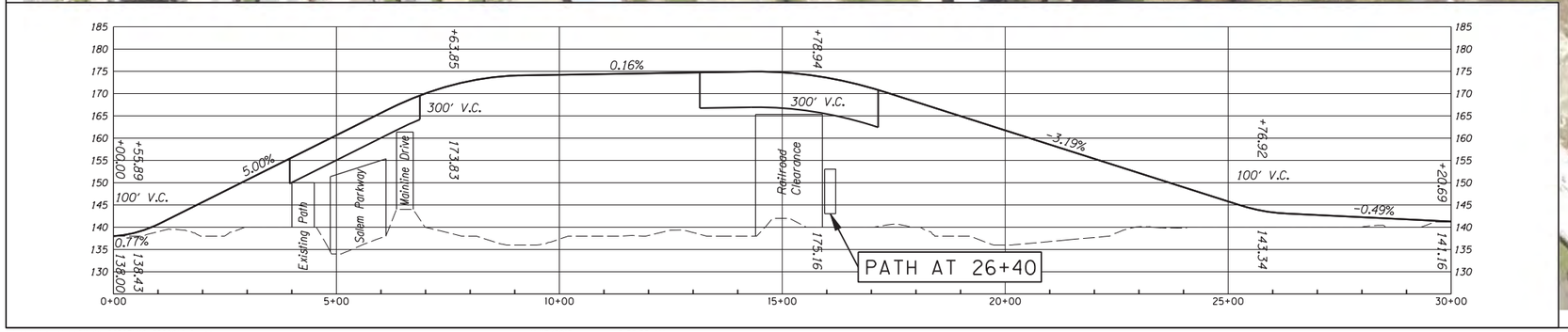

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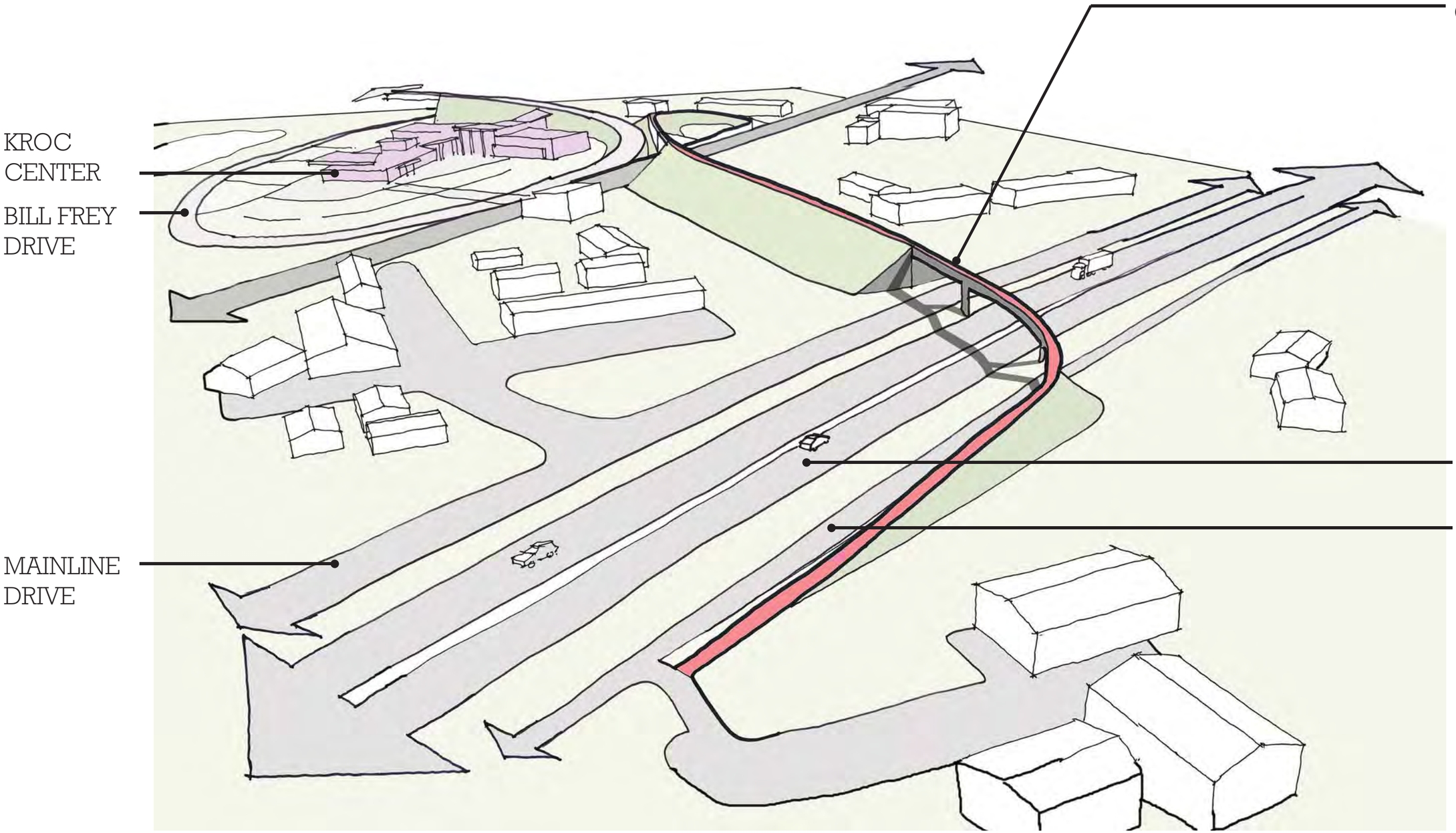

