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# 2

## Description of Proposed Changes

This chapter describes the Proposed Refinements in the context of the D-O LRT Project, from west to east. The refinements discussed in this Supplemental EA include:

- Modification to the station platform lengths;
- Adjustments to the location, configuration, and design of the station platforms, as well as corresponding refinements to the track alignments;
- Modifications to the planned park-and-ride lots;
- Inclusion of bicycle and pedestrian facilities throughout the project;
- Changing the traction power locations and reducing the number of Traction Power Substations;
- Reconfiguration of the Rail Operations and Maintenance Facility (ROMF) and rail yard;
- Using single-track configuration for the segment that includes the New Hope Creek and Sandy Creek bridge crossings;
- Revising the alignment to pass underneath the intersection of University Drive and Shannon Road, rather than cross through the intersection at-grade.

- Elevation of the alignment on Erwin Road;
- Addition of a new station at Blackwell/Mangum Streets;
- Modifications to the track grade along Pettigrew Street and changes to the adjacent roadway system; and
- Inclusion of drainage, grading, and site preparation throughout the project.

## 2.1 Purpose and Need

The purpose and need of the D-O LRT Project was presented in chapter 1 of the DEIS and summarized in sections 1.2.1 of the Combined FEIS/ROD and 1.3 of the Amended ROD; it remains unchanged. The Proposed Refinements would enhance mobility, increase connectivity, and promote future development throughout the Durham-Orange Corridor (D-O Corridor) in fulfillment of the goals of the D-O LRT Project.

The D-O Corridor extends approximately 18 miles from southwest Chapel Hill to eastern Durham and includes several educational, medical and other key activity centers that generate a large number of trips each day. See **Figure 2-1**.

The Proposed Refinements would **enhance mobility** by supporting a competitive, reliable alternative to automobile use for commuters, students, and other travelers throughout the D-O Corridor. Through the addition of the Blackwell/ Mangum Streets

Station, the Proposed Refinements would provide direct service to key destinations in downtown Durham, such as the Durham Performing Arts Center (DPAC), Durham Bulls Athletic Park, and the American Tobacco Campus.

Pedestrian routes, bicycle, and multi-use path enhancements would also provide alternatives to automobile use in the vicinity of the stations and the surrounding neighborhoods.

In addition, the inclusion of additional roadway improvements would enhance mobility and circulation of the roadway network in the vicinity of the stations.

With the restriping of Ramseur Street to allow for two-way traffic between Corcoran Street and Roxboro Street, the Proposed Refinements would enhance public transit operations by providing an alternative for buses that currently travel on Pettigrew Street in downtown Durham.

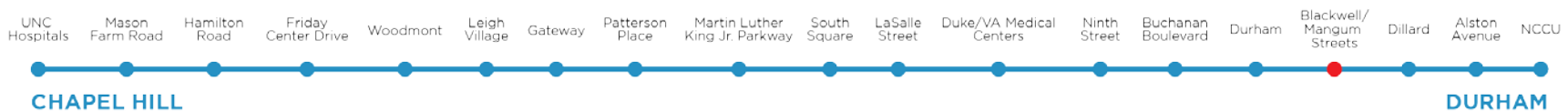
The Proposed Refinements would **increase connectivity** by supporting expanded transit options between Durham and Chapel Hill, such as additional service to major activity and employment centers, enhanced access to neighborhoods, and improved operational characteristics. The new Blackwell/ Mangum Streets Station would provide a direct connection to major activity centers at the DPAC, Durham Bulls Athletic Park, and the American Tobacco Campus. The Proposed Refinements would also increase transit

connections to new and emerging employment centers.

In addition, the inclusion of additional roadway, parking, pedestrian route, bicycle, and multi-use path enhancements would improve connections between the stations and the surrounding neighborhoods.

Finally, the Proposed Refinements would **promote future development** by supporting local land use plans that foster compact and TOD throughout the corridor to enhance economic development opportunities in the vicinities of the stations. Pedestrian routes, bicycle, and multi-use path enhancements support TOD's goal of developing walkable neighborhoods that enhance Durham and Chapel Hill's existing communities. For more information on GoTriangle's grant-funded TOD study, please see <https://gotriangle.org/tod>.

The Proposed Refinements also optimize the station site plans by reducing the platform lengths and improving the connections to surrounding roadway, bicycle, and pedestrian facilities. These changes encourage opportunities for future development by facilitating access between the stations and surrounding areas.



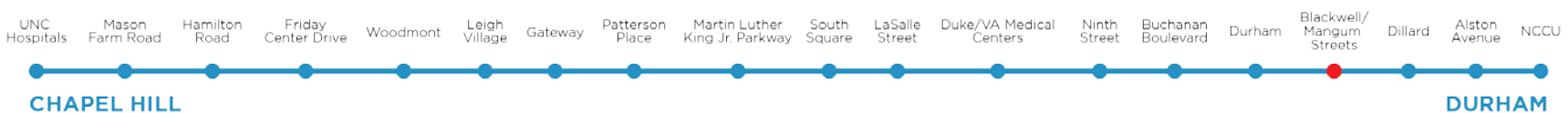
## 2.2 Proposed Refinements to Project Design

The previous NEPA documentation for the D-O LRT Project, including the DEIS (August 2015), Combined FEIS/ROD (February 2016), Supplemental EA for the NCCU Station Refinement (November 2016) and Amended ROD (December 2016), evaluated the effects of the light rail project based on preliminary engineering designs. An evaluation of a range of reasonable alternative alignments was included in the DEIS, as required under 40 CFR 1502.14. The design described in the Amended ROD is referred to herein as the Previous Design.

Since publication of the Amended ROD, engineering design work has progressed, resulting in refinements to the design. Most refinements were initiated to address engineering challenges or to meet mitigation commitments made in the Amended ROD. Due to the limited scope of these refinements, an evaluation of alternatives was not required; however, during the design process, GoTriangle developed and implemented measures to minimize the scope and impact of the Proposed Refinements to the extent possible.

**Appendix A** presents the technical drawings, which are the basis for engineering design. This section describes the proposed design changes to the D-O LRT Project studied in this Supplemental EA. See **Figure 2-1**.

As engineering design advanced, GoTriangle instituted a change control procedure to monitor and evaluate proposed modifications to the physical and operational scope of the project. When a modification was proposed, GoTriangle evaluated the change for technical feasibility and environmental impacts.



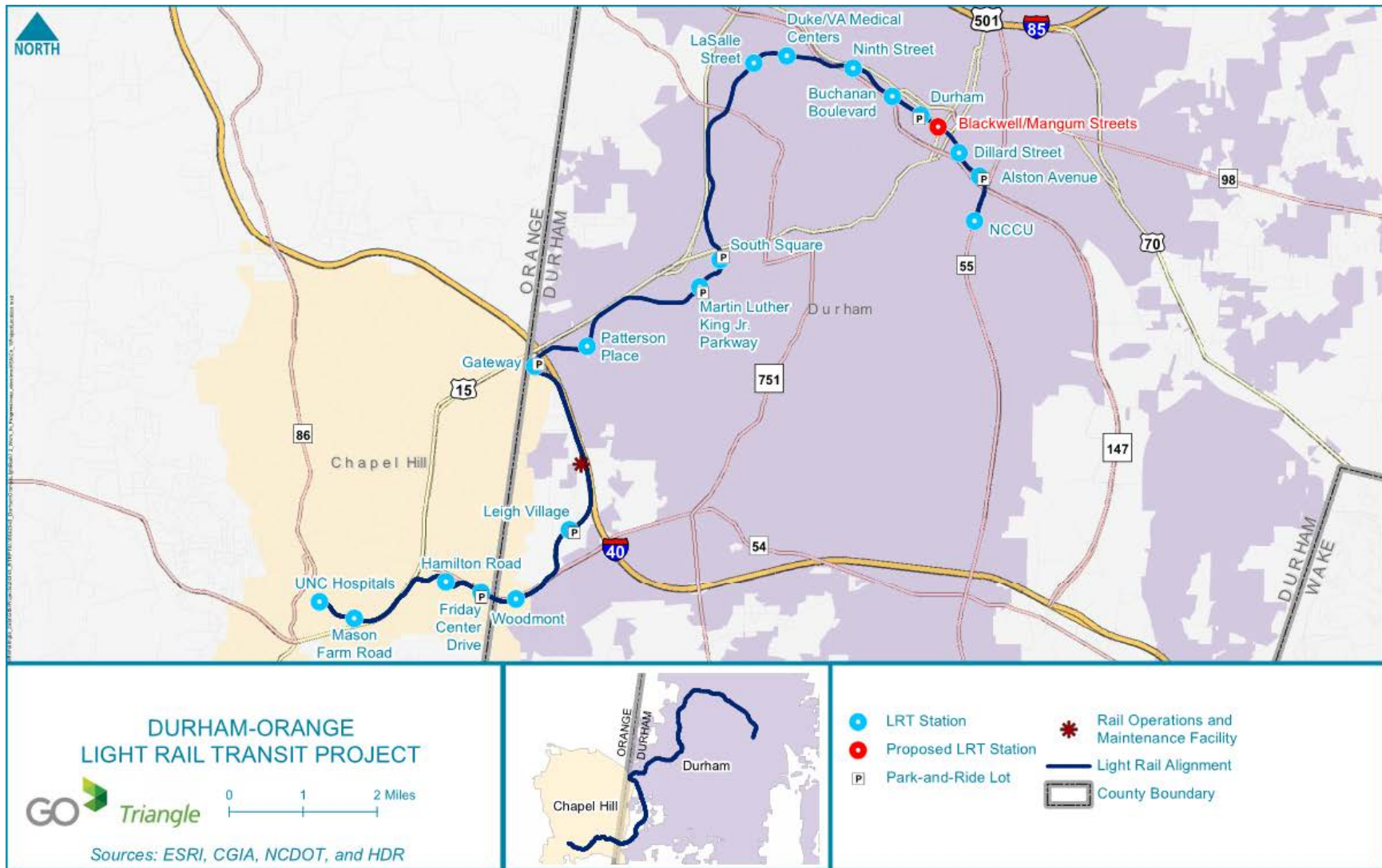
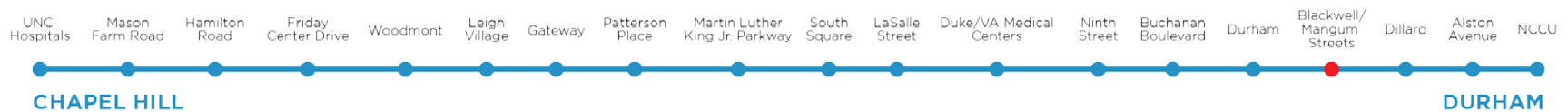


Figure 2-1: Project Location Overview



Depending on the relative magnitude of the change, each modification was required to be approved by either the Project Director, the GoTriangle Board of Trustees, or by all of the following:

- Durham Board of County Commissioners,
- Orange Board of County Commissioners,
- Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC-MPO) Policy Board, and
- GoTriangle Board of Trustees

The Design Change Approval Policy was approved by the GoTriangle Board of Trustees in June 2017.

After receiving local approvals, GoTriangle submitted the proposals to the FTA. FTA directed GoTriangle to prepare a Supplemental EA to evaluate the changes in social, economic, and environmental effects that would result from the Proposed Refinements.

**Tables 2-1 through 2-8** present a summary of the Proposed Refinements (“What’s Changed?”) at specific locations across the project corridor from west to east, and provide reasons for the Proposed Refinements (“Why?”). **Figures 2-2 through 2-27** illustrate the Proposed Refinements in station areas, including side-by-side

comparisons (for most areas) with the Previous Design.

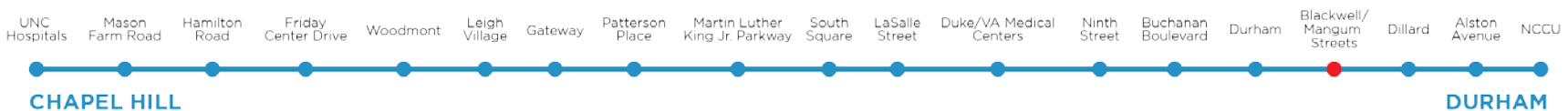
In addition to changes at specific locations, as described in **Tables 2-1 through 2-8**, the Proposed Refinements include several project-wide changes. These project-wide changes include:

- Minor shifts in the location of electrical and communications systems equipment (Traction Power Substations, signal houses, and communication cabinets);
- Implementation of cost effective measures related to the selection of right-of-way fencing, bridge railings and station shelter canopies, as well as a reduction of catenary pole foundation depths;
- Minor modifications to the track alignment and the surrounding roadway network; and
- Minor shifts in station locations based on changes in the track design.

Another project-wide change included in the Proposed Refinements is a reduction in the length of the D-O LRT Project station platforms. The Previous Design includes platforms long enough for three-car trains, whereas the Proposed Refinements include platforms for two-car trains. This refinement was recommended in a Value Engineering (VE) review, which the FTA requires to promote cost-effective project design. The initial VE review for the D-O LRT Project

identified two-car station platforms as a lower cost design to deliver the required capacity. The two-car station platforms would accommodate the initial operating plan of one-car and two-car trains, which would meet the capacity needs of the projected ridership through 2040.

GoTriangle analyzed the proposed change to two-car station platforms and confirmed that the shorter platforms would accommodate sufficient capacity for initial operations, special events, and for peak service beyond 2040; therefore, the Proposed Refinements include two-car platforms at all D-O LRT Project stations.



