Chapter 2: Alternatives

This chapter summarizes the alternatives considered and the process by which alternatives were screened. It also describes the No-Action Alternative, the Enhanced Bus Alternative, and the Preferred Alternative. The Utah Transit Authority (UTA) intends to request federal funding under the Federal Transit Administration's (FTA's) Small Starts program; UTA has prepared a separate Alternatives Analysis (AA) report per FTA Small Starts guidance. The AA report, dated October 2010, documents the process and analysis used to determine a mode and alignment, resulting in a recommended Locally Preferred Alternative (carried forward as the Preferred Alternative in this document). The AA discusses costs, benefits, environmental impacts, and community impacts for the transit improvements.

2.1 DEVELOPMENT OF ALTERNATIVES

A wide range of alternatives was considered to address the transportation needs of the study area. Alternatives that were previously considered in the 2005 *Provo-Orem Rapid Transit Corridor Feasibility Study* were reevaluated, and additional alternatives were developed through technical analysis and the scoping process.

The interchange at 800 South and Interstate 15 (I-15) in Orem was not considered at the initiation of the project in December 2007. In spring 2009 the lead agencies (which were only FTA and UTA at that time) decided to expand the purpose of the Provo-Orem Bus Rapid Transit Project to include addressing the congestion and connectivity needs near I-15 and to consider the interchange at 800 South as an alternative in the Environmental Assessment (EA). At that time the Utah Department of Transportation (UDOT) and the Federal Highway Administration (FHWA), who were cooperating agencies at that time, were invited to become lead agencies. The development of alternatives to address these specific needs is described in Section 2.1.4.

2.1.1 Community Input

Input from the community was critical in identifying and evaluating alternatives to meet the needs of the study area. Input was collected via a range of methods including implementing a formal scoping process, forming stakeholder groups, and meeting with city representatives and the public.

The scoping period for the Provo-Orem Bus Rapid Transit EA was between December 21, 2007, and February 28, 2008. Comments were received via an agency meeting (January 23, 2008), a public meeting (January 24, 2008), the project Website, and agency letters. Input collected during the scoping period assisted in refining the project purpose and need, identifying an initial set of alternatives, and identifying potential environmental impacts associated with the project. Additional public outreach and scoping was conducted when the lead agencies expanded the purpose of the project to address congestion and connectivity issues associated with interchanges on I-15. Chapter 8 summarizes the input collected during the scoping period and the subsequent 800 South outreach activities. Public involvement summary reports are located on the project Website at www.provo-oremrapidtransit.info.

A policy committee was created to gather input from key stakeholders. The policy committee was comprised of staff from Mountainland Association of Governments (MAG), UTA, UDOT, Orem City, Provo City, Brigham Young University (BYU), and Utah Valley University (UVU). This committee guided the overall project and reviewed conceptual-level plans at key milestones.

2.1.2 Modes Considered

Bus rapid transit (BRT) and light rail technologies were considered for the study area. The results of the mode evaluation support the use of BRT. The cost-effectiveness of BRT outweighs that of light rail due to its lower cost and relatively strong ridership. BRT can attain 80 percent of the ridership that light rail can attain (by providing more frequent headways and other service characteristics similar to light rail), at 25 percent of the capital cost. Because light rail in Utah County would be disconnected from the current light rail system on the Wasatch Front, new maintenance facilities would be required, which would be substantially more expensive than expanding the current light maintenance facility required for BRT. At a meeting on March 17, 2008, the results of the mode evaluation were reviewed with members of the technical committee. The committee expressed support for BRT as the preferred mode. Additional details regarding the modes considered are presented in the AA report.

2.1.3 Alignments Considered

Initial alignment alternatives were identified based on results from the 2005 *Provo-Orem Rapid Transit Feasibility Study*, technical analysis to meet the needs of the project, and the stakeholder and community input received during the scoping process. Table 2-1 outlines the alignments considered in the AA. Additional details regarding the alignments considered are presented in the AA report.

Table 2- 1: Initial Alignments Considered in the AA

Segment	Alignment	Source	Retained or Eliminated
UVU	South Side Campus	Considered in 2005 feasibility study	Retained (Phase I Preferred Alternative)
	North Side Campus	Considered in 2005 feasibility study	Retained (Phase II Preferred Alternative)
Orem	University Parkway	Public scoping; considered in 2005 feasibility study but eliminated	Retained as Preferred Alternative
	1200 South	City of Orem suggested during scoping; also considered in 2005 feasibility study but eliminated	Eliminated because it does not serve the Orem commercial area
	State Street	Considered in 2005 feasibility study	Eliminated in 2005 because it does not serve the University Mall or the Orem commercial district. It is not a direct route for students who travel from BYU to the Orem commercial district.
	Vineyard	Suggested during scoping; not considered in 2005 feasibility study	Eliminated because it is outside the study area and does not have enough trip generators or ridership to justify an extension of the study area.

Table 2-1: Initial Alignments Considered in the AA (cont'd)

Segment	Alignment	Source	Retained or Eliminated
BYU	Wilkinson Center	Considered in 2005 feasibility study	Eliminated because BYU does not support this alignment
	Marriott Center	Considered in 2005 feasibility study	Eliminated because BYU does not support this alignment
	Perimeter (900 East)	BYU suggested during scoping; was not considered in 2005 feasibility study	Retained as Preferred Alternative
	Bulldog Boulevard	Considered in 2005 feasibility study but eliminated because it does not serve the BYU stadium	Eliminated because it does not serve the BYU stadium
	2230 North	Considered in 2005 feasibility study but eliminated because it is not a direct route	Eliminated because it is not a direct route from BYU to the Orem commercial district or from BYU to the Provo Intermodal Center; it is not visible; and it does not have many destinations
	700 North	Considered in 2005 feasibility study	Retained as Preferred Alternative
	800 North	Considered in 2005 feasibility study	Eliminated because Provo City preferred 700 North and it does not have adequate right-of-way to accommodate stations
Provo	University Avenue	City of Provo suggested during scoping; recommended from 2005 feasibility study	Retained as Preferred Alternative
	100 West	City of Provo suggested during scoping to implement planned transit-oriented development; also considered in 2005 feasibility study but eliminated	Eliminated because Provo City decided to close 100 West to allow Nu Skin to expand its building in downtown
	Freedom Boulevard	UDOT suggested during scoping; also considered in 2005 feasibility study but eliminated	Eliminated because it did not perform as well as University Avenue (ridership, travel time, serving downtown Provo destinations)
	500 West	Considered but eliminated early in 2005 feasibility study	Eliminated because it does not serve downtown Provo
	Seven Peaks Boulevard	Considered in 2005 feasibility study because it served Seven Peaks Ice Arena; eliminated early in study	Eliminated because it does not serve downtown Provo and creates out-of-direction travel from the Provo Intermodal Center to BYU
	Riverwoods	Provo City suggested during scoping; not considered in 2005 feasibility study	Eliminated because it is outside the study area and does not have enough trip generators or ridership to justify an extension of the study area.