Birds eye view – Alternative SK

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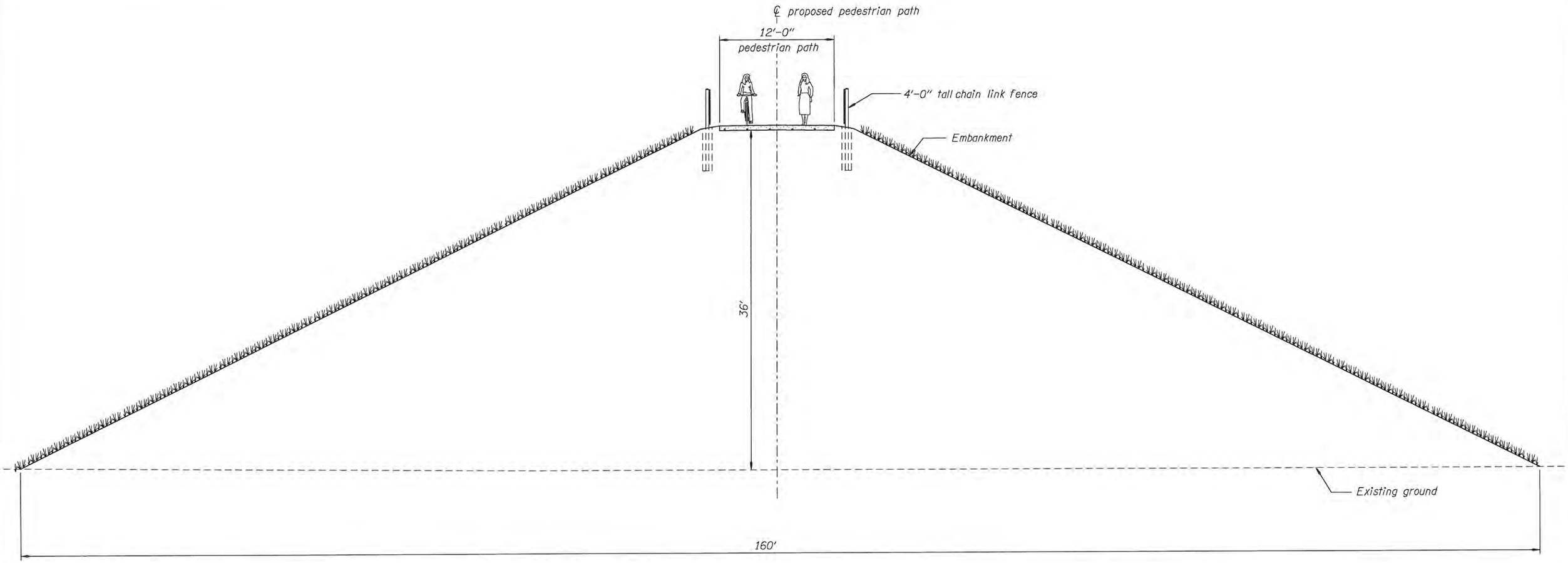