**Table 2-1: Summary of Proposed Refinements – UNC Campus Location**

Location	What's Changed?	Why?
UNC Hospitals Station (Figure 2-2 & appendix A-1, Sheet 1)	<ul style="list-style-type: none"> <li>▪ Increased the extent of roadway modifications in the station area.</li> <li>▪ Eliminated the proposed pedestrian bridge between the station and the Dogwood Parking Deck on the north side of Mason Farm Road.</li> <li>▪ Shifted station platforms from west of East Drive to 350 feet to the east, of East Drive.</li> </ul>	<ul style="list-style-type: none"> <li>▪ In the Amended ROD, GoTriangle committed to perform a detailed traffic study in this area (Mitigation ID # R02).</li> <li>▪ Changes would improve vehicular and pedestrian access to and from station, hospitals, and nearby parking decks.</li> <li>▪ UNC requested the elimination of the pedestrian bridge to better accommodate the anticipated pedestrian volume from the station to destinations within the station area.</li> <li>▪ By shifting the platforms east, pedestrian access would be provided along East Drive, which improves station access.</li> </ul>





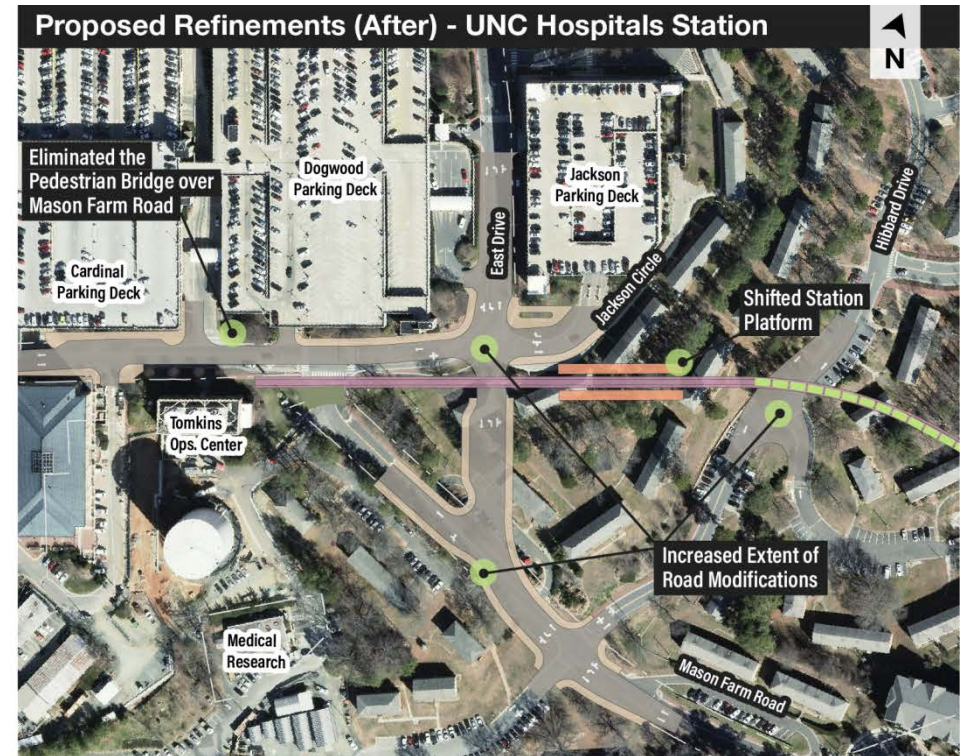
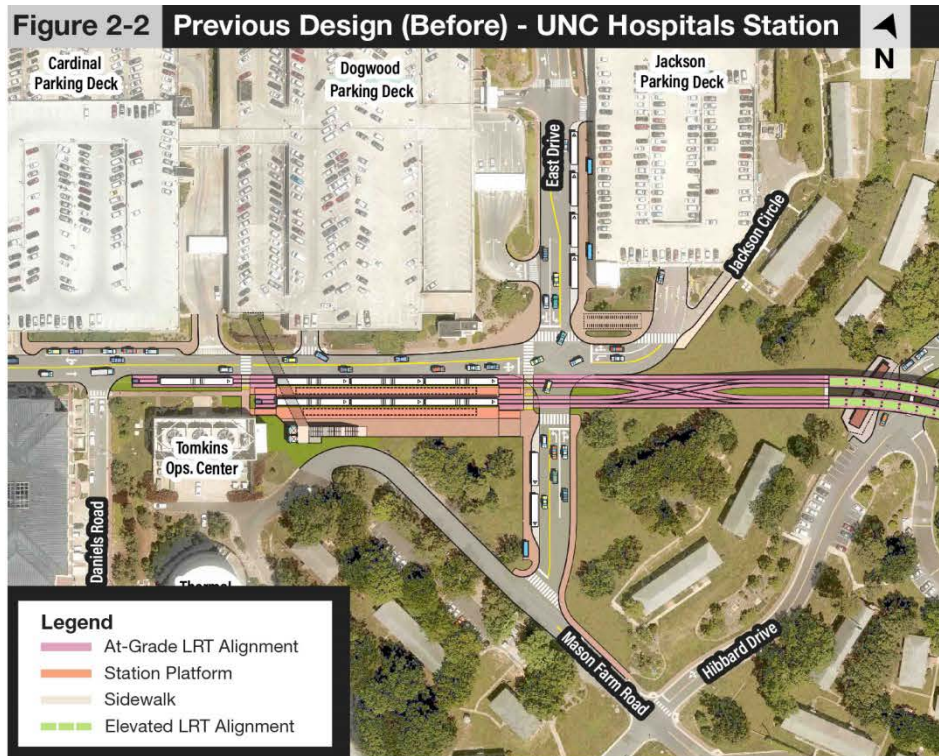
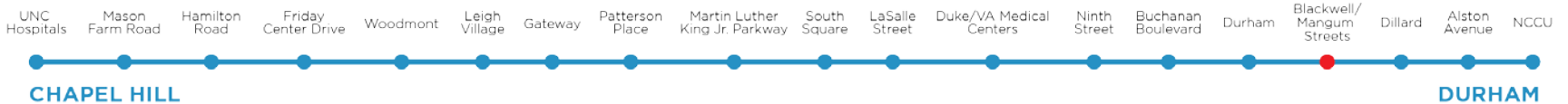


Figure 2-2: Illustration of Proposed Refinements – UNC Hospitals Station



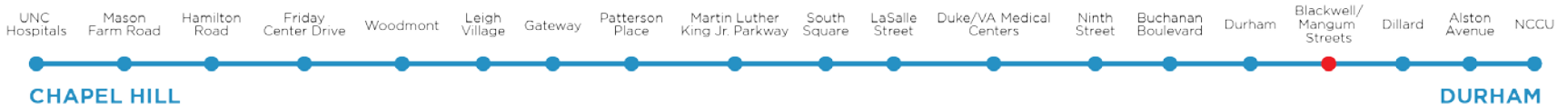
**Table 2-1 (Cont'd): Summary of Proposed Refinements – UNC Campus Location**

Location	What's Changed?	Why?
Mason Farm Road Station (Figure 2-3 and appendix A-1, Sheets 1 – 4)	<ul style="list-style-type: none"> <li>Widened the walkways near Mason Farm Road from the station to the Business School parking lot.</li> <li>Widened walkways, added sidewalks, and a stairway, as well as an ADA-accessible alternative (elevator) for access to the Dean E. Smith Center east.</li> <li>Changed from fill slope to retaining wall along the north side of the proposed station in order to reduce tree removals and to provide space for future development of UNC facilities.</li> <li>Added a multi-use path along the light rail alignment from Old Mason Farm Road to Prestwick Road.</li> </ul>	<ul style="list-style-type: none"> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>

**Figure 2-3 Proposed Refinements - Mason Farm Road Station**



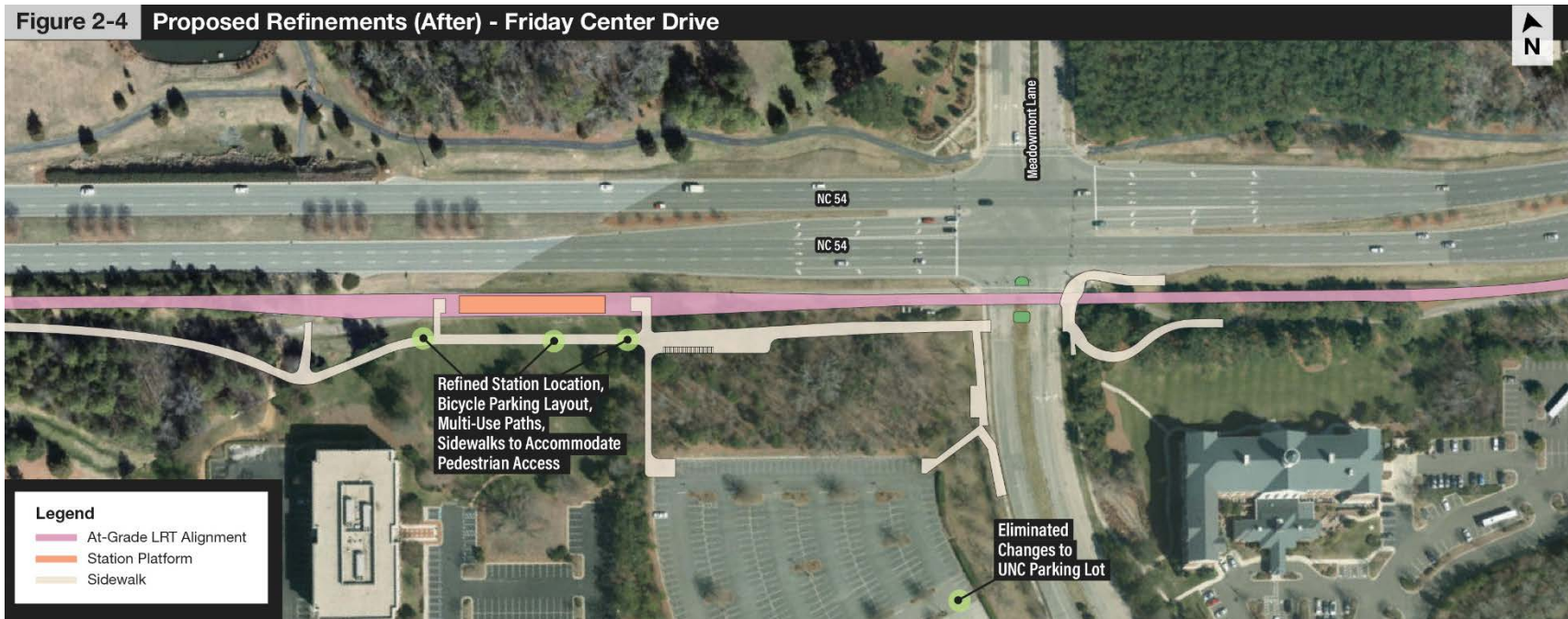
**Figure 2-3: Illustration of Proposed Refinements – Mason Farm Road Station**



**Table 2-2: Summary of Proposed Refinements – East Chapel Hill Location**

Location	What's Changed?	Why?
Hamilton Road Station (appendix A-1, Sheet 4)	<ul style="list-style-type: none"> <li>Added sidewalk along the west side of Burning Tree Drive from NC 54 to Oak Tree Drive.</li> <li>Added a multi-use path along north side of NC 54 from Oakwood Drive to Burning Tree Drive.</li> </ul>	<ul style="list-style-type: none"> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>
Friday Center Drive Station (Figure 2-4 and appendix A-1, Sheet 5)	<ul style="list-style-type: none"> <li>Eliminated Previous Design changes to the existing UNC-owned park-and-ride lot.</li> <li>Refined station location, bicycle parking layout, and multi-use path and sidewalk design to improve the connection to the existing pedestrian underpass and parking lot.</li> <li>Added a sidewalk along east side of Friday Center Drive from Marriott Way to bus shelter.</li> </ul>	<ul style="list-style-type: none"> <li>UNC requested elimination of Previous Design changes to the existing UNC-owned park-and-ride lot.</li> <li>The station design refinement would provide pedestrian access to the station while still preserving the use, flexibility, and long-term maintenance of the existing parking lot for consistency with UNC's plans.</li> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>

**Figure 2-4 Proposed Refinements (After) - Friday Center Drive**



**Figure 2-4: Illustration of Proposed Refinements – Friday Center Drive Station**



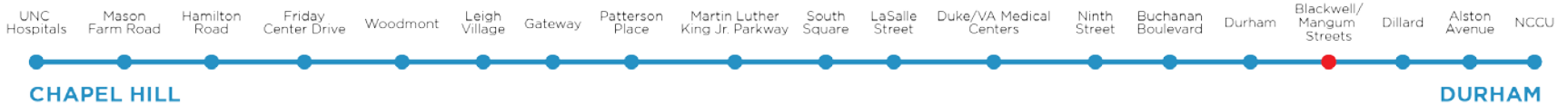
**Table 2-2 (Cont'd): Summary of Proposed Refinements – East Chapel Hill Location**

Location	What's Changed?	Why?
Woodmont Station (Figure 2-5 and appendix A-1, Sheet 6)	<ul style="list-style-type: none"> <li>■ Added two multi-use paths near the station:                             <ul style="list-style-type: none"> <li>○ One at the north side of Stancell Drive from Barbee Chapel Road to Downing Creek Parkway (consistent with local bicycle plans), and</li> <li>○ One east of the light rail alignment along Downing Creek Parkway to Cranebridge Place.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ In the Amended ROD, GoTriangle committed to minimize impacts to planned bicycle and pedestrian facilities (Mitigation ID # PBF03).</li> <li>■ In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>

**Figure 2-5 Proposed Refinements (After) - Woodmont Station**



**Figure 2-5: Illustration of Proposed Refinements – Woodmont Station**



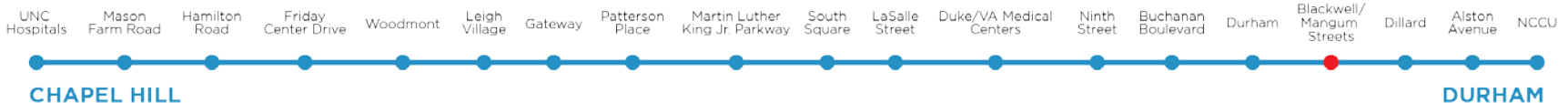
**Table 2-3: Summary of Proposed Refinements – ROMF Location**