2.1.4 800 South Interchange

In spring 2009 the lead agencies (FTA and UTA), in consultation with the relevant cooperating agencies (UDOT, FHWA, and MAG), expanded the Provo-Orem Bus Rapid Transit Project to include alignment options that would address the congestion and connectivity needs near I-15. The timeline below describes the history of the 800 South interchange, the decision to include the interchange as a part of this project and to invite UDOT and FHWA to become joint lead agencies, and the development of interchange alternatives.

2005 *Provo-Orem Rapid Transit Feasibility Study*

The 2005 *Provo-Orem Rapid Transit Corridor Feasibility Study* considered a BRT alignment over the planned interchange at 800 South in Orem because it provided better connectivity to the planned intermodal center, and had the potential to serve UVU better than University Parkway. The new interchange at 800 South was being considered as part of the I-15 Corridor Environmental Impact Statement (EIS) Project (Lehi to Provo).

2008 I-15 Corridor EIS (Draper to Payson)

The I-15 Corridor project covered 43 miles from Draper to Payson. The Draft EIS considered an interchange at 800 South. However, the new interchange at 800 South was not carried forward in the Final EIS because of concerns raised by agencies over impacts to wetlands and apartments near the interchange (northeast of I-15 and 800 South) and concerns raised by residents over increased traffic, noise, and visual impacts. UDOT and Orem City supported the new interchange. However, the I-15 EIS project focused on improving mainline I-15 and there was not adequate time in the project schedule to evaluate further designs and address the agency and public concerns.

2008 University Parkway Interchange Design

In fall 2008, the Provo-Orem Bus Rapid Transit Project team recommended exclusive BRT lanes on University Parkway across I-15. At the same time, UDOT further evaluated the University Parkway interchange design as a part of the I-15 project and determined that due to engineering and traffic operation constraints, it would not be feasible to allow exclusive BRT lanes on the segment of University Parkway near the I-15 interchange. The University Parkway interchange is congested and is anticipated to be over capacity in 2030 even with the improvements proposed as part of the I-15 project. The I-15 project improvements to this interchange include triple lefts to serve the southbound to eastbound movement and a continuous flow intersection at Sandhill Road.

The University Parkway interchange is not as attractive an alignment as the 800 South alignment for the following reasons:

- The University Parkway interchange will be failing in 2030.
- As currently configured the Sandhill Road/University Parkway intersection does not adequately accommodate the traffic demand.
- Transit vehicles would be required to navigate the Sandhill intersection and the adjacent roundabout.
- A station located near the Sandhill Road entrance to UVU would not be ideal because the road configuration complicates pedestrian and vehicle access.

2009 Provo-Orem Bus Rapid Transit Project Expanded

In spring 2009 the lead agencies (FTA and UTA), in consultation with the relevant cooperating agencies (UDOT, FHWA, and MAG), determined that providing a new connection across I-15 to the Orem Intermodal Center, as well as relieving traffic congestion at the University Parkway interchange, were critical needs. They further decided to do the following:

- Expand the purpose of the Provo-Orem Bus Rapid Transit Project to include addressing the congestion and connectivity needs near I-15.
- Consider the interchange at 800 South as an alternative in the EA.
- Invite UDOT and FHWA to be joint lead agencies with FTA and UTA to better achieve multi-modal transportation solutions in this corridor.

2009 BRT Alignment Evaluation

The project team evaluated two BRT alignments near I-15 and UVU in Orem: 800 South and University Parkway. The 800 South alignment is shown as the Phase II alignment on Figure 2-1: Preferred Alternative (located at the end of the chapter). It departs from University Parkway at 400 West and follows Campus/College Drive to 800 South. Following 800 South, a new interchange overpass would be needed across I-15 to reach the Orem Intermodal Center located on the west side of I-15. Exclusive lanes for BRT would be possible on the new 800 South interchange.

The University Parkway alignment is shown as the Phase I alignment on Figure 2-1. It would begin at the Orem Intermodal Center and follow Geneva Road in mixed-flow traffic to University Parkway. The alignment would cross I-15 on the University Parkway interchange, stop at a station near Sandhill Road to serve UVU, and continue in mixed-flow traffic to 400 West. The station at Sandhill Road has poor accessibility. As stated above, UDOT determined that due to engineering and traffic operation constraints, it would not be feasible to allow exclusive lanes on the segment of University Parkway near the I-15 interchange.

The BRT alignment on 800 South would avoid congestion at the University Parkway/I-15 interchange and would also provide better access to UVU and the Orem Intermodal Center. Exclusive lanes would provide better reliability and predictability and would only be possible on the 800 South interchange overpass. For these reasons, the project team recommended the 800 South alignment for BRT with a new interchange at 800 South and I-15 to serve autos and transit as the Preferred Alternative.

2008–2009 Public Input and Half Interchange

During the decision process outlined above, the project team created a stakeholder working group including UVU, UDOT, MAG, UTA, and residents that lived near the proposed 800 South interchange. At that time the project team was considering a half interchange with northbound ramps to access I-15 from 800 South. No movements would be accommodated to or from I-15 southbound at this location. Southbound movements would be accommodated at the University Parkway interchange only. The project team conducted three meetings with the stakeholder working group from December 2008 to February 2009 to identify issues and develop alternatives.

The main concern associated with the new interchange was the increase of traffic levels on neighborhood roads and accommodating future UVU campus plans by maintaining as much UVU land in a contiguous piece as possible.

The project team continued coordination with the stakeholders on the committee and residents through e-mails and one-on-one meetings during spring of 2009. The half interchange alternative was presented at an Orem Transportation Advisory Committee meeting and a public meeting in June 2009. More than 100 residents attended the public meeting.