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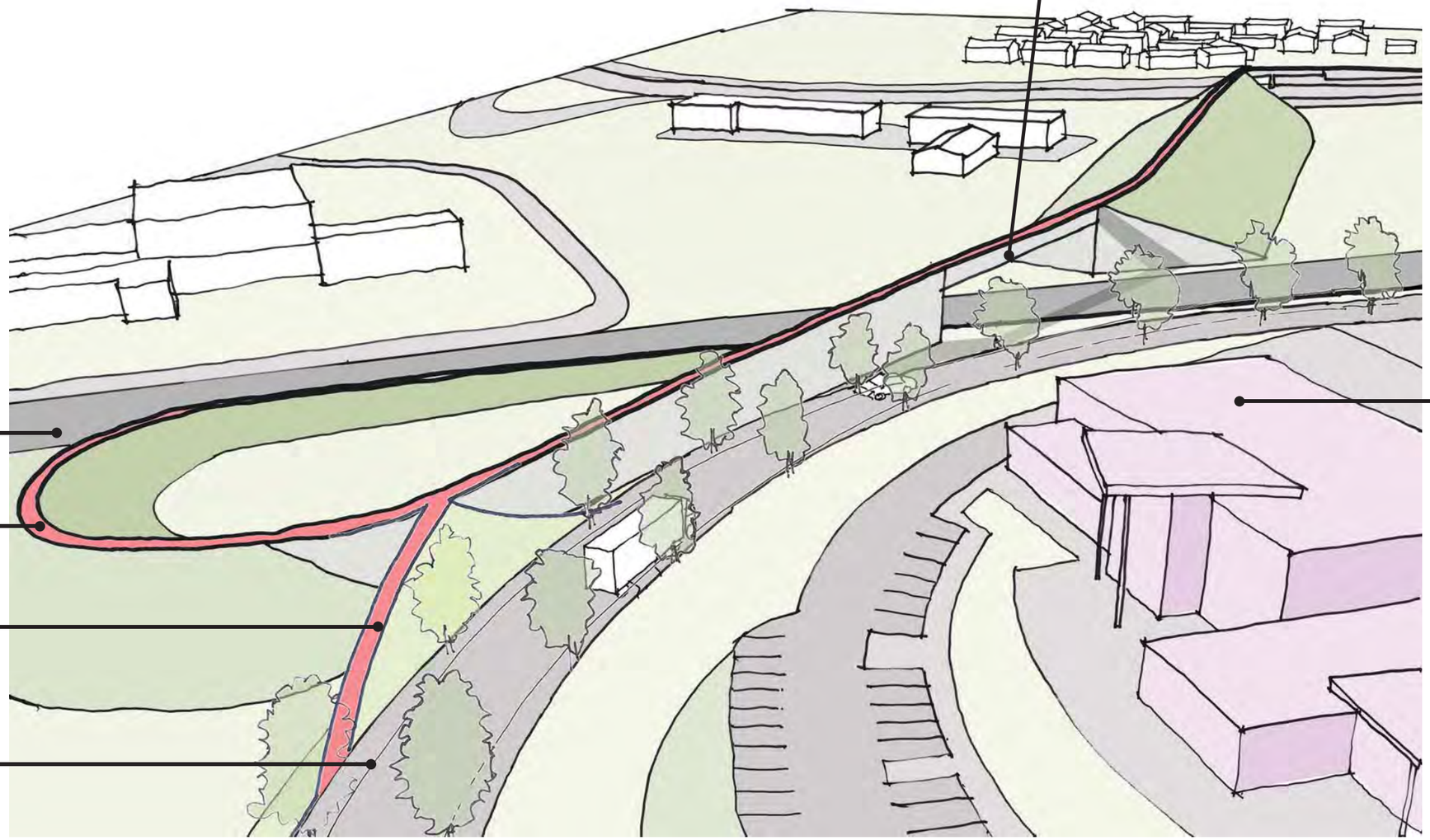

Birds eye view – Alternative SK

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Appendix B – Evaluation Matrix

Appendix B
Salem Parkway-Kroc Center Access Feasibility Study
DRAFT Evaluation of Alternatives November 5, 2012