Location	What's Changed?	Why?
Leigh Village Station (appendix A-1, Sheets 8, 9)	<ul style="list-style-type: none"> <li>Reconfigured the proposed roadways around the station to improve intersections, roadways, and access to the station.</li> </ul>	<ul style="list-style-type: none"> <li>The proposed changes would better support future development adjacent to the station while maintaining the same level of transit access.</li> </ul>
ROMF (appendix A-2, Sheet 11)	<ul style="list-style-type: none"> <li>Reconfigured the track alignments, roadways, and building locations on the ROMF site plan.</li> <li>Eliminated the northern loop track.</li> <li>Raised elevation of the ROMF yard by four feet and subsequently adjusted the heights of retaining walls in the yard, as well as eliminated the north yard lead track.</li> </ul>	<ul style="list-style-type: none"> <li>GoTriangle modified the track alignments and ROMF site plan to improve ROMF operations.</li> <li>In the Amended ROD, GoTriangle committed to refine strategies such as landscape design to complement the surrounding context (Mitigation ID # LUZ02).</li> <li>The proposed changes would reduce total capital cost associated with the ROMF</li> </ul>
Farrington Road Bridge (Figure 2-6 and appendix A-2, Sheet 11)	<ul style="list-style-type: none"> <li>Eliminated the extension of the existing Farrington Road Bridge over the light rail alignment.</li> <li>Added an independent light rail underpass under Farrington Road.</li> </ul>	<ul style="list-style-type: none"> <li>NCDOT requested that GoTriangle incorporate an independent underpass to accommodate NCDOT maintenance and inspection of the existing bridge.</li> </ul>

**Figure 2-6 Proposed Refinements (After) - Farrington Road Bridge**



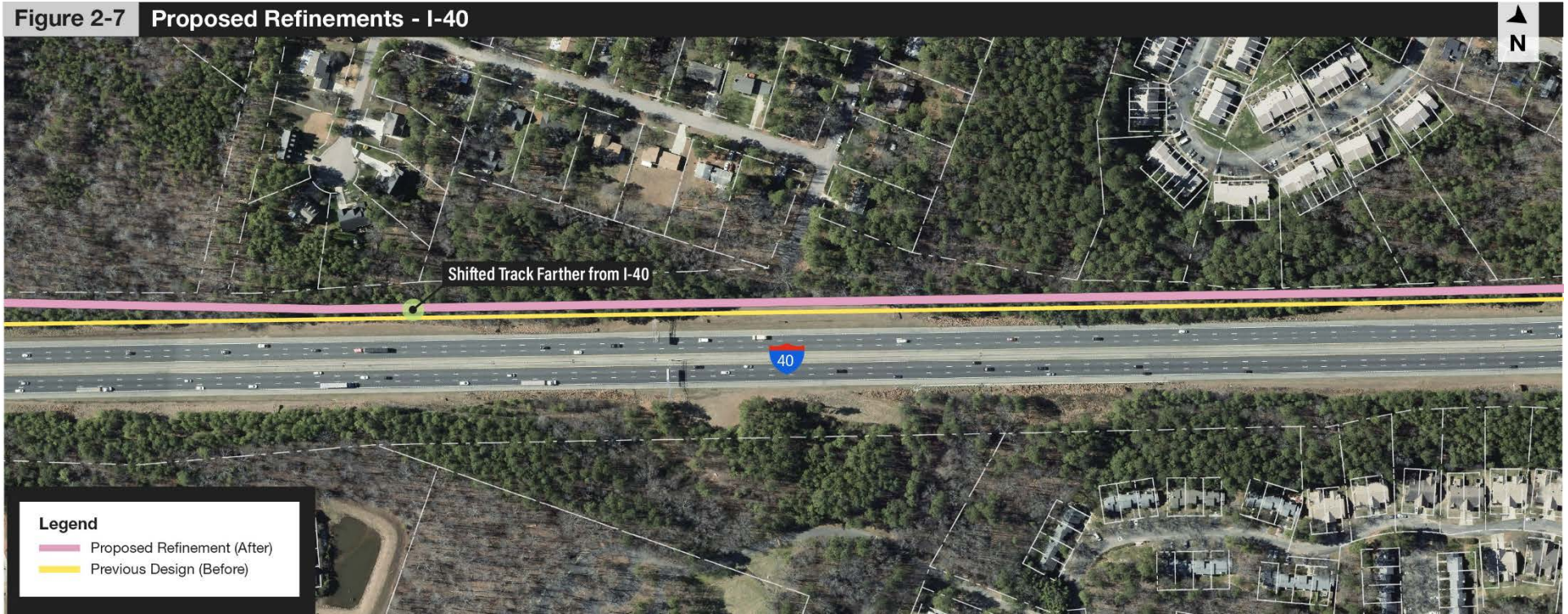
**Figure 2-6: Illustration of Proposed Refinements – Farrington Road Bridge**



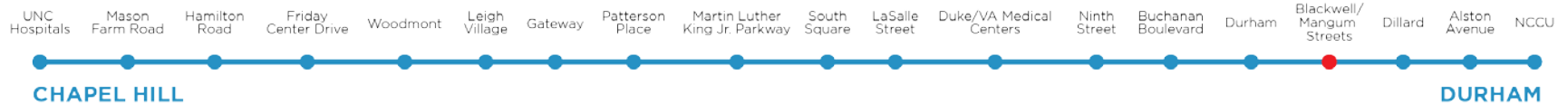
**Table 2-4: Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
Realignment in Vicinity of I-40 (Figure 2-7 and appendix A-2, Sheet 12)	<ul style="list-style-type: none"> <li>Shifted the track alignment along I-40 farther from the existing shoulder of the eastbound I-40 travel lane.</li> </ul>	<ul style="list-style-type: none"> <li>The North Carolina Department of Transportation (NCDOT) requested that GoTriangle offset the light rail alignment farther from I-40 to minimize encroachment into the NCDOT controlled access area, to increase separation between the light rail tracks and I-40, and to accommodate future widening plans along I-40.</li> </ul>

**Figure 2-7 Proposed Refinements - I-40**



**Figure 2-7: Illustration of Proposed Refinements – I-40**



**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
Gateway Station (Figure 2-8 and appendix A-2, Sheets 13, 14)	<ul style="list-style-type: none"> <li>▪ Moved the station to the west and reconfigured the station, shifted North White Oak Drive, reconfigured the park-and-ride site layout, and revised the alignment to accommodate the station relocation.</li> <li>▪ Revised the roundabout layout to include a single roundabout lane instead of two lanes. The eastbound to southbound and westbound to northbound slip lanes would be removed and the approach and geometry of the lanes would be modified.</li> <li>▪ Added a sidewalk along the east side of Pope Road from Olde Coach Road to Chapel Hill Road.</li> <li>▪ Identified the Gateway Station park-and-ride site as a potential joint development site. At this time, the Proposed Refinements do not include activities or improvements specifically tied to a joint development project; rather, the design refinements include acquisition and site preparation for a park-and-ride facility that may also support a future joint development (redevelopment).</li> </ul>	<ul style="list-style-type: none"> <li>▪ The change in station location would increase potential economic development benefits for both Orange and Durham counties.</li> <li>▪ The change to the park-and-ride site layout would make it conducive to urban redevelopment.</li> <li>▪ Since publication of the Amended ROD, GoTriangle engaged a task force of local stakeholders, including representatives from local governments, regional agencies, and the Durham Housing Authority to identify potential joint development sites in the D-O LRT Project Corridor. The task force identified and evaluated over 30 potential sites and recommended four sites for further study, including the Gateway Station park-and-ride.</li> </ul>



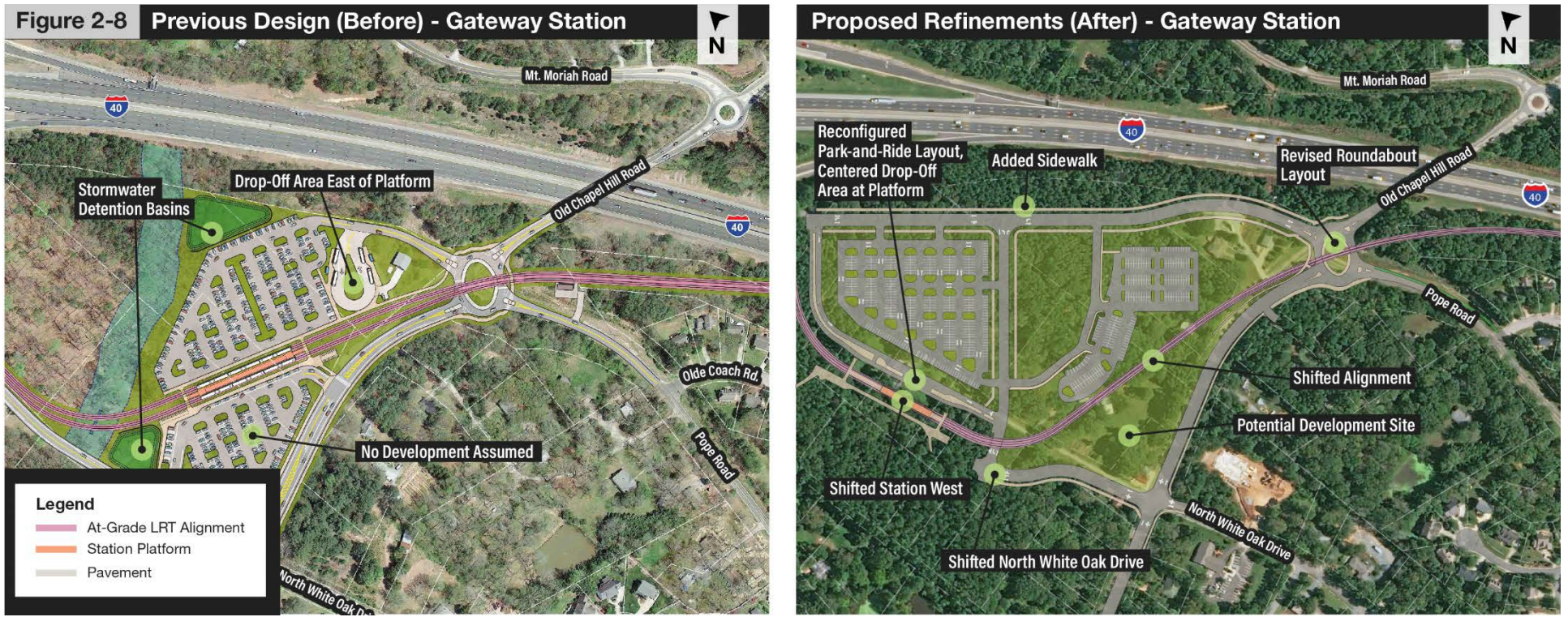
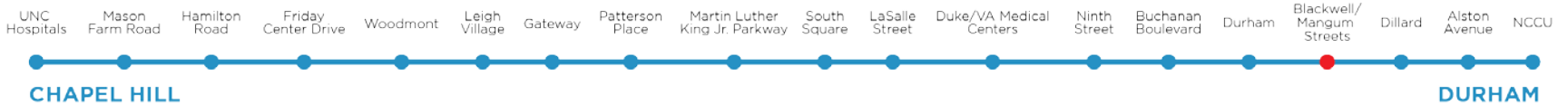


Figure 2-8: Illustration of Proposed Refinements – Gateway Station





**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
Patterson Place Station (Figure 2-9 and appendix A-2, Sheets 15-17)	<ul style="list-style-type: none"> <li>▪ Shifted the station platform approximately 500 feet to the northeast).</li> <li>▪ Revised the track alignment across Southwest Durham Drive and removed retaining walls (.).</li> <li>▪ Reconfigured Sayward Drive to accommodate station and track alignment.</li> <li>▪ Revised from a double-track to a single-track alignment between Patterson Place Station and Martin Luther King Jr. Parkway Station, approximately from Southwest Durham Drive to Snow Crest Trail near University Drive. Track switches (i.e. single-track turnouts) to connect the double-track alignment with the single-track section, would be added at both ends of the single-track section. Single-track bridge structures would extend over New Hope Creek, Garrett Road and Sandy Creek.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The changes would improve access to and visibility of the station in accordance with the TOD study.</li> <li>▪ The changes would better situate the station for potential future development, unlike the Previous Design, which locates the station in a constrained area.</li> <li>▪ The changes would avoid creation of an uneconomic remnant parcel north of Southwest Durham Drive, which is part of the Previous Design.</li> <li>▪ The grant-funded TOD study recommended optimizing the platform location for future development.</li> <li>▪ The VE study identified the revision to a single-track section as a cost savings measure, which also avoids the need to relocate the City of Durham's 16-inch water line in the New Hope Creek Bottomlands and minimizes ground disturbance impacts to natural resources and water resources.</li> </ul>