2010 High-Occupancy/Toll Interchange Alternative

In 2010, FHWA recommended that a full high-occupancy/toll (HOT) interchange be considered at the 800 South location. A description of the HOT interchange is included in Section 2.2.3. The HOT interchange alternative could accommodate all movements (northbound and southbound), which is consistent with FHWA policy. The ramps for the HOT interchange would be located in the center of I-15 and would be accessed through the HOT lanes. This alternative would avoid complicated and costly braided ramps associated with a full-access interchange, and would increase the value of the current HOT lanes for carpoolers and Express Pass users (see Section 2.2.3 for more details). This alternative would not impact the apartments northeast of 800 South; the alternative would impact some wetlands (discussed in Chapter 3).

The full HOT interchange alternative was reviewed with the 800 South stakeholder committee in June 2010 and the Orem Transportation Advisory Committee in July 2010. The impacts of the full HOT interchange would be similar to the impacts of the half interchange and no substantial concerns were raised. Impacts include traffic increases on 800 South and noise and visual impacts to residents on 680 South. The stakeholder committee and the Orem Transportation Advisory Committee recommended that the following measures be used to mitigate these impacts. These mitigation measures are also discussed in Chapter 3.

- A neighborhood entrance at 800 South and 400 West to calm traffic and reduce through-traffic east of 800 West
- Noise and visual mitigation for residences on 680 South near UVU, potentially including a berm, wall, and/or landscaping
- Continuation of the stakeholder committee or other design committee during final design of the interchange

Summary of Interchange Alternatives Considered But Eliminated

Table 2-2: Interchange Alternatives Eliminated summarizes the interchange concepts that were considered but eliminated.

Table 2-2: Interchange Alternatives Eliminated

Alternative	Reasoning Behind Elimination
University Parkway Improvements to Accommodate BRT	This alternative is not feasible. The I-15 Corridor EIS evaluated interchange configurations for University Parkway and has already maximized its potential to carry traffic with the design that was approved with the Record of Decision. Even with these design improvements, the interchange is expected to be at least 50 percent over capacity in 2030.
Overpass	An overpass is not a viable alternative because it would not meet the purpose and need of the project. It would not improve connectivity from I-15 to Orem and Provo, nor would it relieve congestion on the University Parkway interchange.
Full Interchange at 800 South with Braided Ramps to the South	The Preferred Alternative for the I-15 Draft EIS included this alternative. The alternative was not selected as the Preferred Alternative in the Final EIS because the geometry for the connection to the south would be complicated and expensive due to the proximity to the University Parkway interchange.
Half Interchange with I-15 Ramps to the North	This alternative would provide some congestion relief at the University Parkway interchange because the movements to the north are the predominant movements. This alternative would accommodate the short spacing between the proposed 800 South and University Parkway interchange (less than the recommended spacing of 1 mile). This alternative would also avoid the complicated braided ramps required for the southbound movements. However, FHWA does not support the half interchange concept. Because FHWA policy does not recommend half interchanges, this alternative was eliminated from further consideration.

2.2 ALTERNATIVES CARRIED FORWARD FOR FURTHER ANALYSIS

This section describes the Preferred Alternative selected by the lead agencies to address the transportation needs of the study area. Consistent with the National Environmental Policy Act (NEPA) and FTA guidelines, the No-Action and Enhanced Bus (TSM) Alternatives are also considered. The No-Action Alternative, the Enhanced Bus Alternative, and the Preferred Alternative will be carried forward for further environmental analysis in Chapter 3.

2.2.1 The No-Action Alternative

The No-Action Alternative includes planned and committed highway and transit facilities that are likely to exist in the year 2030, with the exception of the Provo-Orem Bus Rapid Transit Project itself. The No-Action Alternative provides a baseline for comparing the travel benefits and other objectives associated with the other proposed alternatives. The No-Action Alternative does not include a transit improvement in the study area, nor does it include general purpose lanes on University Parkway or an interchange at 800 South. Under the No-Action Alternative, the following projects included in the MAG Regional Transportation Plan would be constructed:

- FrontRunner commuter rail from Salt Lake to Provo: This project is under construction and is expected to open in 2013.
- Local bus system: The current bus system will be redesigned to serve FrontRunner commuter rail. In the No-Action Alternative, the current Bus Route 830 remains the same as the current route. This network is included in the MAG Regional Transportation Plan and Travel Demand Model for 2030 bus service.

- I-15 corridor widening and reconstruction from Lehi to Provo: The EIS is complete and construction began in 2010.
- Geneva Road widening, Provo to Pleasant Grove: Construction on this project is expected to begin in 2010. UDOT is currently procuring a design-build contractor.
- Provo Intermodal Center: The EA is complete and construction is expected to begin in 2011.
- Orem Intermodal Center: The EA is complete and construction is expected to begin in 2011.

2.2.2 The Enhanced Bus Alternative

In addition to build alternatives, which entail major capital investment, FTA guidance requires that lower-cost transportation solutions be investigated. The objective of the Enhanced Bus Alternative is to determine how much of the benefit of the Preferred Alternative could be attained without building additional facilities. The Enhanced Bus Alternative assumes improved transit service characteristics and Transportation Systems Management (TSM) strategies, such as signal timing improvements, traffic engineering actions, and bus route restructuring.

The Enhanced Bus Alternative would include the following:

- The Enhanced Bus route would follow the current Bus Route 830, which follows University Parkway and University Avenue. The northern terminus would be the Orem Intermodal Center and the southern terminus would be University Parkway and I-15, directly south of the Novell campus.
- The route would be 10 miles long and would include approximately 28 stops (including those at the intermodal centers).
- The route would operate as mixed-flow with traffic.
- Standard bus vehicles would be used.
- There would be 10-minute and 20-minute service frequencies during the peak and off-peak periods, respectively.
- The local background bus network would be the same as the No-Action Alternative.
- FrontRunner commuter rail would offer regional transit service to the Orem and Provo Intermodal Centers. FrontRunner would be modeled based on what is included in the MAG Regional Transportation Plan and Travel Demand Model for 2030 service.
- Bus stops would include benches and shelters.