Objective	Description	Weighting	Alternative H	H weighted	UC	UC weighted	SK	SK weighted	Rationale
Objective 1: Safety for Users of the Facility									
Criterion 1a: Minimizes the potential for vehicle conflicts at facility crossings.	This criterion will evaluate the number of potential controlled and uncontrolled vehicle crossing points (i.e. locations where there could be a conflict between motor vehicles and pedestrians/bicyclists along the facility or at the end(s) of the facility.) The evaluation will consider a trip from a location northwest of the Salem Parkway to the Kroc Center.	**0.213**	4	0.852	6	1.278	6	1.278	Alternative H has 1 controlled crossing at Salem Parkway and Verda Lane, where there are known red-light runs that would put pedestrians and cyclists at greater risk relative to other Alternatives. Alternative H also has two uncontrolled crossings at Bill Frey Drive and Mainline Drive. Alternative UC and SK have no controlled crossings, and 1 uncontrolled crossing at Bill Frey Drive.
Criterion 1b: Facility meets project design criteria.	AASHTO, ODOT, and BNSF design guidelines define standards for width, grade, clearance, etc. All alternatives will be designed following these guidelines, but some may require minor exceptions (e.g. horizontal curves).	**0.010**	4	0.040	4	0.040	4	0.040	No Alternative requires a major design exception
Criterion 1c: Personal safety and security	Qualitative assessment of whether the facility creates isolated areas, or has obscured views or confined areas; or (conversely) provides a more safe and secure environment. This criterion considers both the user of the facility and the impact of the facility on the surrounding area.	**0.188**	4	0.752	2	0.376	0	0.000	With Alternative H the user is at-grade, not confined, and has full sight of the trail the entire length. Alternative UC creates a point of isolation between the ramp structure at Shady Lane and Salem Parkway. Alternative UC has both elevated and underground structure that would create confined points, but is at-grade midway between cut and fill, within the industrial area south of Salem Parkway, allowing the user ground access. Alternative SK creates points of isolation between the multi-use path along Salem Parkway and Salem Parkway itself, and at the ramp between BNSF rail line and Bill Frey Drive. From a user's standpoint, they would be on an elevated structure with limited sight-distance (due to two ramps at either end) and in a confined space along the elevated structure.
Objective 2: Directness of Route									
Criterion 2: Reduce the potential for out-of-direction travel for bicyclists and pedestrians.	Bicyclists and pedestrians are not inclined to travel out-of-direction, which can lead to crossing unsafely across the Salem Parkway and/or railroad tracks. They prefer the most direct route. This criterion evaluates how well the facility provides a direct route for pedestrians and bicyclist to the Kroc Center. Trip length and the number of households within a prescribed distance will be evaluated for each alternative. For trip length, the evaluation will consider a trip starting from the intersection of Brooks Ave and Candlewood Drive in Keizer (located north of the Salem Parkway multi-use path) and going to the Kroc Center.	**0.065**	2	0.130	4	0.260	3	0.195	Alternative H is direct because the path itself is non-circuitous; however, it would require out-of-direction travel for users coming from Brooks Ave. and Candlewood Drive. Alternative UC is somewhat circuitous in its path and requires a modest amount of out-of-direction travel relative to other Alternatives. With Alternative SK, the crossing itself is very circuitous because of the two ramps, the user doesn't have full sight of the crossing length, but it also does not require out-of-direction travel considering Brooks Ave. and Candlewood Drive as the origin point.
Objective 3: Facility integrates with the Larger Multi-Modal System									
Criterion 3: Facility ties in with existing and planned bicycle, pedestrian, transit, and roadway system.	One purpose of the study is to identify facilities that tie-in with the larger existing and planned bicycle, pedestrian, and roadway systems. This criterion will assess how well each facility meets this objective.	**0.164**	3	0.492	4	0.656	3	0.492	Salem Industrial Drive is proposed to have bike lanes, but does not presently. Alternative H implements multi-use path planned within the City of Salem TSP. Alternative UC provides a new crossing that ties in with the path along Salem Parkway, and implements part of the planned path in the Claggett Creek wetland area. Alternative SK connects to the path along Salem Parkway and provides a new crossing. It does not implement any part of the planned path in the Claggett Creek wetlands area.

Appendix B
Salem Parkway-Kroc Center Access Feasibility Study
DRAFT Evaluation of Alternatives November 5, 2012

Objective	Description	Weighting	Alternative H	H weighted	UC	UC weighted	SK	SK weighted	Rationale
Objective 4: Property and Environmental Impacts									
Criterion 4a: Assessment of relative overall impact to properties and structures within the study area.	This will look at the number of structures or properties potentially impacted. This is a preliminary assessment and not a full impact assessment. Because impacts from an alternative can vary substantially based on its location and design (i.e. whether a facility is constructed at grade, elevated on structures, or on berms), professional judgment will be used to assess whether there could be relatively minor, intermediate, or considerable impacts.	**0.098**	4	0.392	2	0.196	2	0.196	Alternative H would have no property or structural impacts. Alternative SK has the greatest footprint and impact to properties; although it avoids impacts to any structures. Alternative UC has a footprint impact that is less than SK, but would impact the greatest number of structures of the three alternatives.
Criterion 4b: Minimizes impacts nearby wetlands, Claggett Creek, and other natural resources in the study area	This is based on engineering judgment on the amount of storm water mitigation and other mitigations that may be needed for the alternative.	**0.032**	2	0.064	3	0.096	4	0.128	Alternative H has the greatest potential to impact the Claggett Creek wetlands, both during construction staging and in terms of permanent stormwater runoff. Alternative UC includes a path within the wetlands area and has some potential for impact during construction and permanently in the form of additional stormwater runoff. Alternative SK is away from the wetlands and does not have potential for impact to it.
Objective 5: Transportation and Utility Impacts									
Criterion 5: Positive-to-no impact to existing and planned transportation facilities and utilities during construction or as a permanent impact.	This is based on engineering judgment on the impact to utilities (BPA power lines), transportation facilities (railroad track and rail operations; Salem Parkway and other streets within the study area); and other infrastructure within the study area.	**0.049**	4	0.196	2	0.098	0	0.000	Alternative H has no impact to existing or planned transportation or major utilities. Alternative UC would disrupt railroad operations during construction of the under-crossing. Alternative SK would require raising both PGE and BPA power lines, which is a substantial temporary impact.
Objective 6: Public Support									
Criterion 6: Public support of each alternative based on comments at public "listening stations", surveys, website comments, and public open house comments.		**0.090**	N/A		N/A		N/A		Recommend leaving this criterion open until a public open house and survey is conducted. Those from the public who stopped at the listening station overwhelmingly preferred Alternative H, likely because they mistakenly thought it would be built in conjunction with a new roadway as well, which is not true.
Objective 7: Cost									
Criterion 7: Preliminary cost estimates of the alternatives		**0.090**	4	0.360	3	0.270	2	0.180	Alternative H is the least cost; Alternative UC is in the middle; and Alternative SK has the greatest cost due to the greatest amount of structure.
Objective 8: Ability to Phase Project									
Criterion 8: Sub components of the project can be phased and have independent utility for users	Due to the availability of funding, it may be advantageous to have a set of facilities that can be constructed in phases. If phased, then each phase should have independent utility (i.e. serve the public) until later phases can be constructed.	**0.010**	0	0.000	0	0.000	0	0.000	Alternative H could not be staged. Alternative SK and UC could be staged, but each phase would not have independent utility. There was no diferentiation found with this criterion.
Weighted Totals									
				3.28		3.27		2.51	From highest scoring to least: Alternative H, Alternative UC, and Alternative SK.