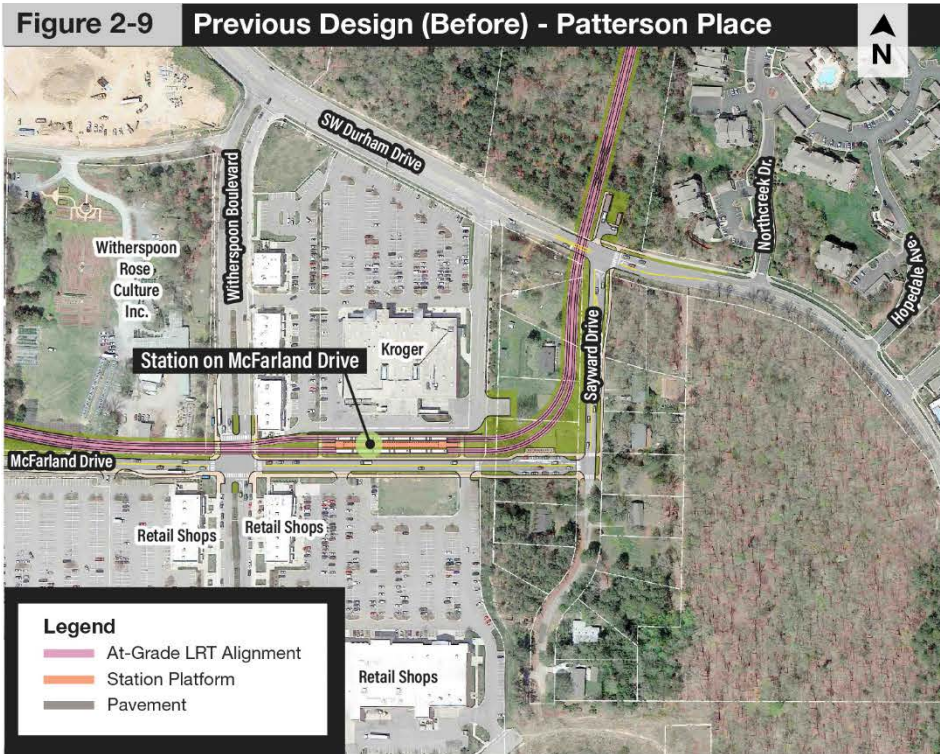
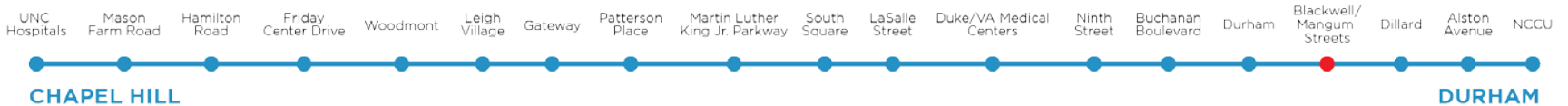


Figure 2-9: Illustration of Proposed Refinements – Patterson Place Station



**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
University Drive and Martin Luther King Jr. Parkway Station (Figures 2-10 to 2-11, and appendix A-2, Sheet 18)	<ul style="list-style-type: none"> <li>▪ Revised the track design from median-running with significant roadway reconstruction, including additional turn lanes, to side-running. Realigned the track from the median to the shoulder on the north side of University Drive between Snow Crest Trail and Martin Luther King Jr. Parkway, crossing at-grade on a diagonal through the intersection of Martin Luther King Jr. Parkway to the south side of University Drive.</li> <li>▪ Added traffic signals at the existing intersections of University Drive with Larchmont Road and the BB&amp;T Plaza Drive.</li> <li>▪ Moved the station from the median to the south side of University Drive.</li> <li>▪ Modified sidewalks, bicycle lanes, and multi-use paths to improve access to the relocated station.</li> <li>▪ Added a sidewalk along the west side of Larchmont Road between University Drive and Gatehouse Lane.</li> <li>▪ Reconfigured the park-and-ride lot to the south, closer to Martin Luther King Jr Parkway, which avoided the acquisition of a big box store and required the acquisition of two bank properties.</li> </ul>	<ul style="list-style-type: none"> <li>▪ In the Amended ROD, GoTriangle committed to perform an additional traffic analysis and coordinate with NCDOT, Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), and municipalities to address traffic impacts at the intersection of University Drive and Martin Luther King Jr. Parkway (Mitigation ID # R01). The revised track design would minimize roadway reconstruction because University Drive would not need to be widened to accommodate the light rail.</li> <li>▪ The changes would enhance pedestrian and bicycle connectivity and access across University Drive and in the vicinity of the intersection of University Drive and Martin Luther King Jr. Parkway, consistent with GoTriangle's commitments in the Amended ROD (Mitigation IDs # PBF01, PBF03).</li> <li>▪ By not widening University Drive, both access and waiting conditions for riders would be improved and would align with the City's compact development goals for the area.</li> <li>▪ The VE study identified moving the park-and-ride lot to the south as a cost savings measure to avoid acquisition of the commercial retail "big box" store.</li> <li>▪ In the Amended ROD, GoTriangle committed to perform additional engineering design work and seek to avoid or limit impacts to existing utilities (Mitigation ID # UI01). The changes would avoid the need to relocate a major communications hub facility near Snow Crest Trail and University Drive.</li> </ul>



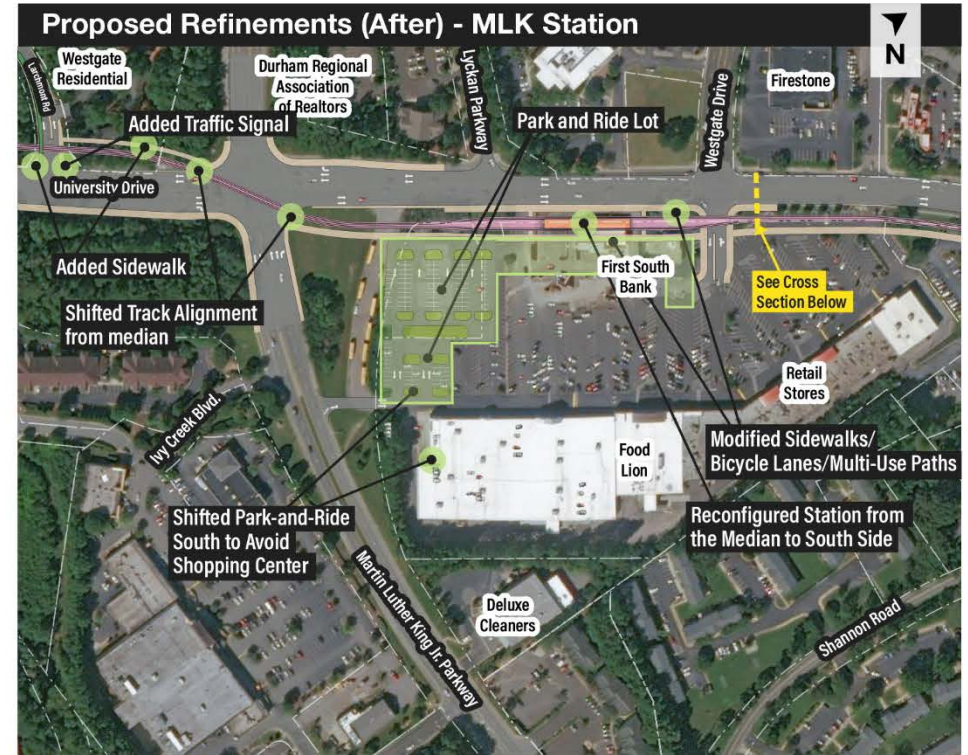
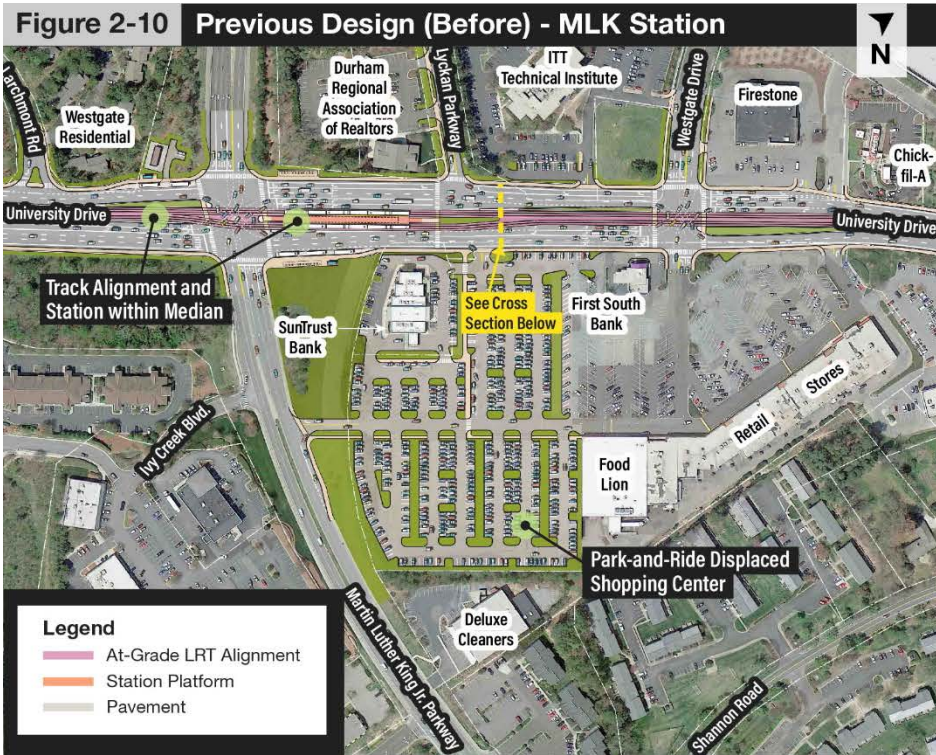
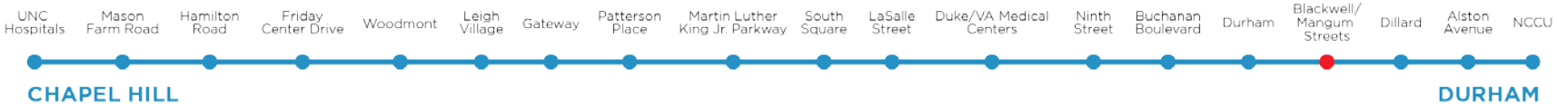


Figure 2-10: Illustration of Proposed Refinements – Martin Luther King Jr Parkway Station



Figure 2-11: Cross Sections – Martin Luther King Jr Parkway Station



**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
<p>South Square Station                      (Figures 2-12, 2-13 and appendix A-2, Sheet 19)</p>	<ul style="list-style-type: none"> <li>▪ Revised the alignment through the intersection of University Drive and Shannon Road to pass underneath the intersection in an underpass instead of crossing through the intersection at-grade.</li> <li>▪ Revised the location of the station approximately 220 feet to the south, locating the station at-grade south of Auto Drive, instead of elevated north of Auto Drive.</li> <li>▪ Maintained access from the new park-and-ride lot to Shannon Road.</li> <li>▪ Added 350 new park-and-ride spaces (for total of approximately 600 spaces) on portions of parcels identified as acquisitions for the track alignment and park-and-ride in the Previous Design.</li> <li>▪ Identified the South Square Station park-and-ride site as a potential joint development site. At this time, the Proposed Refinements do not include activities or improvements specifically tied to a joint development project; rather, the design refinements include acquisition and site preparation for a park-and-ride facility that may also support a future joint development (redevelopment).</li> </ul>	<ul style="list-style-type: none"> <li>▪ In the Amended ROD, GoTriangle committed to incorporate roadway safety measures into the design refinements, such as shifting the light rail alignment horizontally or vertically away from vehicular traffic (Mitigation ID # R04). The underpass design in the Proposed Refinements eliminates a complex at-grade crossing through the intersection of University Drive and Shannon Road.</li> <li>▪ Additional parking is more consistent with projected park-and-ride demand in this portion of the corridor.</li> <li>▪ Since publication of the Amended ROD, GoTriangle has engaged a task force of local stakeholders, including representatives from local governments, regional agencies, and the Durham Housing Authority, to identify potential joint development sites in the D-O LRT Project Corridor. The task force identified and evaluated over 30 potential sites and recommended four sites for further study, including the South Square Station park-and-ride.</li> </ul>



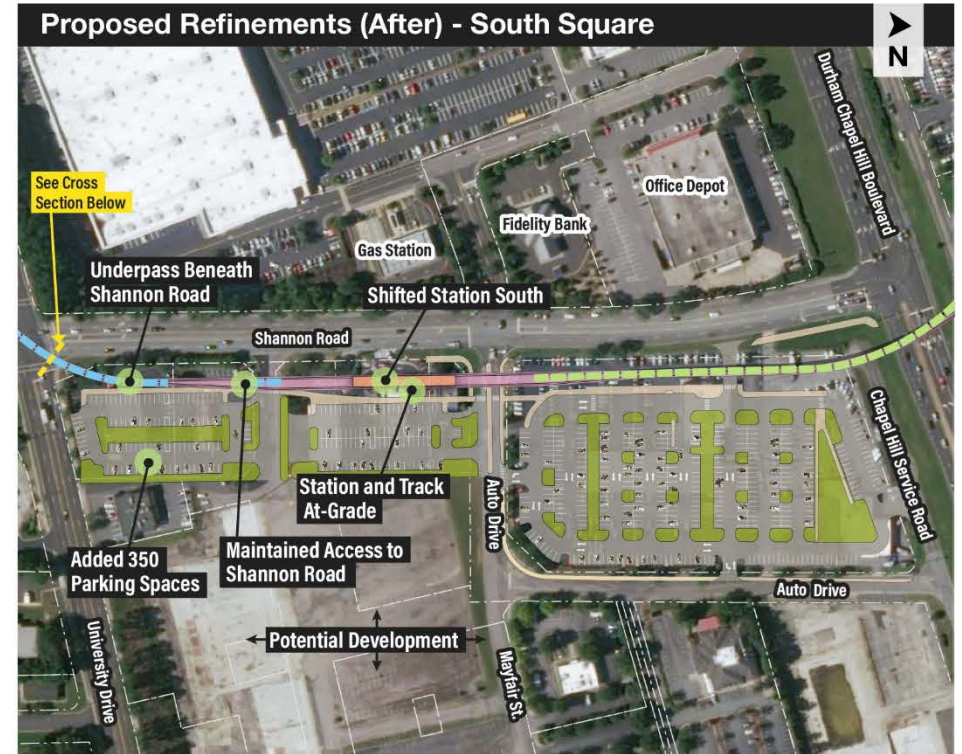


Figure 2-12: Illustration of Proposed Refinements – South Square Station

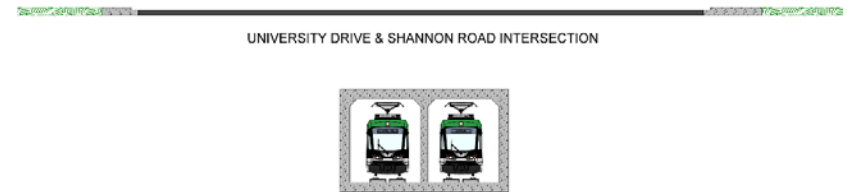
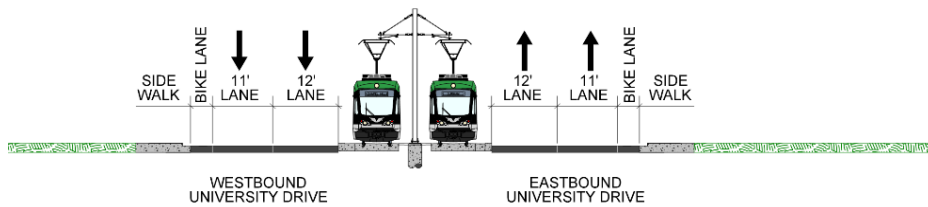
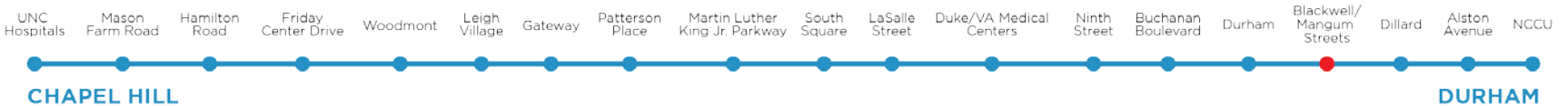