2.2.3 The Preferred Alternative

The Preferred Alternative includes both rapid transit and roadway improvements. Figure 2-1: Preferred Alternative identifies the location of new BRT lanes, general purpose lanes, and stations.

Funding to address all the needs is not available. Therefore, the Preferred Alternative would be implemented in two phases: Phase I (immediate) and Phase II (long-term), as shown on Figure 2-1. Both phases of the Preferred Alternative include rapid transit and roadway improvements. The Phase II project would address transportation needs in the year 2030, which is the planning horizon year consistent with the MAG Regional Transportation Plan and the associated 2030 Regional Travel Demand Model. However, the Phase I project would likely be opened in the year 2014, assuming funds become available. Additional information on opening year conditions is provided in the AA report to be consistent with FTA Small Starts requirements.

Phase I would consist of BRT service from the Orem Intermodal Center on the north to the Provo Intermodal Center and the Novell campus on the south, as well as general purpose travel lanes for vehicles on a section of University Parkway. The transit portion of the Phase I Preferred Alternative is documented as the recommended Locally Preferred Alternative in the AA report. The AA is prepared for FTA funding purposes; UTA intends to request FTA Small Starts funding for the transit components of the Phase I project. Phase II of the Preferred Alternatives would include a new HOT interchange at 800 South and I-15 to serve both vehicles and transit.

Environmental impacts of both phases of the Preferred Alternative are included in Chapter 3.

Preferred Alternative Support

The Preferred Alternative is supported by Orem City, Provo City, UVU, BYU, UDOT, UTA, and MAG. On August 12, 2008, Orem City passed a resolution in support of the Preferred Alternative on University Parkway. On May 4, 2010, Provo City passed a resolution supporting the Preferred Alternative on University Avenue. MAG also documented support for this alternative in September 2010. These were local actions. The UTA Board of Trustees has not taken formal action on this project or any particular alternative. Action will be taken after the EA is complete and a decision is finalized. Resolutions and documentation of support are included in the Appendix.

How the Preferred Alternative Meets Purpose and Need

Overall, the Preferred Alternative meets the purpose and need of the project as described in Chapter 1. Specifically, the Preferred Alternative would address the following problems discussed in Chapter 1 as part of the need for the project:

- Increase transportation capacity to accommodate growing population, employment, student enrollment, and travel demand.
- Improve transit competitiveness with the automobile by improving transit reliability and reducing transit travel time.
- Improve transit connections to and from FrontRunner commuter rail.
- Improve multi-modal connectivity across I-15 and from I-15 to Orem and Provo (Phase II).

Preferred Alternative – Phase I

Phase I of the Preferred Alternative, shown on Figure 2-1, would be approximately 10.5 miles long and would consist of the following:

- BRT service from the Orem Intermodal Center to University Avenue just north of I-15 in Provo, operating in exclusive lanes (approximately 53 percent) and mixed-flow conditions
- The addition of two general purpose travel lanes on University Parkway from State Street to University Avenue

The Phase I transit improvements would not depend upon the Phase I roadway improvements; i.e., the transit improvements could be constructed independently of the roadway improvements. The roadway improvements are proposed as part of the Phase I project because the improvements are needed and the funding could be acquired in the short term.

Phase I of the Preferred Alternative would start at the project's northern terminus, the proposed Orem Intermodal Center located off Geneva Road in Orem. BRT service would operate in mixed-

flow lanes over the University Parkway Single Point Urban Interchange until reaching 400 West. Phase I would differ from Phase II only in this segment. A station would be constructed to serve UVU near Sandhill Road and University Parkway. The only construction required in this segment would be the station. After Phase II is implemented, BRT would not operate on this segment and the station would no longer be needed.

From 400 West, BRT would operate on exclusive center-running lanes on University Parkway through Orem's commercial district and into Provo. General purpose travel lanes and exclusive BRT lanes would be added on University Parkway from State Street to University Avenue; University Parkway currently has only two general purpose lanes in each direction in this section. After implementing the Preferred Alternative, University Parkway would have three general purpose travel lanes in each direction plus one exclusive BRT lane in each direction from 400 West to University Avenue.

At University Avenue in Provo near BYU, the Preferred Alternative would transition from operating in exclusive center lanes to mixed-flow. The route would then turn onto 900 East where it would run on shared lanes heading southbound and on an exclusive lane heading northbound.

BRT would operate on exclusive center-running lanes on 700 North, then continue on exclusive lanes on University Avenue through Provo. BRT would access the Provo Intermodal Center just south of the Union Pacific Railroad tracks via mixed-flow lanes on University Avenue. BRT service would continue using mixed-flow lanes south of the Provo Intermodal Center, ending at the new Southgate development and the Novell campus in Provo.

Maintenance Facility. UTA is planning to expand the existing Timpanogos bus maintenance facility located on Geneva Road in Orem (see Figure 1-1). The expansion has been planned for nearly 10 years and is included in MAG's Regional Transportation Plan and UTA's Facilities Master Plan. The planned expansion of the Timpanogos Business Unit facility will accommodate an additional 75 buses over the existing capacity of 65 buses. The need for this added maintenance capacity is based on plans for expanded local bus service in this business unit district over the next 15 years. The new expanded facility would be adequate to house the 30 additional buses that would be required for Phase I of the Preferred Alternative. UTA already owns the additional property needed for this expansion, and is currently preparing a categorical exclusion to clear this bus maintenance facility expansion project environmentally.

Preferred Alternative – Phase II

Phase II of the Preferred Alternative would include a new HOT interchange at 800 South and I-15 to serve both vehicles and transit. The ramps off I-15 would serve only HOT traffic, while the interchange overpass would include two lanes for general purpose traffic and two lanes exclusively for BRT. The interchange would be configured to accommodate center exit/entrance ramps from I-15. Phase II improvements would also include exclusive BRT lanes on Campus/College Drive. The Phase II project in combination with the existing Phase I project would be approximately 11 miles long. BRT would operate in exclusive lanes for 71 percent of the route.

For Phase II, the BRT route would start at the Orem Intermodal Center and continue on 800 South and Campus/College Drive through UVU to 400 West. The Phase II BRT route is the same as the Phase I route from the intersection of 400 West and University Parkway eastward to Orem and Provo.