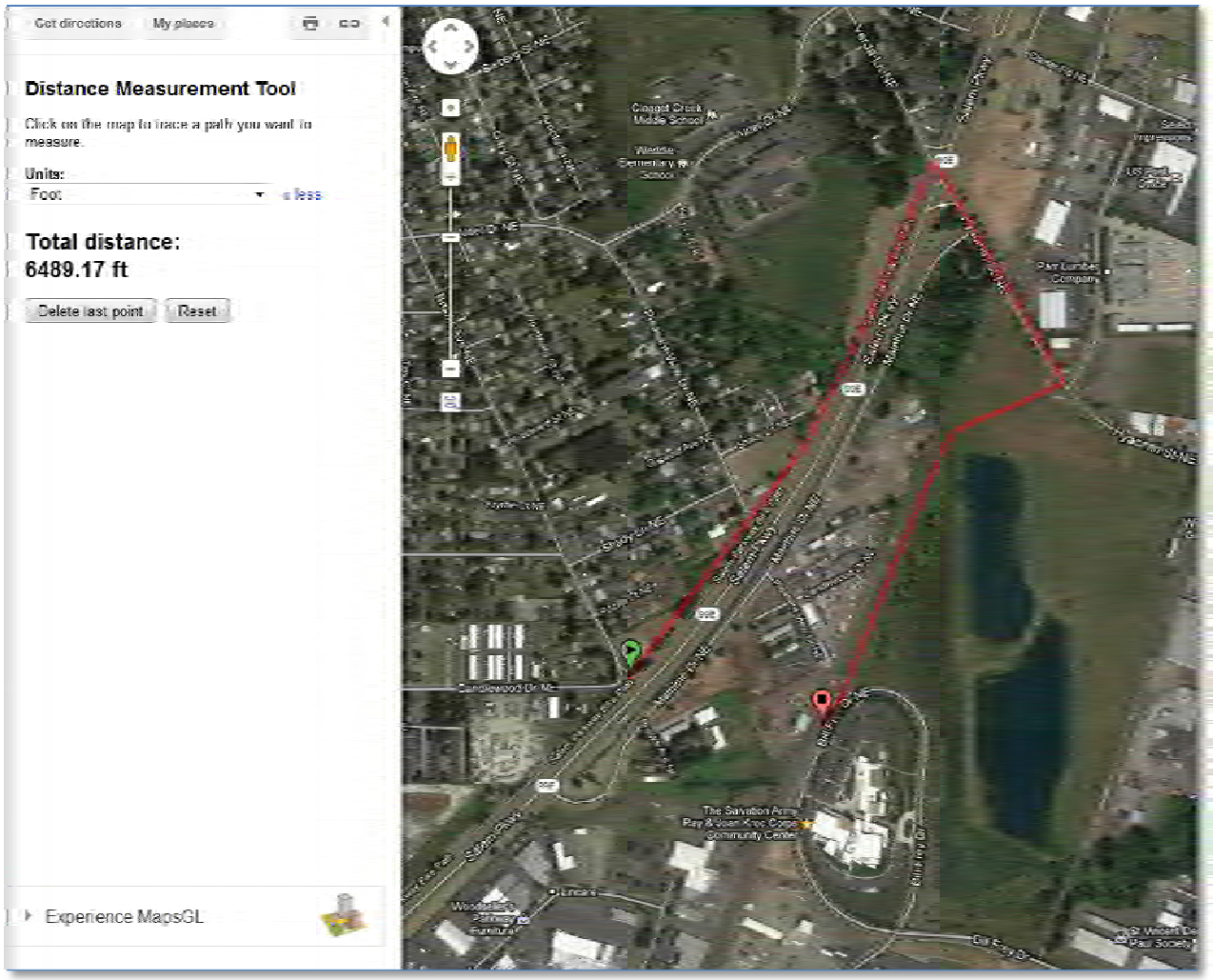
Appendix C – Crossing Distances

Appendix C Comparison of Travel Distances

All start at Brooks Ave. and Candlewood Drive

Alternative	Feet	Miles
Alt H	6,490	1.23
Alt UC	4,360	0.83
Alt SK	3,920	0.74
No build - via Salem Industrial Drive	8,815	1.67
No build via Hyacinth/Portland Rd.	11,957	2.27