Figure 2-13: Cross Sections – South Square Station  
(Previous Design at Left; Proposed Refinements at Right)



**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
Conifer Glen Lane (Figure 2-14 and appendix A-2, Sheet 20)	<ul style="list-style-type: none"> <li>Redesigned the track's elevated structure to return to ground level north of the Business US 15-501 crossing and remain at ground level through the Parc at University Tower Apartments property.</li> <li>Closed Conifer Glen Lane access to Tower Boulevard.</li> <li>Added alternative access to the Parc at University Tower Apartments from Pickett Road.</li> </ul>	<ul style="list-style-type: none"> <li>GoTriangle changed the design because adequate vertical clearance of the light rail track over Conifer Glen Lane cannot be achieved in a cost-effective manner.</li> </ul>

**Figure 2-14 Proposed Refinements - Conifer Glen**



**Figure 2-14: Illustration of Proposed Refinements – Conifer Glen Lane**



**Table 2-4 (Cont'd): Summary of Proposed Refinements – US 15-501 Corridor Location**

Location	What's Changed?	Why?
<p>Western Bypass (Figure 2-15, appendix A-2, Sheet 20 and appendix A-3, Sheet 21)</p>	<ul style="list-style-type: none"> <li>Shifted the rail alignment to the east, away from US 15-501 and east of the Western Bypass.</li> <li>Shifted the elevated structure over Cornwallis Road away from the interchange with US 15-501.</li> <li>Added a backup rail operations control center in a prefabricated structure on the east side of Western Bypass at a site previously evaluated, but no longer needed for a Traction Power Substation.</li> <li>Modified driveways to maintain access to private properties along the Western Bypass.</li> </ul>	<ul style="list-style-type: none"> <li>NCDOT requested that GoTriangle consider an alignment that would not cross Western Bypass at-grade, and that would instead cross Cornwallis Road further east to avoid conflicts with the existing NCDOT bridge over Sandy Creek.</li> <li>The changes would avoid considerable rock excavation and a large retaining wall, which would be costly.</li> <li>Advancements in design change the voltage of the Traction Power Substations and reduce the number of substations needed from 19 to 11 total. One of the previous Traction Power Substation locations was identified for use as a secondary backup rail operations control center.</li> <li>Modifications to driveway access to private properties on Western Bypass would accommodate the revised track alignment. GoTriangle would maintain access to private properties on the light rail alignment.</li> </ul>

**Figure 2-15 Proposed Refinements - Western Bypass**



**Figure 2-15: Illustration of Proposed Refinements – Western Bypass**





**Table 2-5: Summary of Proposed Refinements – Duke West Campus and Medical Center Location**

Location	What's Changed?	Why?
US 15-501 from Cornwallis Road to Cameron Boulevard (Figure 2-16 and appendix A-3, Sheets 21, 22)	<ul style="list-style-type: none"> <li>Shifted the track alignment closer to US 15-501 north of Cornwallis Road.</li> <li>Proposed relocating an existing 30-inch water main along the east side of US 15-501 to the west side of US 15-501.</li> </ul>	<ul style="list-style-type: none"> <li>In the Amended ROD, GoTriangle committed to continue coordination with Duke University and NCDOT to determine appropriate mitigation measures for the Al Buehler trail and Duke University Golf Club; the changes allow for additional trees to be maintained in the area between US 15-501 and the Al Buehler trail, enhancing visual screening for the trail and the golf course as compared to the Previous Design (Mitigation ID # VAC02).</li> <li>The changes would improve maintenance access to the water line and avoid conflict with NCDOT plans to widen US 15-501 as compared with the Previous Design.</li> </ul>

**Figure 2-16 Proposed Refinements - US 15-501**

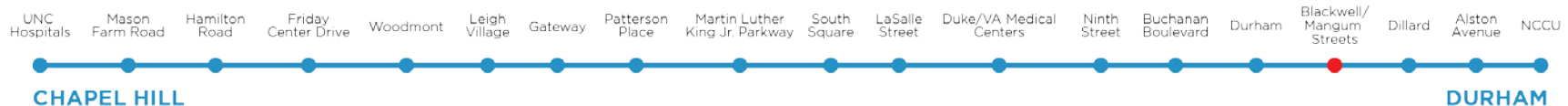


**Figure 2-16: Illustration of Proposed Refinements – US 15-501**



**Table 2-5 (Cont'd): Summary of Proposed Refinements – Duke West Campus and Medical Center Location**

Location	What's Changed?	Why?
<p>Erwin Road and Duke/VA Medical Centers                      (Figures 2-17 to 2-21 and appendix A-3, Sheets 23 - 26)</p>	<ul style="list-style-type: none"> <li>▪ Revised the track alignment from south of Cameron Boulevard to NC 147 from a street-level median-running alignment to a combination of at-grade side-running and elevated median-running alignment, as follows:                             <ul style="list-style-type: none"> <li>○ Shifted the rail alignment from the median of Erwin Road at the intersection of Cameron Boulevard to the southeast side of Erwin Road.</li> <li>○ The alignment transitions from ground level to elevated structure just southwest of LaSalle Street, remains elevated and transitions into the median of Erwin Road, shifts out of the median on the north side of Erwin Road, just east of Flowers Drive, remaining elevated to the Ninth Street Station.</li> </ul> </li> <li>▪ Moved the LaSalle Street Station to the south side of Erwin Road, elevated on retained fill.</li> <li>▪ Moved the Duke/VA Medical Centers Station from between Trent and Flowers Drives in the Previous Design to just west of Fulton Street. The elevated structure provides direct access to the platform from the sidewalks.</li> </ul>	<ul style="list-style-type: none"> <li>▪ In the Amended ROD, GoTriangle committed to perform additional engineering design work to avoid or limit impacts to existing utilities (Mitigation ID # UI01). The changes would avoid the need to relocate a major high-voltage (44kV) electrical transmission line under Erwin Road that provides power to the Duke University and Durham VA hospital complexes, thereby reducing risk to electrical service interruption at the hospitals and a substantial cost to relocate a major high-voltage electrical transmission line.</li> <li>▪ In the Amended ROD, GoTriangle committed to coordinate with emergency and medical personnel during design advancement to investigate impacts of the light rail system on their day-to-day operations (Mitigation ID # SS01). VA and Duke University Medical Centers personnel encouraged GoTriangle to refine the design to an elevated alignment through the hospitals area to eliminate potential conflicts with ambulances crossing and traveling along the light rail corridor.</li> <li>▪ In the Amended ROD, GoTriangle committed to incorporate roadway safety measures into the design refinements, such as shifting the light rail alignment horizontally or vertically away from vehicular traffic (e.g., shifting to side-running from median-running), and installing elevated structures to avoid significant impacts on existing roads (Mitigation ID # R04).</li> </ul>



**Table 2-5 (Cont'd): Summary of Proposed Refinements – Duke West Campus and Medical Center Location**

Location	What's Changed?	Why?
Erwin Road and Duke/VA Medical Centers (Cont'd) (Figures 2-17 to 2-21 and appendix A-3, Sheets 23 - 26)		<ul style="list-style-type: none"> <li>■ In the Amended ROD, GoTriangle committed to continue coordination with Duke University on relocating and maintaining services provided at the John Hope Franklin Center (Mitigation ID # NCR02); the changes would avoid impacts to the John Hope Franklin Center and eliminate the need for its relocation.</li> <li>■ In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01); the changes provide enhanced access to stations as compared to the Previous Design by locating the LaSalle Street station on the side of Erwin Road and the Duke/VA Medical Centers station on an elevated structure with direct access to the platform from the sidewalks.</li> </ul>



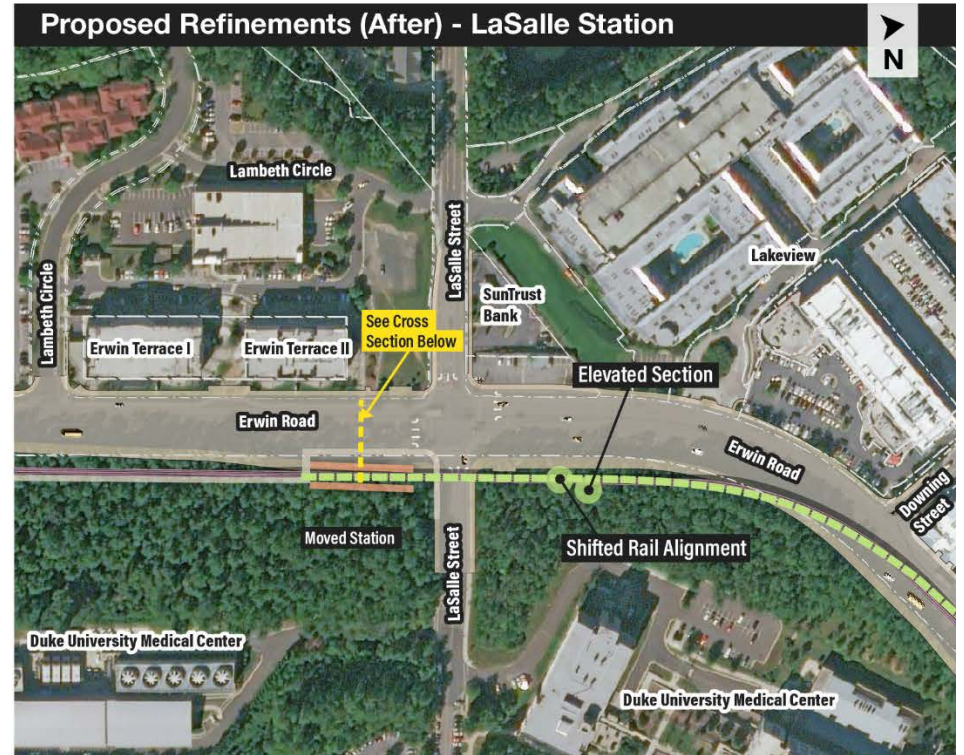
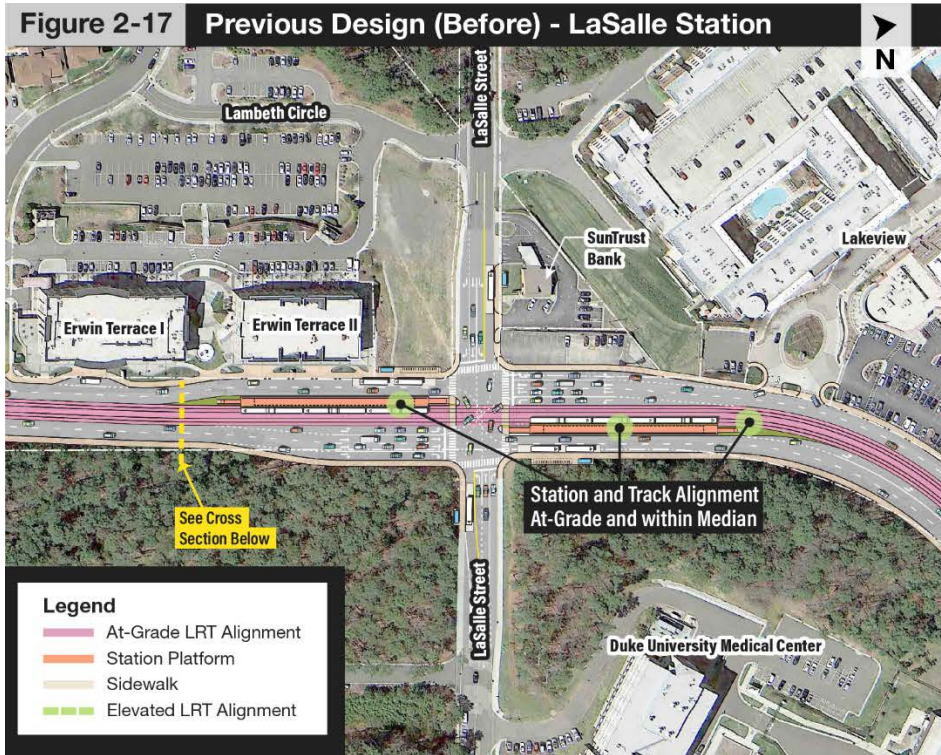