800 South Improvements

For Phase II, 800 South would be realigned and/or widened from Geneva Road on the west side of I-15 to approximately 900 West on the east side of I-15 (approximately 1 mile). The BRT exclusive lanes would tie directly into the Orem Intermodal Center via a new road at approximately 1420 West. On the east side of I-15, 800 South would be realigned north of its current location and tie into Campus/College Drive with a new roundabout at approximately 900 West.

A short road to connect the new 800 South and the old 800 South just east of I-15 is being considered (see Figure 2-2: Preferred Interchange Alternative, located at the end of the chapter). This connection would allow faster access to 1200 West but would require additional land from UVU. UVU does not currently support the connection; however, it is included as a potential design option for its traffic benefits (Lochner 2010a). The impacts associated with this connection are included in the overall impacts for the project (discussed in Chapter 3).

The new interchange at 800 South would provide a much needed connection across I-15 for autos, cyclists, pedestrians, and transit. Currently travel between the UVU campus and the Orem Intermodal Center requires using the University Parkway interchange, which is an indirect route and not friendly to pedestrians or cyclists. The 800 South interchange would make a direct connection between the UVU campus and the Orem Intermodal Center, and it would provide a safer crossing for students who live in mixed-use housing on the west side of I-15 to access UVU

Description of HOT Lanes

Only vehicles qualified to use the I-15 HOT lanes would be allowed to use the 800 South interchange. Currently I-15 has HOT lanes from North Salt Lake southward to Lehi (over 30 miles). UDOT plans to extend these lanes from Lehi to Spanish Fork in the future. UDOT refers to the HOT lanes as Express Lanes. The following vehicles are currently approved for HOT use:

- Carpoolers (vehicles carrying more than one passenger), also referred to as high-occupancy vehicles or HOV
- Express Pass users (with payment)
- Buses
- C plate vehicles (clean fuel designation)
- Motorcycles

Express Pass is an electronic payment system that allows solo drivers to use the HOT lanes. UDOT monitors the number of solo drivers using the lanes to ensure there is adequate capacity for carpoolers. The electronic system charges solo drivers by using an algorithm that adjusts the price based on traffic conditions. The lanes are divided into four payment zones with overhead signs that show the price to use each zone. Readers at several locations along the Express Lanes detect in-vehicle Express Passes as they travel through the zones, and drivers' accounts are charged when they exit.

BRT Service

BRT service would offer higher speed, frequent, and all-day bus service operation (Phase I and Phase II). The proposed BRT line would be the only transit service operating along the Preferred Alternative corridor. BRT service would include the following:

- Articulated low-floor, high-capacity buses specially designed with doors on both sides. An articulated bus is comprised of two rigid buses linked together by a pivoting joint in the middle, providing higher passenger capacity.
- Center-running exclusive lanes for approximately 53 percent of the route (Phase I)

Example of articulated bus: Las Vegas Max BRT bus
Source: sites.google.com/site/columbusbusplan.brtcasestudie

- Substantial, level-boarding stations with capacity to accommodate high demand at key stations such as the stadium and universities
- Off-board fare collection (using ticket vending machines) for faster boarding
- Enhanced, real-time transit information (next bus information) at stations
- Frequent service throughout the day (10 to 30 minutes) with increased service during peak periods (5 minutes)
- Operations between 4:30 a.m. and 2:00 a.m.
- Transit signal priority for BRT vehicles at most intersections.

Vehicle Requirements

Preliminary ridership estimates indicate that peak-hour transit demand will be approximately more than 550 passengers per hour (peak hour, peak direction). Bus capacity will need to be at least 65 passengers. Therefore, 60-foot articulated specialty BRT vehicles are planned for the project. These vehicles would be adequate for Phase I and Phase II of the project. Since most stations are planned as center platforms, vehicles would need to provide two-sided boarding, with left-side and right-side doors. Vehicles would be hybrid electric powered. Approximately 30 vehicles would be needed.

Traffic and Signal Modifications

There are approximately 38 signals on the Preferred Alternative corridor, and Intelligent Transportation Systems treatment (transit signal priority) would be implemented at most of the intersections during Phase I. Specific traffic modifications include the following:

- A new signalized intersection would be added between State Street and 800 East in Orem. This new intersection would serve pedestrian access to the proposed station at that location, as well as a primary access for the University Mall.
- New pedestrian signals would be added at 600 North and 400 South on University Avenue to access center stations.
- All southbound and northbound left turning movements along 900 East in Provo would be prohibited except the southbound left turning movement at Heritage Drive.
- All eastbound and westbound left turning movements along 700 North in Provo would be prohibited, except at 700 North/University Avenue.
- Southbound and northbound left turning movements would be prohibited along University Avenue in Provo at 400 North, 300 North, and Center Street.
- A new signal would be added at I-15 and 800 South for the new interchange (Phase II).

Cross-Sections

Typically, UDOT requires 12-foot standard travel lanes on their roads, including roads where bigger vehicles such as buses will be operating (e.g., University Parkway). However, in areas along the project corridor where there are right-of-way limitations, the design has been reduced to 11-foot or 10-foot lanes (e.g., 700 North) (Lochner 2010a). The locations of these cross-sections are shown on Figure 2-1.

800 South Interchange (Phase II)

The cross-section for the new 800 South interchange is shown on Figure 2-3 on page 2-15. The improvements include two 12-foot, center-running exclusive BRT lanes, 2-foot traffic separation with curb, two 12-foot general purpose traffic lanes, 12-foot left turn/median lanes to access I-15 ramps, an 8-foot shoulder/bike lane, and a sidewalk.

Campus/College Drive (Phase II)

The improvements for Campus/College Drive between 800 South and 400 West in Orem include 12-foot, center-running exclusive BRT lanes, 2-foot traffic separation with curb, reduced traffic lanes to 11 feet, and a 4-foot shoulder/bike lane. The proposed improvements generally fit inside the existing UVU right-of-way; however, Campus/College Drive will need to be widened to the east. The proposed cross-section for Campus/College Drive is shown on Figure 2-4 on page 2-16.

University Parkway: 400 West to 800 East

The improvements on University Parkway between 400 West and 800 East in Orem include 12-foot, center-running exclusive BRT lanes, 2-foot traffic separation with curb, reduced traffic lanes to 11 feet, reduced shoulders to 8 feet, and elimination of the existing median. The addition of exclusive BRT lanes will require additional right-of-way along the corridor. The proposed University Parkway cross-section between 400 West and 800 East is shown on Figure 2-5 on page 2-17. From State Street to 800 East, the current cross-section only includes two general purpose lanes in each direction. The Preferred Alternative would add a general purpose lane in each direction in this section.