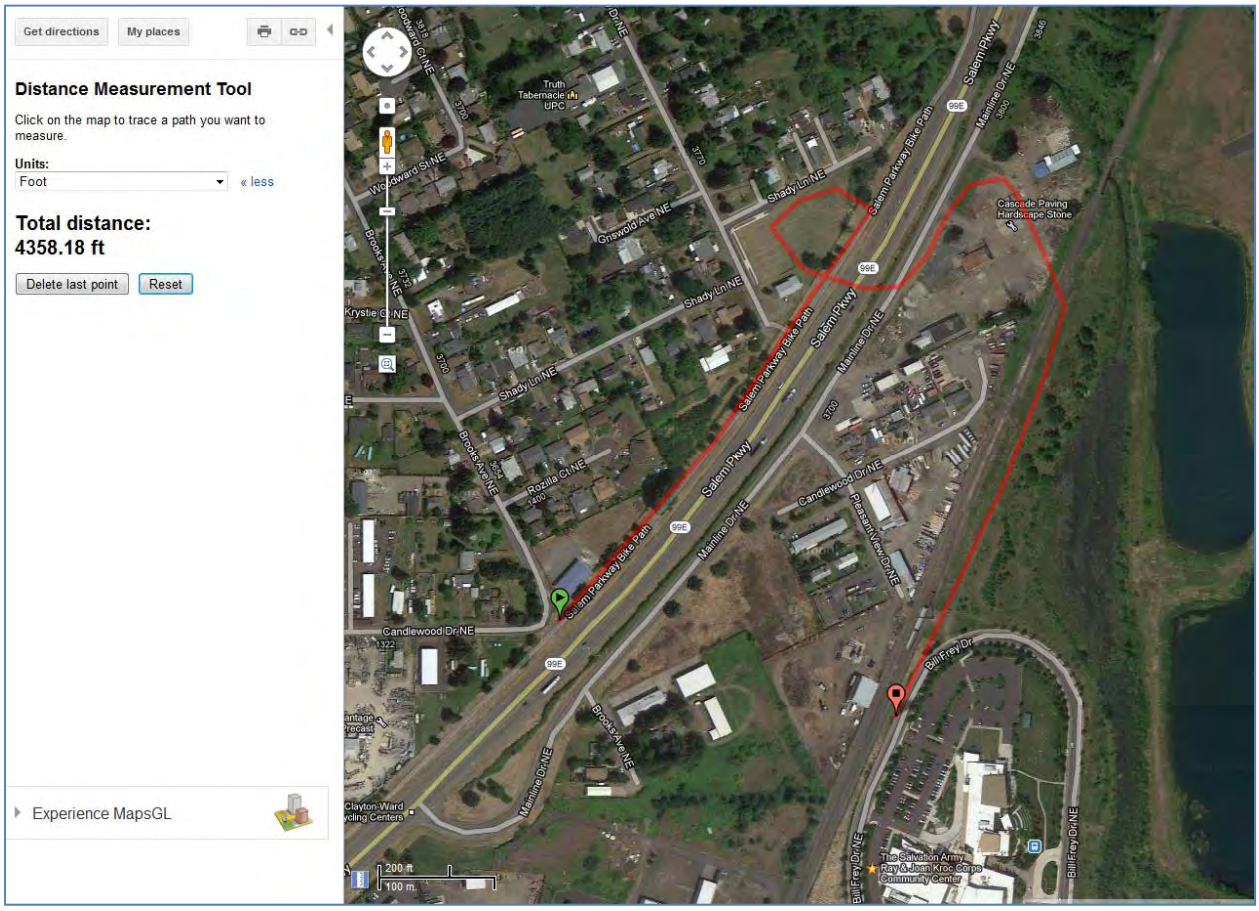
Alt H - 6490 feet (1.23 miles)