Figure 2-17: Illustration of Proposed Refinements – LaSalle Street Station

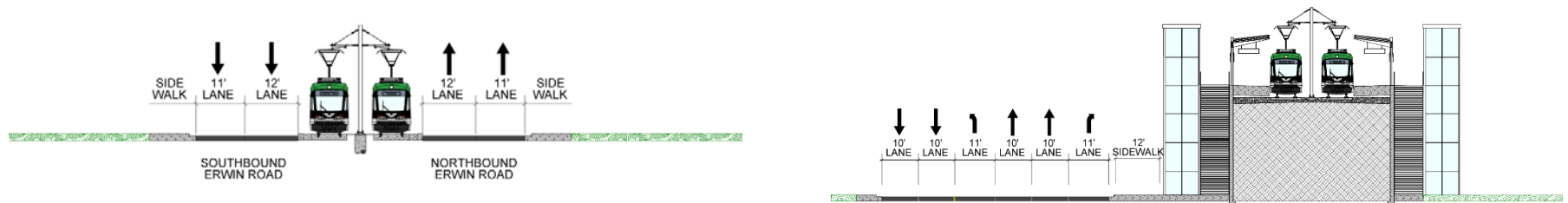
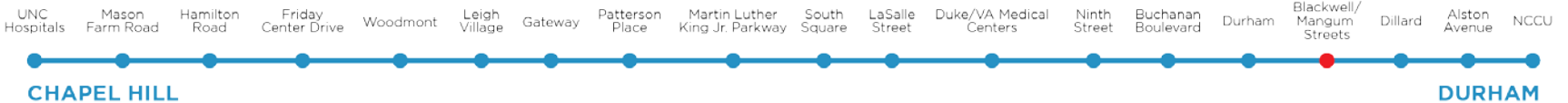


Figure 2-18: Cross Sections – LaSalle Street Station  
(Previous Design at Left; Proposed Refinements at Right)



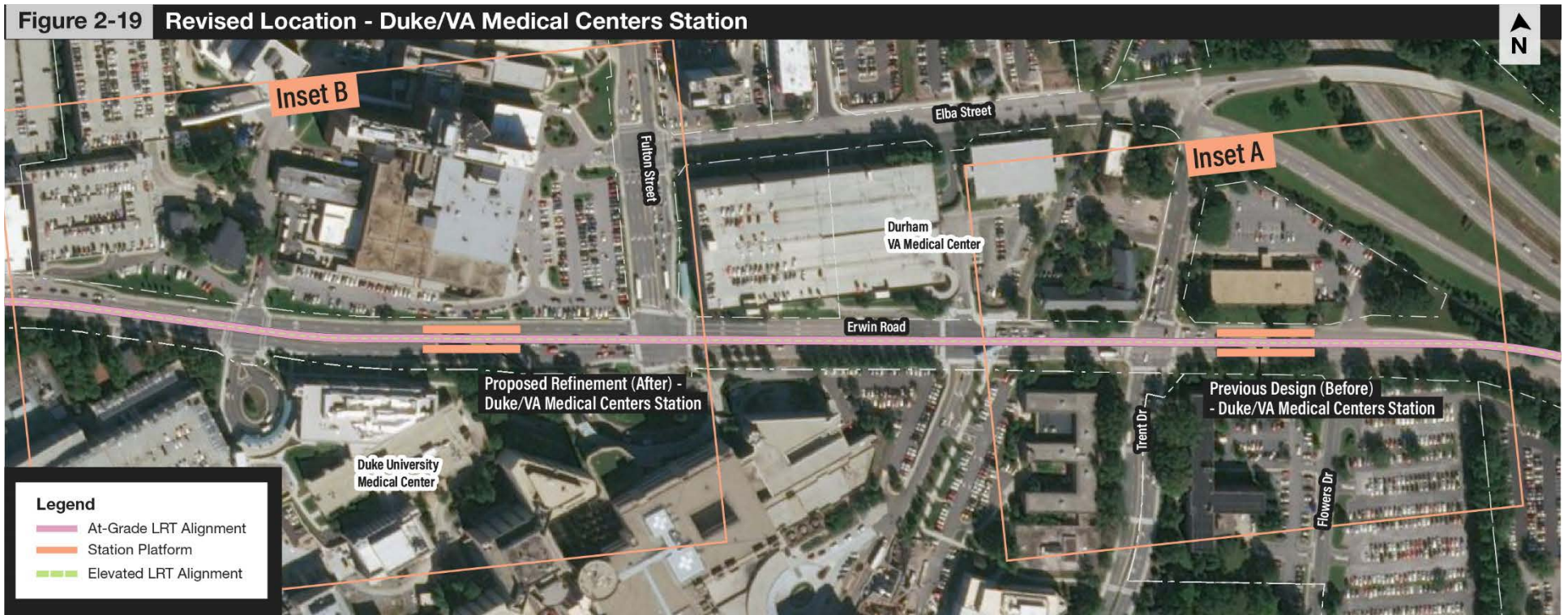
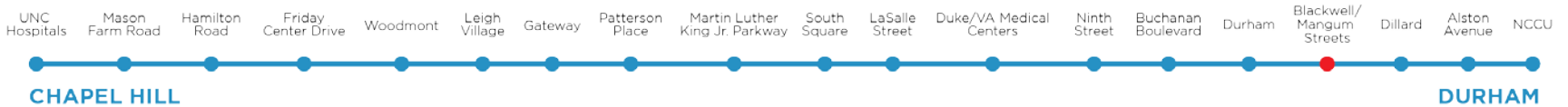


Figure 2-19: Illustration of Proposed Refinements – Erwin Road



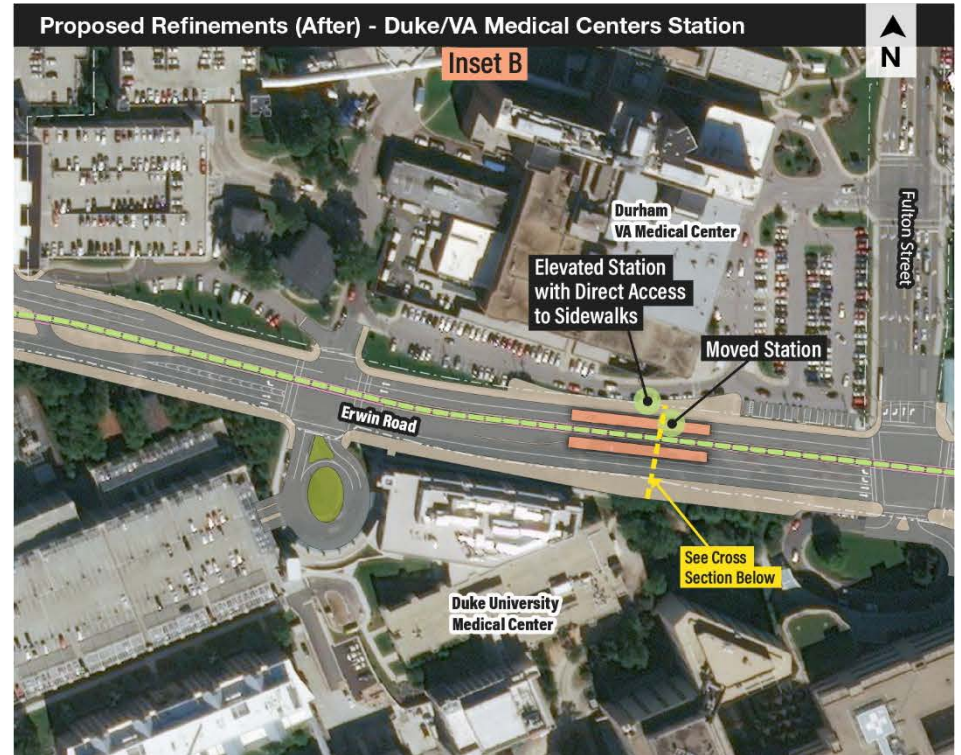
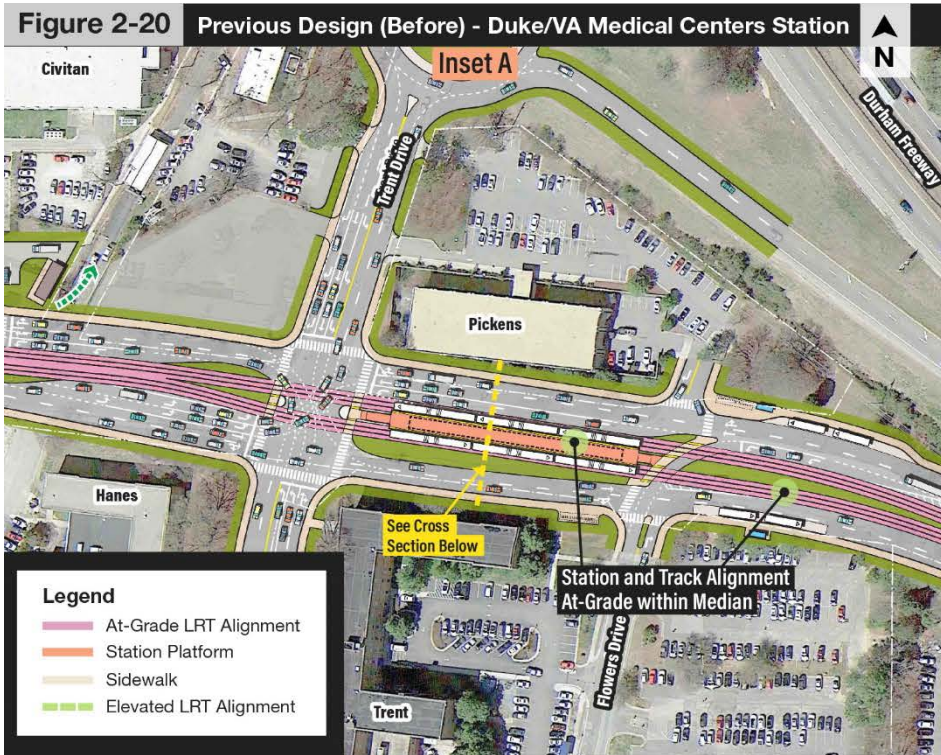
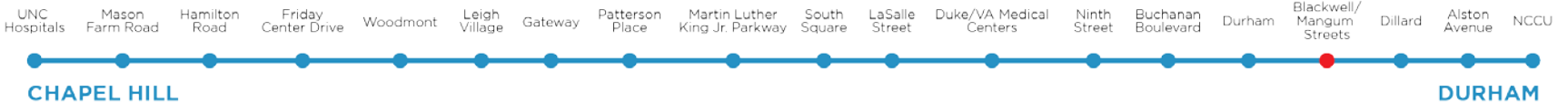


Figure 2-20: Illustration of Proposed Refinements – Duke/VA Medical Centers Station



Figure 2-21: Cross Sections – Duke/VA Medical Centers Station  
 (Previous Design at Left; Proposed Refinements at Right)

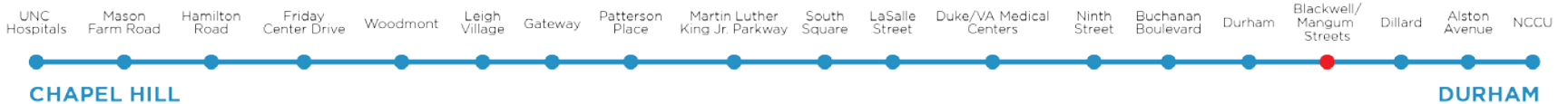


**Table 2-6: Summary of Proposed Refinements – Old West Durham/Duke East Campus Location**

Location	What's Changed?	Why?
Ninth Street Station (Figure 2-22 and appendix A-3, Sheets 26, 27)	<ul style="list-style-type: none"> <li>Shifted the location of the elevated station to the east approximately 220 feet to straddle Erwin Road, allowing direct pedestrian access from both the east and west sides of the street.</li> <li>Added a sidewalk on the south side of Pettigrew Street from Erwin Road to Swift Avenue.</li> </ul>	<ul style="list-style-type: none"> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>

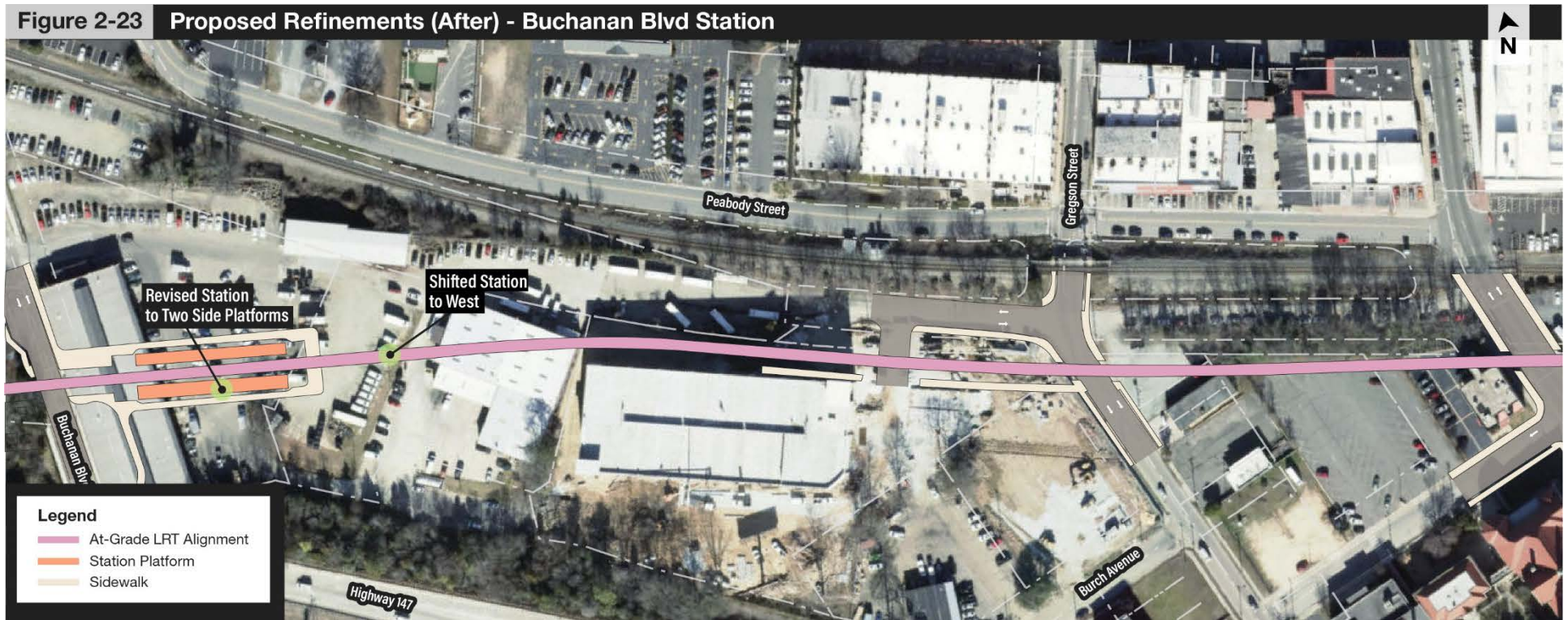


**Figure 2-22: Illustration of Proposed Refinements – Ninth Street Station**

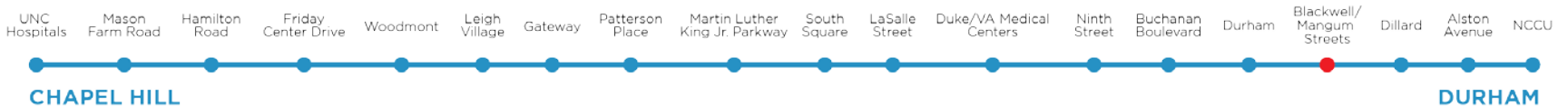


**Table 2-6 (Cont'd): Summary of Proposed Refinements – Old West Durham/Duke East Campus Location**

Location	What's Changed?	Why?
Buchanan Boulevard Station (Figure 2-23 and appendix A-3, Sheet 28)	<ul style="list-style-type: none"> <li>Changed the station type from a single center platform in the Previous Design to two side platforms and reconfigured the station site design.</li> <li>Shifted the station to the west to directly connect to sidewalks along Buchanan Boulevard.</li> </ul>	<ul style="list-style-type: none"> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> </ul>