University Parkway: 800 East to University Avenue

The improvements on University Parkway between 800 East and University Avenue include 12-foot, center-running exclusive BRT lanes, 2-foot traffic separation with curb, two 11-foot traffic lanes (in addition to reducing the four existing 12-foot traffic lanes to 11-foot traffic lanes), 8-foot shoulders, relocation of the College Connector Trail, and barrier separation between the traffic and the trail. The proposed University Parkway cross-section between 800 East and University Avenue is shown on Figure 2-6 on page 2-18.

900 East

The improvements on 900 East include one 10-foot, center-running exclusive lane in the northbound direction, potentially separated by 2-foot, traffic-separated curb. The southbound direction uses the outside general purpose traffic lane. The proposed improvements fit inside the existing right-of-way, except at station locations. Additionally, the improvements maintain the four existing 10-foot traffic lanes and an 8-foot sidewalk park strip. The exclusive lane in the northbound direction would allow for a center station. The center station would provide better pedestrian accessibility than a side station on the east side of the road because the predominant pedestrian movement is from the station to BYU campus on the west. The center station is only possible with the northbound exclusive lane. The final decision on the exclusive lane will be

made during final design in coordination with Provo City. The proposed 900 East cross-section is shown on Figure 2-7 on page 2-19.

700 North

The 700 North improvements include 11-foot, center-running exclusive BRT lanes, two 11-foot traffic lanes, and 4-foot bike lanes. Additional right-of-way will be needed along certain segments of the corridor. The proposed 700 North cross-section is shown on Figure 2-8 on page 2-20.

University Avenue: 700 North to 500 South

The University Avenue improvements between 700 North and 500 South include 11-foot, center-running exclusive BRT lanes, 1-foot traffic separation with curb, two 11-foot traffic lanes, and 4-foot shoulder or 10-foot parallel parking between 300 North and Center Street. The proposed University Avenue cross-section is shown on Figure 2-9 on page 2-21.

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Figure 2- 3: 800 South Cross-Section (Phase II)

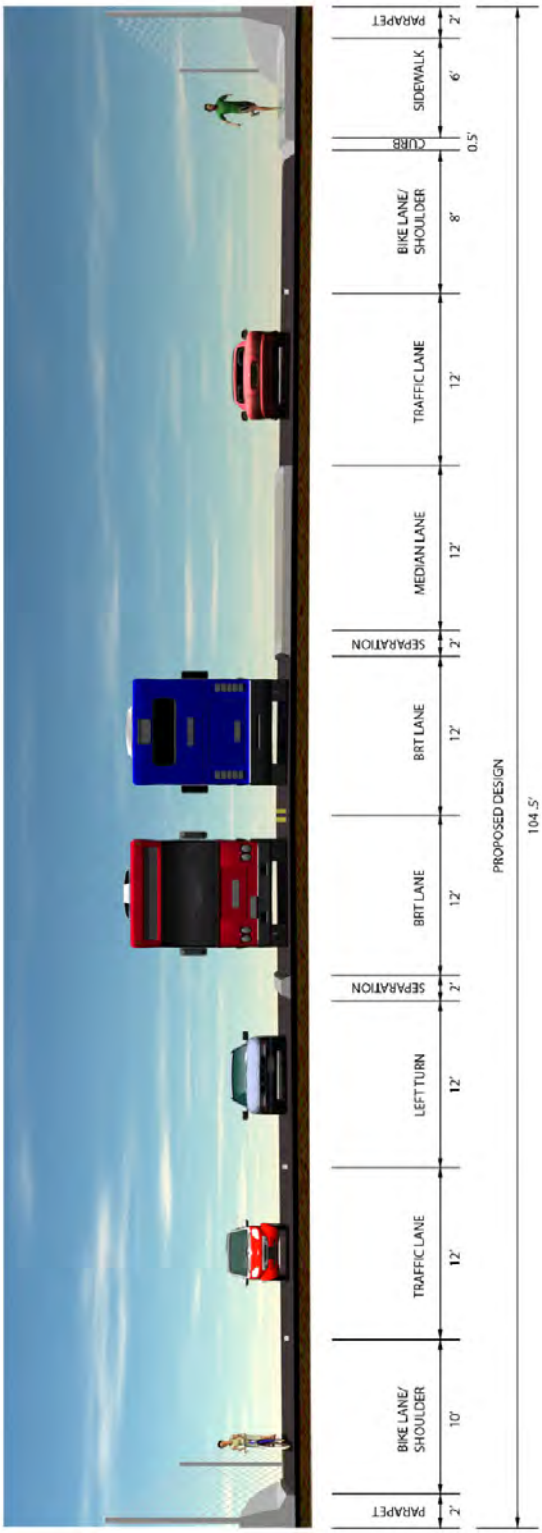


Figure 2- 4: Campus/College Drive Cross-Section (Phase II)