Appendix C Comparison of Travel Distances

All start at Brooks Ave. and Candlewood Drive

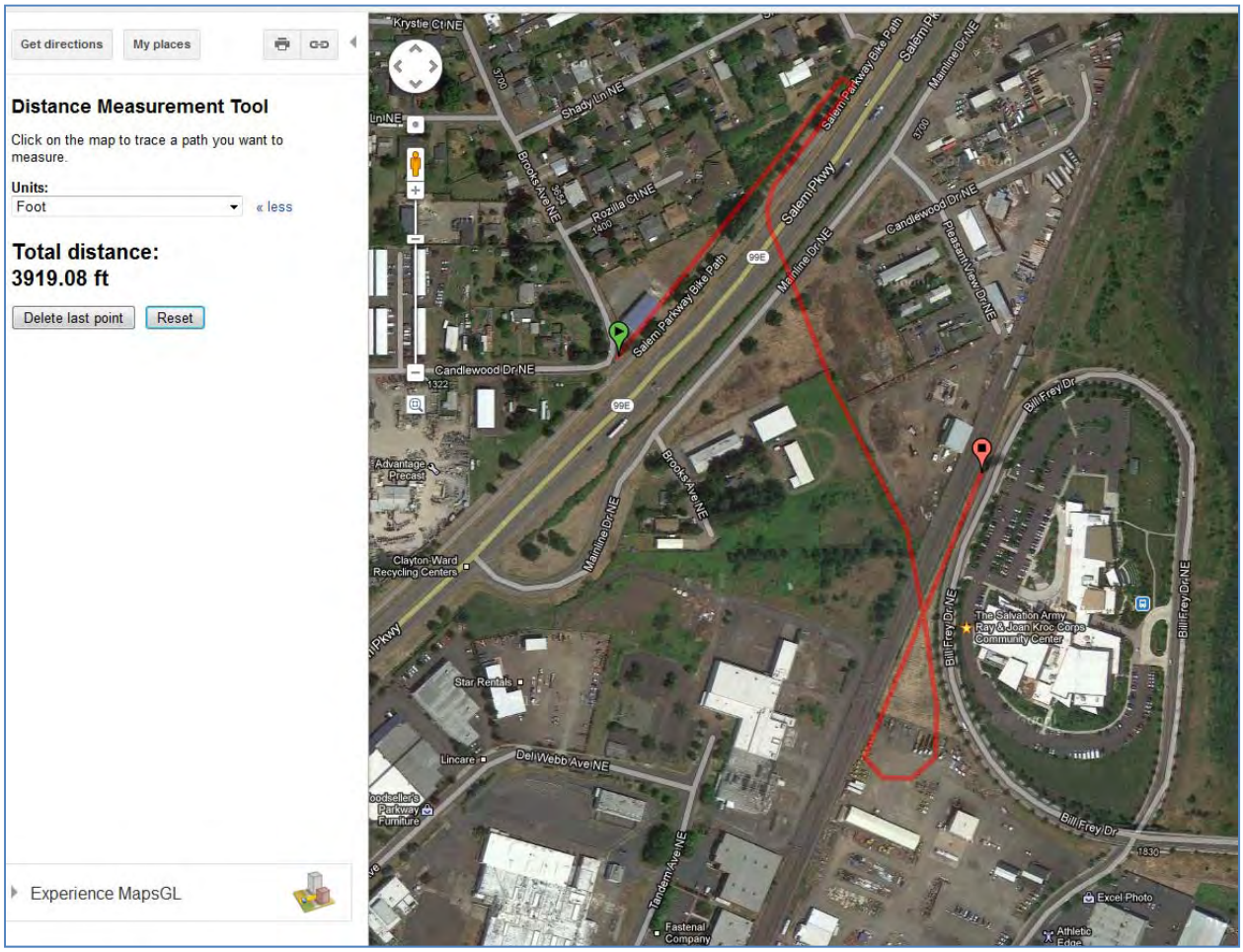
Alternative "UC" - 4360 feet (0.83 miles)



Appendix C Comparison of Travel Distances

All start at Brooks Ave. and Candlewood Drive

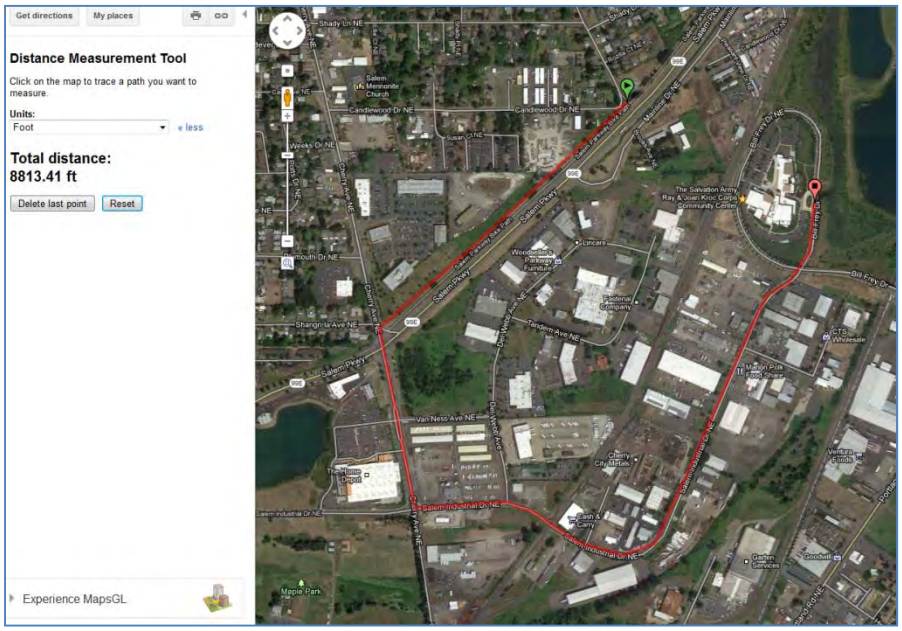
Alternative "SK" - 3920 feet (0.74 miles)