**Figure 2-23: Illustration of Proposed Refinements – Buchanan Boulevard Station**





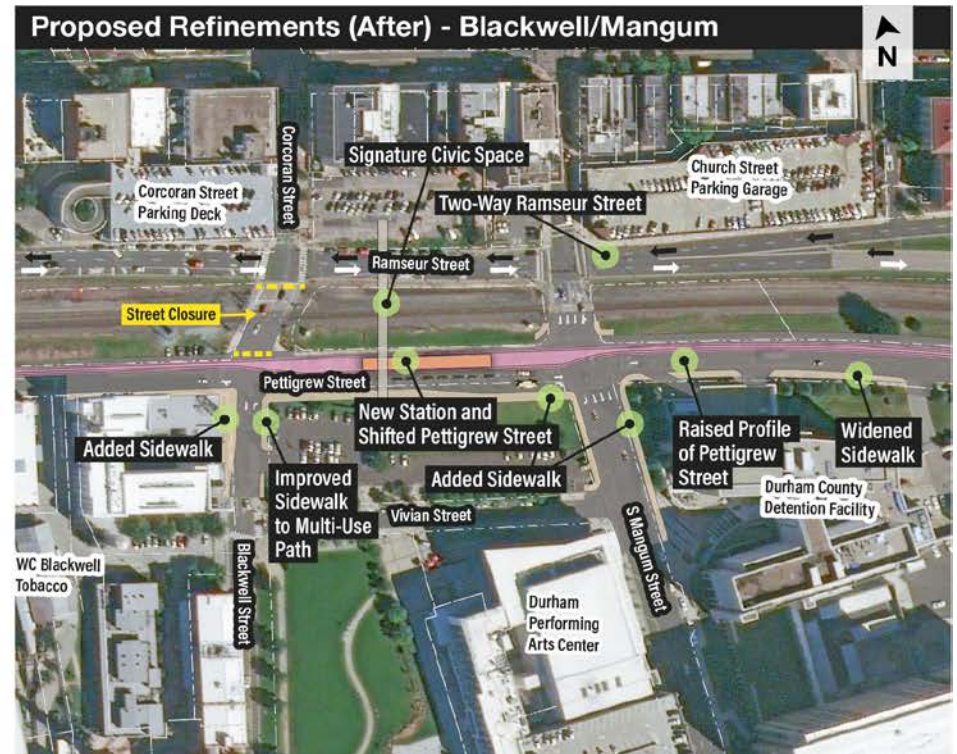
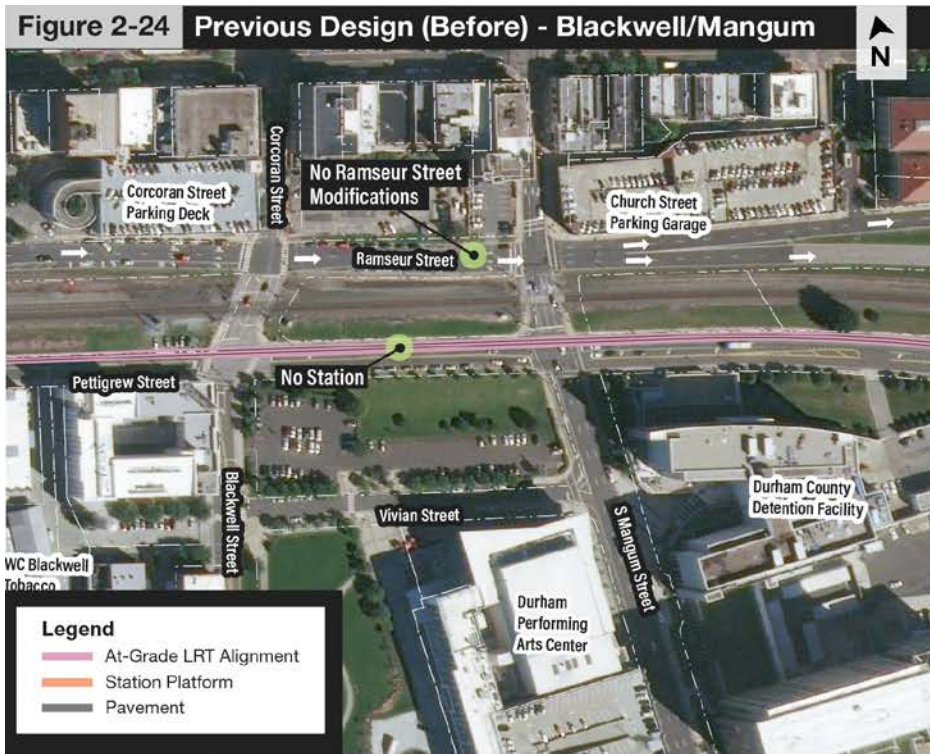
**Table 2-7: Illustration of Summary of Proposed Refinements – Downtown Durham Location**

Location	What’s Changed?	Why?
<p>Triangular Parcel bounded by the North Carolina Railroad Company (NCRR) right-of-way, Duke Street, and Chapel Hill Street (<b>appendix A-3, Sheet 28</b>)</p>	<ul style="list-style-type: none"> <li>Identified this parcel, which GoTriangle has owned since 2004, as a potential joint development site. At this time, the Proposed Refinements do not include activities or improvements specifically tied to a joint development project. The Previous Design, which remains unchanged, includes hazardous material remediation as part of site preparation (in accordance with the Amended ROD, Mitigation ID # HCRM01) for the light rail alignment, which could also support a future joint development on the site.</li> </ul>	<ul style="list-style-type: none"> <li>Since publication of the Amended ROD, GoTriangle has engaged a task force of local stakeholders, including representatives from local governments, regional agencies, and the Durham Housing Authority, to identify potential joint development sites in the D-O LRT Project Corridor. The task force identified and evaluated over 30 potential sites and recommended four sites for further study, including this property near Durham Station.</li> </ul>
<p>Blackwell/Mangum Streets Station (<b>Figure 2-24 and appendix A-3, Sheets 29 – 31</b>)</p>	<ul style="list-style-type: none"> <li>Added the proposed Blackwell/Mangum Streets Station, a center platform station near the Durham Performing Arts Center (DPAC), between Blackwell Street and Mangum Street. This required shifting Pettigrew Street to the south approximately 10 feet, and raising the street profile.</li> <li>Improved multi-use path on the east side of Blackwell Street from Pettigrew Street to Vivian Street and widened a sidewalk on Pettigrew Street from Blackwell Street to Chatham Place.</li> <li>Reconfigured Ramseur Street to permit two-way operations between Chapel Hill Street and Dillard Street.</li> <li>Closed Blackwell Street to vehicle and pedestrian access between Ramseur Street and Pettigrew Street.</li> <li>Raised the profile of Pettigrew Street and the intersecting streets between Blackwell Street and Grant Street.</li> <li>Added a signature civic space connecting Pettigrew Street to Ramseur Street approximately mid-block between Blackwell Street and Mangum Street.</li> </ul>	<ul style="list-style-type: none"> <li>In response to public comments and comments received from the City of Durham, GoTriangle committed to study the addition of a proposed station near Blackwell and Mangum Streets (Combined FEIS/ROD appendix D.3). The proposed station would meet the project goal of providing direct service to key destinations in downtown Durham.</li> <li>In the Amended ROD, GoTriangle committed to refine the design to enhance sidewalk connections and improve bicycle and pedestrian access to stations (Mitigation ID # PBF01).</li> <li>In the Amended ROD, GoTriangle committed to coordinate with NCRR, Norfolk Southern, and NCDOT regarding safety measures near at-grade rail and roadway crossings (Mitigation ID # R04, SS01). Due to the steep grade separation, the Previous Design would have created a safety and feasibility issue for large vehicles (e.g., lowboy trailers) attempting to cross both the railroad and light rail tracks. Raising the profile of Pettigrew Street from Blackwell Street to Grant Street would improve the grade crossings. The closure of Blackwell Street is due to the severity of the grade difference across the tracks and the resultant impacts to the Old Bull Building, a Historic National Landmark. The closure of Blackwell Street also addresses a gate operations signaling issue.</li> <li>Conversion of Ramseur Street to two-way operations allows bus traffic to relocate from the westbound light rail alignment between Dillard Street and Chapel Hill Street and to travel westbound on Ramseur Street.</li> </ul>



**Table 2-7 (Cont'd): Illustration of Summary of Proposed Refinements – Downtown Durham Location**

Location	What's Changed?	Why?
Blackwell/Mangum Streets Station (cont'd) (Figure 2-24 and appendix A-3, Sheets 29 – 31)		<ul style="list-style-type: none"> <li>In order to maintain pedestrian access to downtown Durham across the NCCR Corridor, and to the proposed Blackwell/Mangum Street Station, a signature civic space is proposed to connect Pettigrew Street and Ramseur Street.</li> </ul>



**Figure 2-24: Illustration of Proposed Refinements –Blackwell/Mangum Streets Station**



**Table 2-7 (Cont'd): Illustration of Summary of Proposed Refinements – Downtown Durham Location**

Location	What's Changed?	Why?
Dillard Street Station (Figure 2-25 and appendix A-3, Sheet 30)	<ul style="list-style-type: none"> <li>▪ Eliminated park-and-ride at the Dillard Street Station.</li> <li>▪ Modified the roadway design: removed a lane along Pettigrew Street adjacent to the station platform (reducing from the three lanes in the Previous Design to two lanes), and widened Pettigrew Street for left and right turn lanes at Fayetteville Street.</li> <li>▪ Converted Dillard Street to one-way southbound operations between Ramseur Street and Pettigrew Street.</li> <li>▪ Shifted the platform and the track alignment to the east to accommodate a longer westbound right turn along Pettigrew Street.</li> <li>▪ Added gates to light rail crossing adjacent to railroad crossing at Fayetteville Street.</li> </ul>	<ul style="list-style-type: none"> <li>▪ A private developer redeveloped the site identified as a park-and-ride with an apartment complex and plans for additional commercial buildings. GoTriangle can no longer pursue a cost-effective park-and-ride lot at this location.</li> <li>▪ Through coordination with the City of Durham and the private developer at this site, GoTriangle recognized that the Previous Design would significantly affect the available footprint for the private development and that raising the grade of Pettigrew Street as planned in the Previous Design would conflict with the building frontage, negatively affecting pedestrian circulation and access between the development and the station. The changes would improve the interface between the development and the station.</li> </ul>