Figure 2- 5: University Parkway Cross-Section: 400 West to 800 East

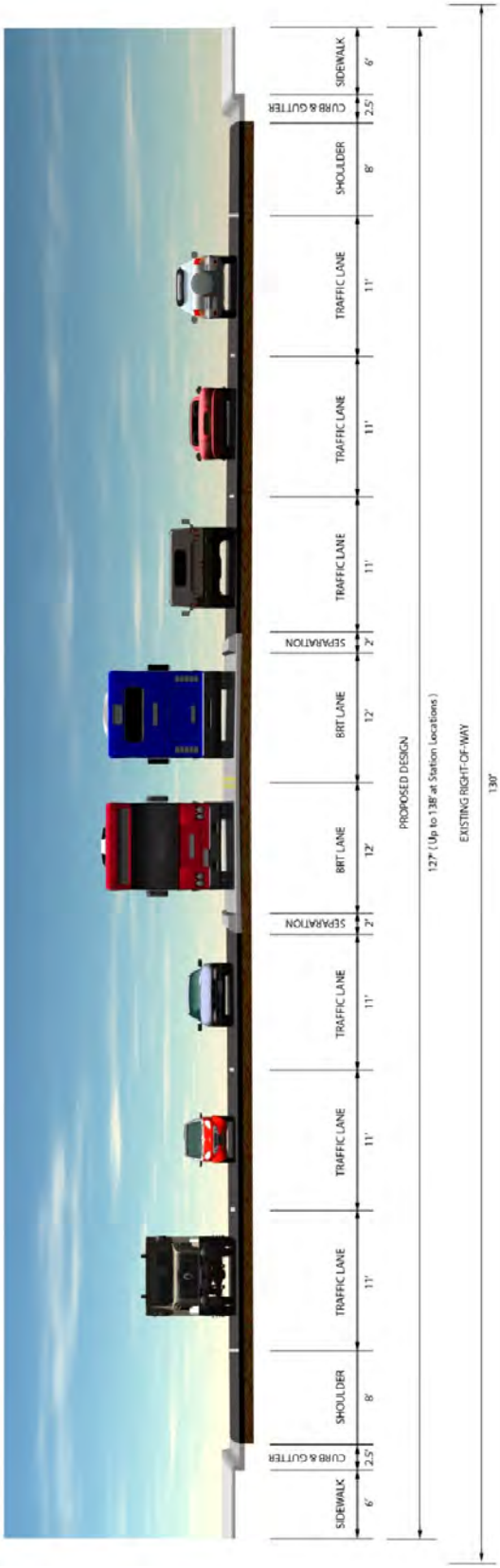


Figure 2- 6: University Parkway Cross-Section: 800 East to University Avenue

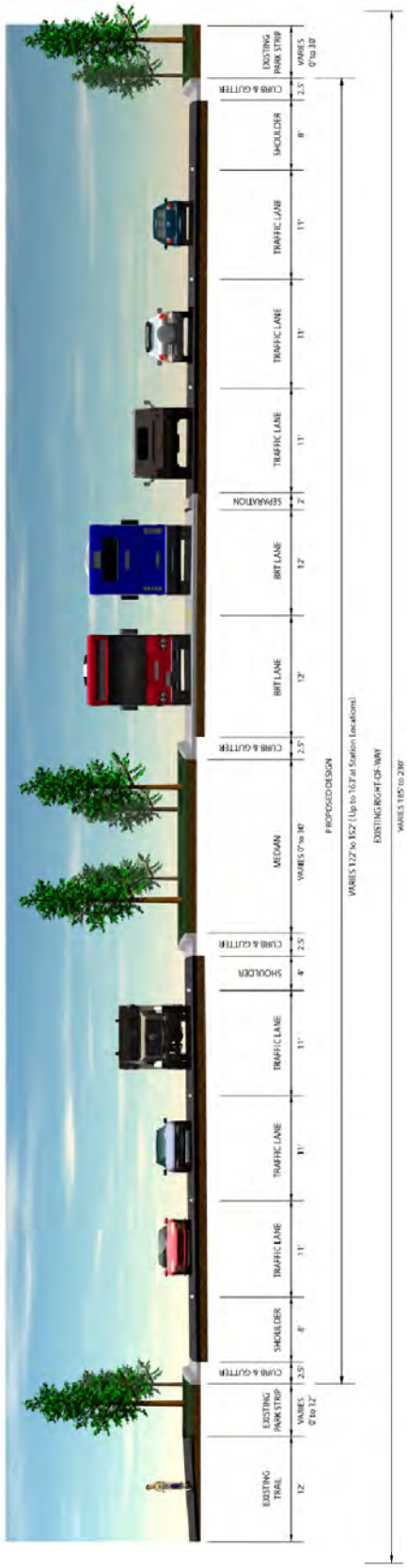


Figure 2- 7: 900 East Cross-Section

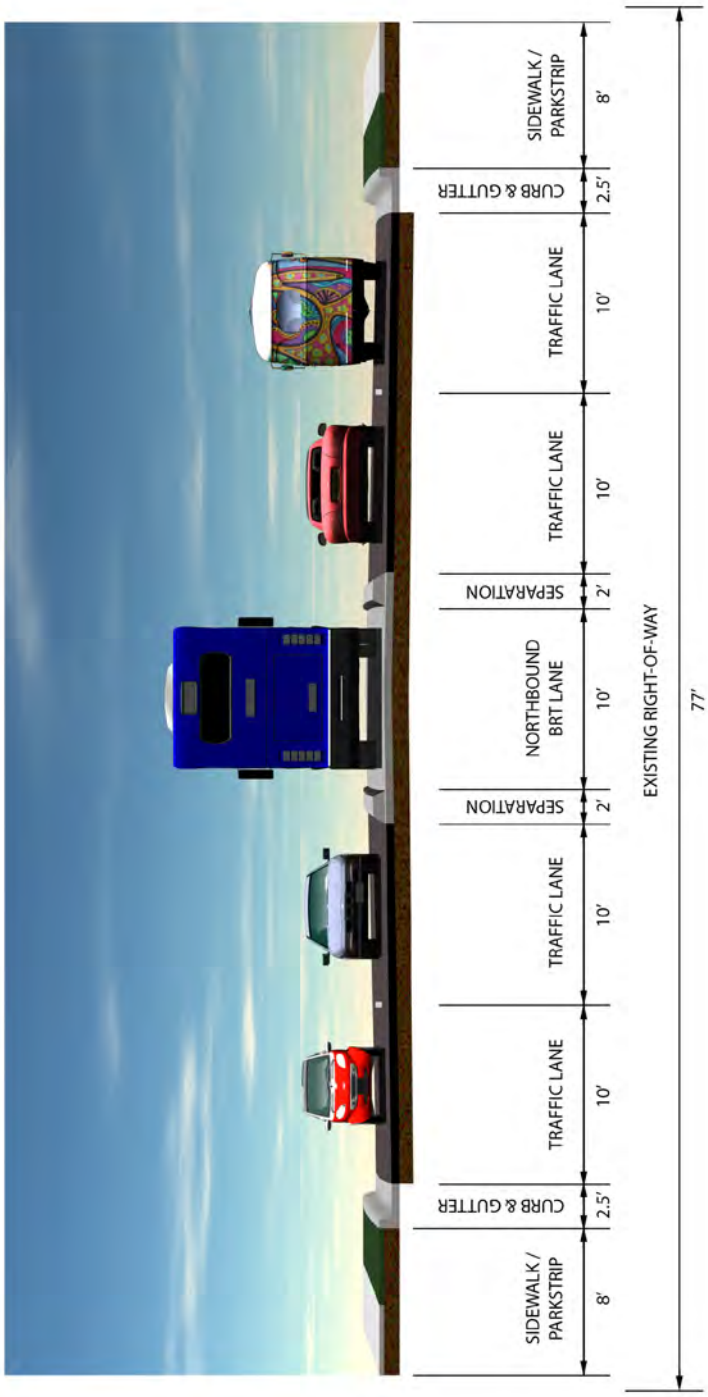
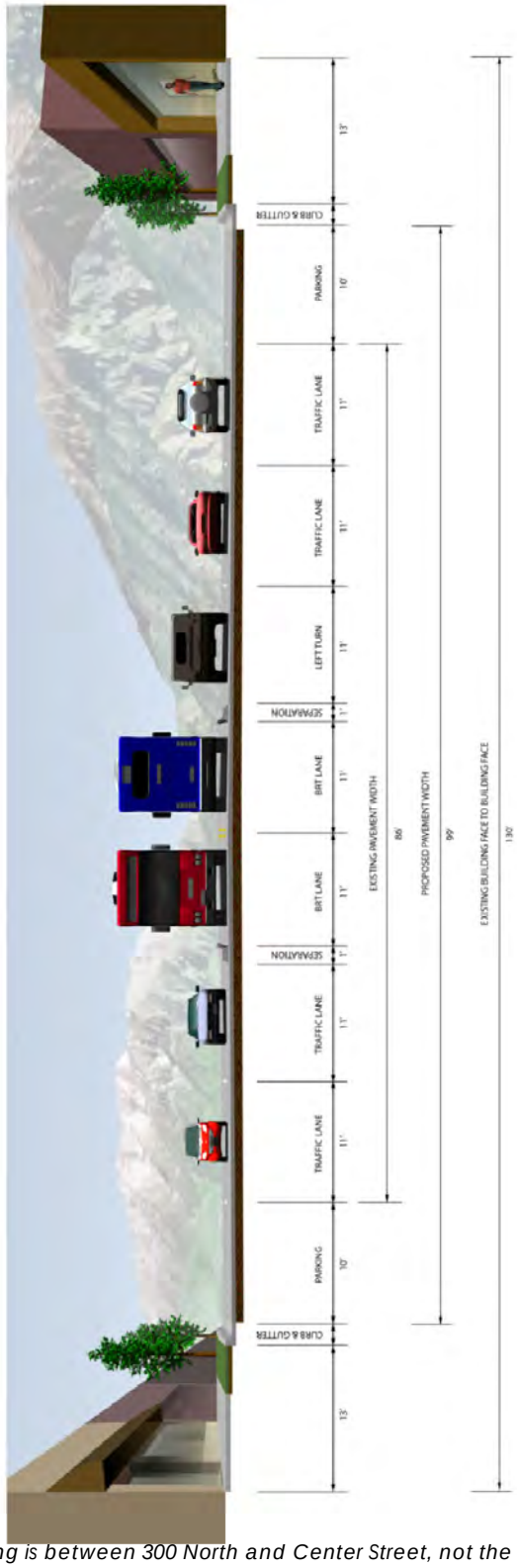


Figure 2- 8: 700 North Cross-Section

Figure 2- 9: University Avenue Cross-Section: 700 North to 500 South*



**10-foot parallel parking is between 300 North and Center Street, not the full length of University Avenue.*

Stations

Stations are planned mainly as single-center stations, but there are a few side stations where there are no exclusive lanes. The center-station design has only one platform that would serve both directions of travel. The platform would be located in the center of the roadway between the exclusive BRT lanes. Left turns would only be allowed on a green left turn movement because BRT would move with the through-movements. All left turns must be signalized along the BRT route. There are several advantages of the single-center station, including: less confusion for passengers as to which platform to use, cost when compared to two split far-side platforms, and the platform can be located on either side of an intersection. It also necessitates buses with doors on both sides.