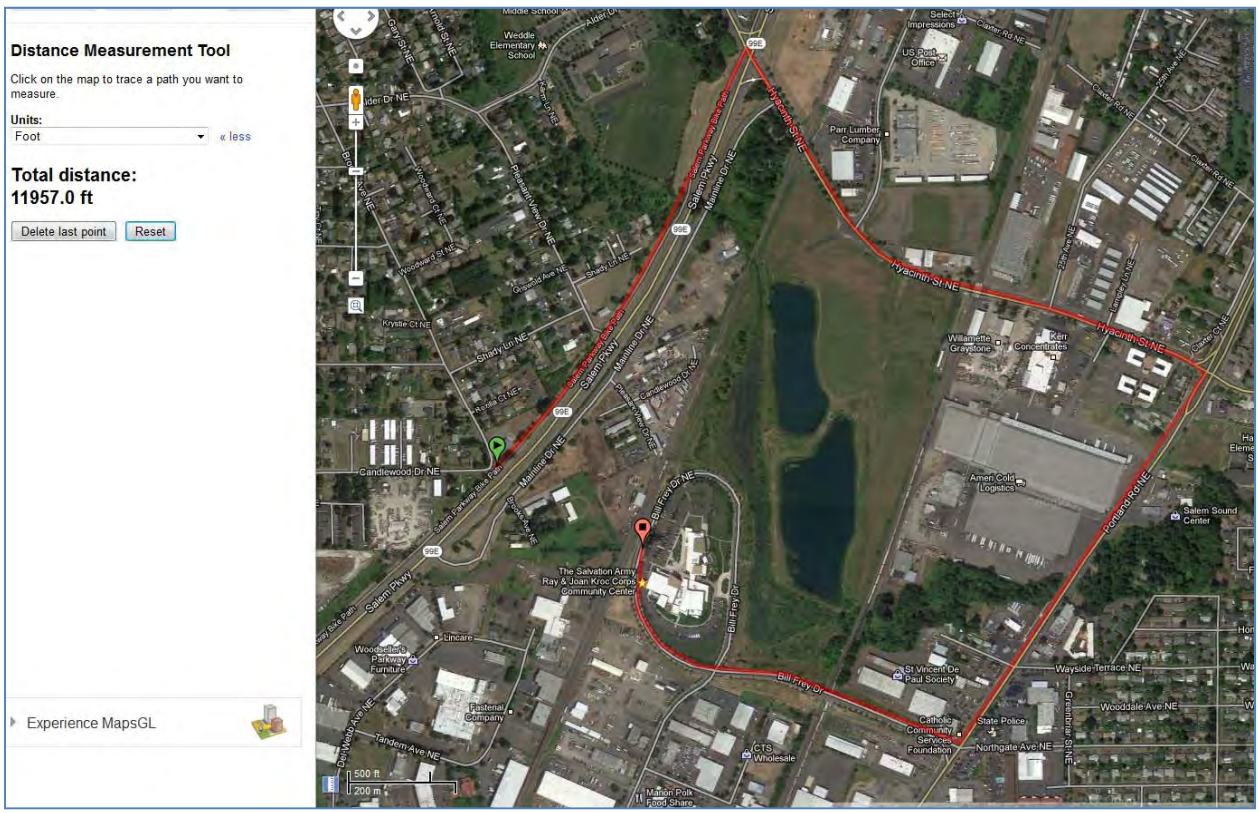
Appendix C Comparison of Travel Distances

All start at Brooks Ave. and Candlewood Drive

No build - (route via Salem Industrial): 8815 feet (1.67 miles)



No build - (route via Hyacinth & Portland Rd): 11,960 feet (2.27 miles)



Appendix D – Sample Bridge Photos

Prestressed Precast Concrete Box Girders

Slant-leg Cast-in-Place Post-Tensioned Concrete Slab Bridge


Prestressed Precast Concrete Girders


Prestressed Precast Concrete Box Girders

Prestressed Precast Concrete Box Girders

Prestressed Precast Concrete Girders

Prestressed Precast Concrete Girders

Prestressed Precast Concrete Box Girders

Steel Through Truss