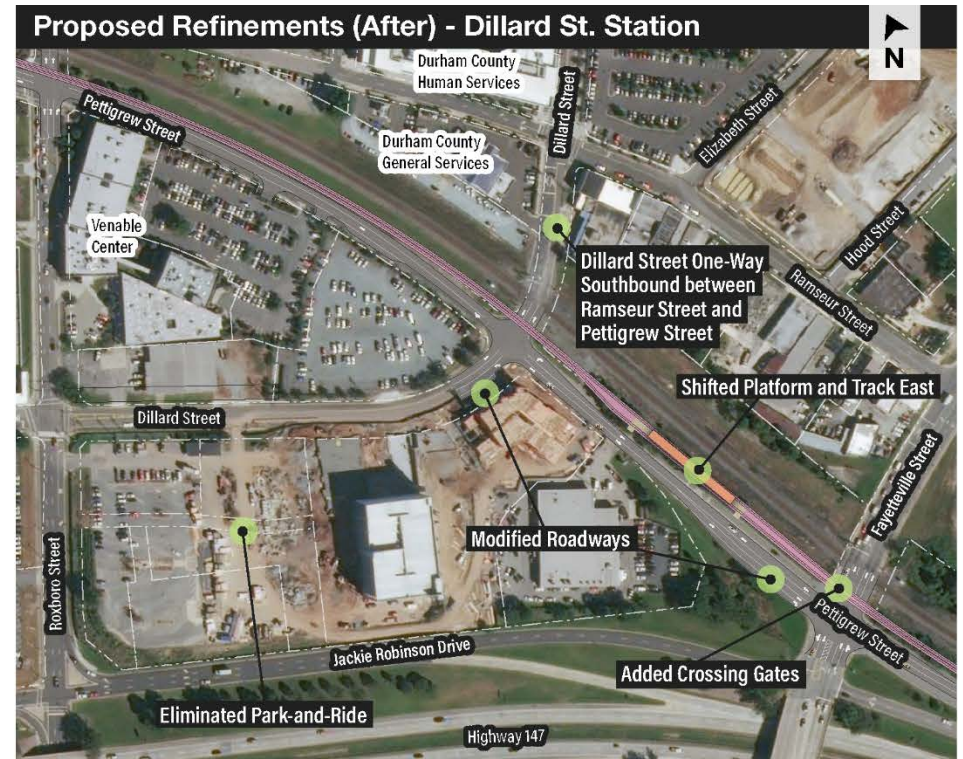
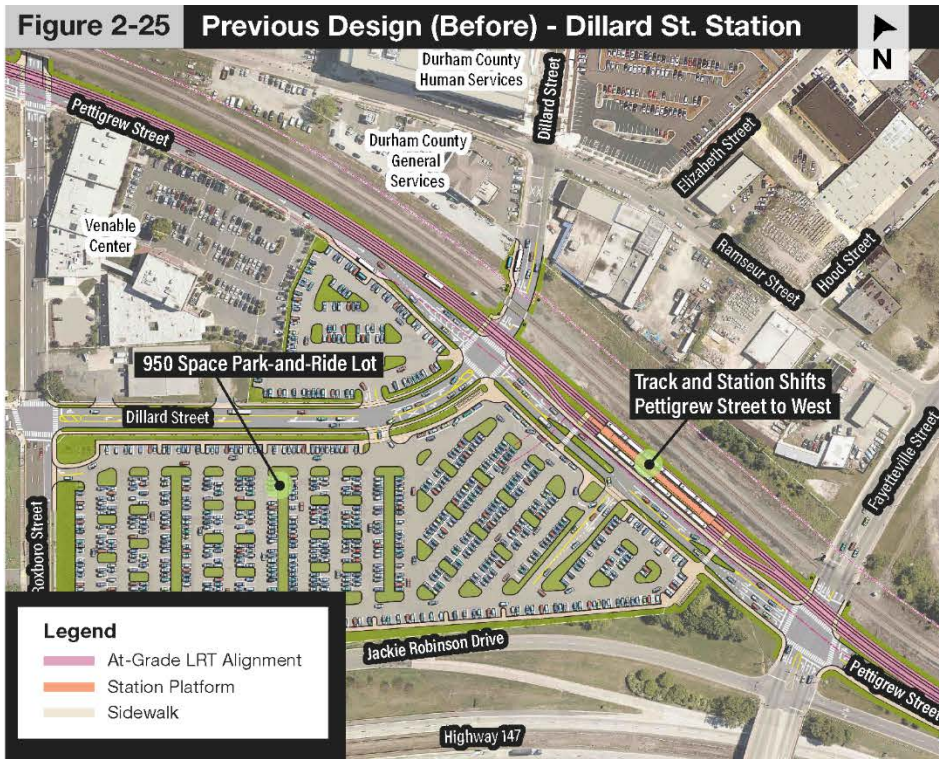
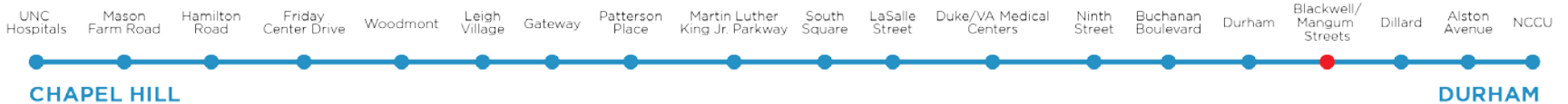


Figure 2-25: Illustration of Proposed Refinements – Dillard Street Station



**Table 2-8: Summary of Proposed Refinements – East Durham Location**

Location	What's Changed?	Why?
<p>Alston Avenue Station                      (Figure 2-26 and appendix A-3, Sheet 31)</p>	<ul style="list-style-type: none"> <li>▪ Changed the park-and-ride parking layout from a parking garage and surface lot to multiple surface parking lots.</li> <li>▪ Reconfigured the at-grade crossing of Pettigrew Street and moved the station platform closer to the intersection of Pettigrew Street and Grant Street to improve pedestrian access to the station.</li> <li>▪ Converted the existing path between the R. Kelly Bryant Bridge and Alston Avenue just north of NC 147 to a multi-use path, including lighting and wayfinding.</li> <li>▪ Identified the Alston Avenue Station park-and-ride as a potential joint development site. At this time, the Proposed Refinements do not include activities or improvements specifically tied to a joint development project; rather, the design refinements include acquisition and site preparation for a park-and-ride facility that may also support a future joint development (redevelopment).</li> </ul>	<ul style="list-style-type: none"> <li>▪ The surface parking configuration is more cost effective and is better aligned with other planned park-and-ride parking.</li> <li>▪ GoTriangle refined the design in response to the City of Durham's request to improve pedestrian access and reduce vehicular conflicts between the light rail system and the roadway operations. This refinement is consistent with GoTriangle commitments in the Amended ROD (Mitigation ID #s LUZ01, NCR02, EJ01, R07, R04).</li> <li>▪ The refinements would result in direct access to existing and future planned development along Grant Street.</li> <li>▪ GoTriangle enhanced the pedestrian route to meet its commitments in the Amended ROD (Mitigation IDs # PBF01, PBF03).</li> <li>▪ This refinement would mitigate the loss of opportunity for on-street bicycle facilities on Alston Avenue with improvements to off-street facilities (Mitigation IDs #PBF05).</li> <li>▪ Since publication of the Amended ROD, GoTriangle engaged a task force of local stakeholders, including representatives from local governments, regional agencies, and the Durham Housing Authority, to identify potential joint development sites in the D-O LRT Project Corridor. The task force identified and evaluated over 30 potential sites and recommended four sites for further studies along the alignment, including the Alston Avenue Station park-and-ride.</li> </ul>



**Table 2-8 (Cont'd): Summary of Proposed Refinements – East Durham Location**

Location	What's Changed?	Why?
<p>NCCU Station                      (Figures 2-27 and appendix A-3,                      Sheet 32)</p>	<ul style="list-style-type: none"> <li>▪ Added a sidewalk along the north side of Linwood Avenue between Ridgeway Avenue and Alston Avenue and along the south side of Lawson Street between Alston Avenue and Wabash Street.</li> <li>▪ Enhanced the pedestrian route along the east side of Alston Avenue.</li> <li>▪ Modified roadway connections and grading along Alston Avenue at the intersections of Linwood Avenue, Cox Avenue and Dupree Street.</li> <li>▪ Added roadway connection between Price Avenue and Massey Avenue to accommodate community circulation and the closing of intersections at Alston Avenue. Also added pedestrian connection to Alston Avenue.</li> <li>▪ Eliminated the storage tracks at the end of the line to accommodate shifting the station platform closer to Lawson Street.</li> </ul>	<ul style="list-style-type: none"> <li>▪ GoTriangle refined the design in response to the City of Durham's request to improve pedestrian access and reduce vehicular conflicts between the light rail and the roadway operations. This refinement is consistent GoTriangle's commitments in the Amended ROD (Mitigation ID #s LUZ01, NCR02, EJ01, PBF06).</li> <li>▪ GoTriangle refined the design to include aesthetic enhancements to pedestrian routes in response to the City of Durham's request that the D-O LRT Project meet the City's design code.</li> <li>▪ In the Amended ROD, GoTriangle committed to coordinate with the City of Durham during additional engineering design work on roadway modifications (Mitigation ID # R07). The City of Durham expressed concern that the storage of light rail vehicles in the location designated in the Previous Design would interfere with sight distance at the traffic signal at S. Alston Avenue and Lawson Street. The change would eliminate that concern.</li> </ul>



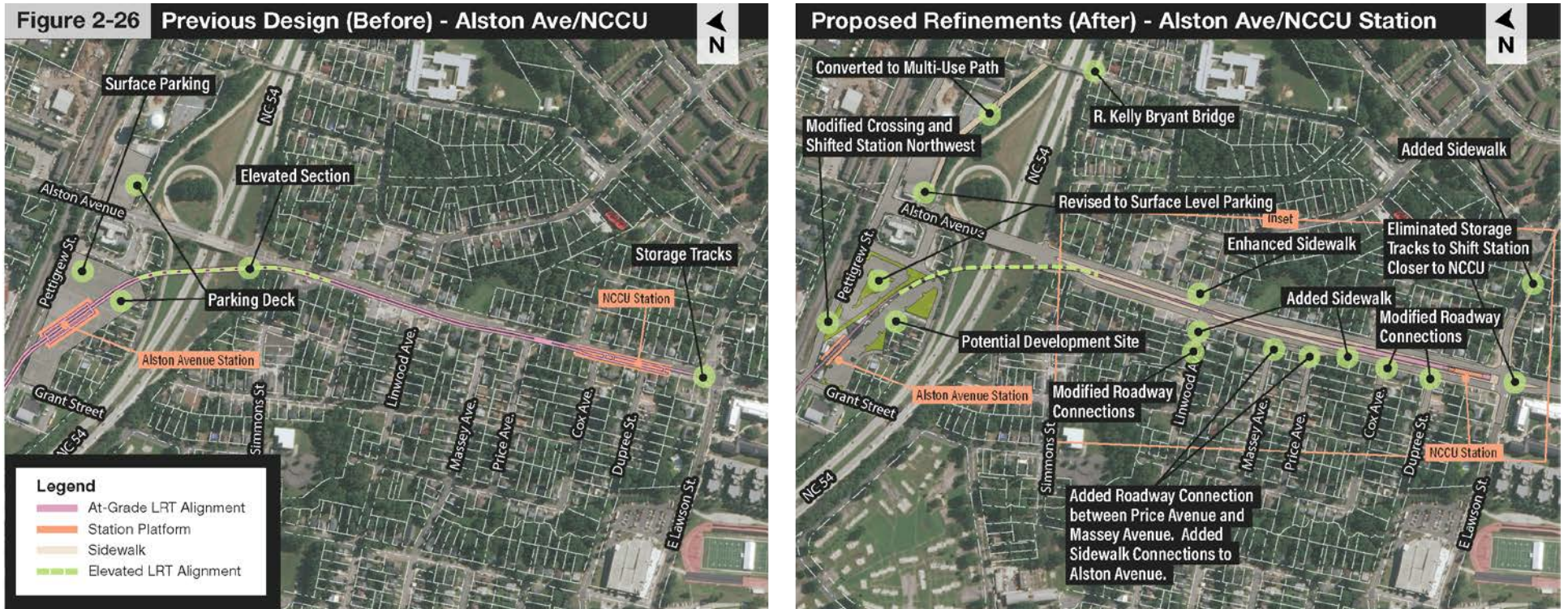


Figure 2-26: Illustration of Proposed Refinements – Alston Avenue/NCCU Stations

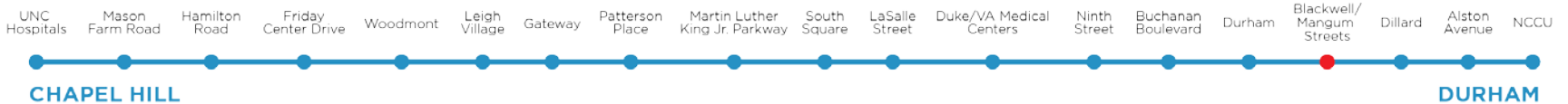
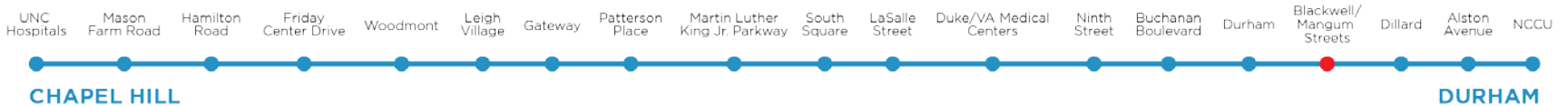




Figure 2-27: Illustration of Proposed Refinements – Alston Avenue/NCCU Station Inset





## 2.3 Proposed Refinements to Transit Operating Plan

### 2.3.1 Proposed Service Plan

The proposed operating plan for the D-O LRT Project with Proposed Refinements is identical to the operating plan under the Previous Design. Service is proposed to be provided seven days a week, from 5:30 AM to midnight most days and 6:30 AM to midnight on Sunday. On weekdays, service would operate on 10-minute headways during peak periods and 20-minute headways during off-peak periods. On weekends, service would operate on 20-minute headways, with 30-minute headways on Sunday mornings and Saturday and Sunday evenings.

### 2.3.2 Operating Requirements

The general operational characteristics of the LRT service are identical under the Previous Design and the Proposed Refinements, including the use of a mix of one-car and two-car trains during peak periods.

The Proposed Refinements include adjustments to the track alignment, in particular at Gateway Station, Patterson Place Station, and Martin Luther King Jr. Parkway Station. In addition, the refinements include a new proposed station at Blackwell and Mangum Streets. These refinements

would affect the total travel time. As such, a review of the previous operational analysis was conducted, and a new travel time was calculated to account for these new conditions. Based on this review, end-to-end travel time along the alignment increases to 52-54 minutes, as compared to 44-46 minutes under the Previous Design. Due to the increased end-to-end travel time, the required number of vehicles has increased by one to 18 total vehicles under the Proposed Refinements. The cycle time (round-trip time for a single train set) is 120 minutes.

### 2.3.3 Supporting Bus Services

Modifications to the bus networks operated by GoTriangle, GoDurham, and Chapel Hill Transit to accommodate the Proposed Refinements are identical to the changes proposed in the Previous Design. These changes are discussed in detail in **appendix K.1** of the DEIS.