Station locations are shown on Figure 2-1. Figure 2-10 to Figure 2-14 are visual renderings for proposed stations along the corridor. The renderings illustrate possible designs for stations; however, station designs will not be finalized until the next phase of the project (final design).

The Phase I project includes 17 stations and the Phase II project includes 19 stations. The station at UVU near Sandhill Road and University Parkway would be constructed with the Phase I project but would not be needed after Phase II is implemented. Phase I would include BRT operation in mixed-flow traffic on 1200 South and University Parkway from 400 West to the Orem Intermodal Center, as shown on Figure 2-1.

Figure 2- 10: Main Street Station Visualization (Orem)

Figure 2-11: 300 North Station Rendering (Provo)

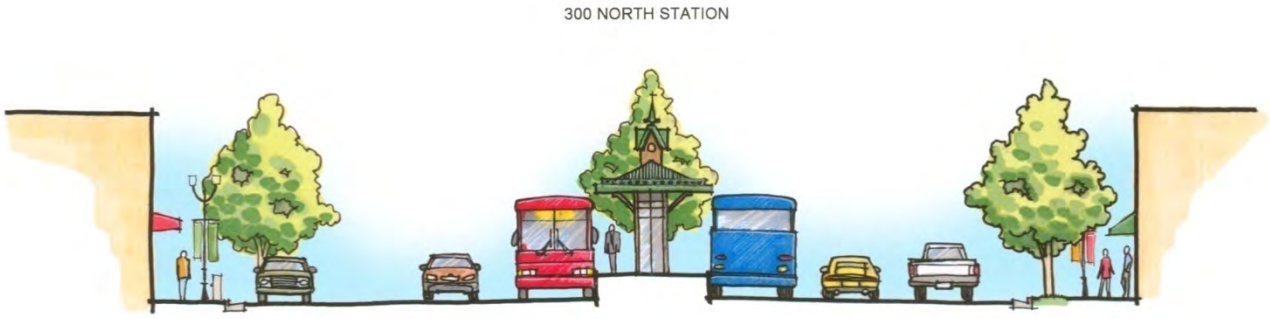


Figure 2- 12: Center Street Station Rendering (Provo)

Figure 2- 13: Perspective Rendering of University Avenue (just south of Center Street, looking north, Provo)

Figure 2- 14: Plan View Rendering (Provo)

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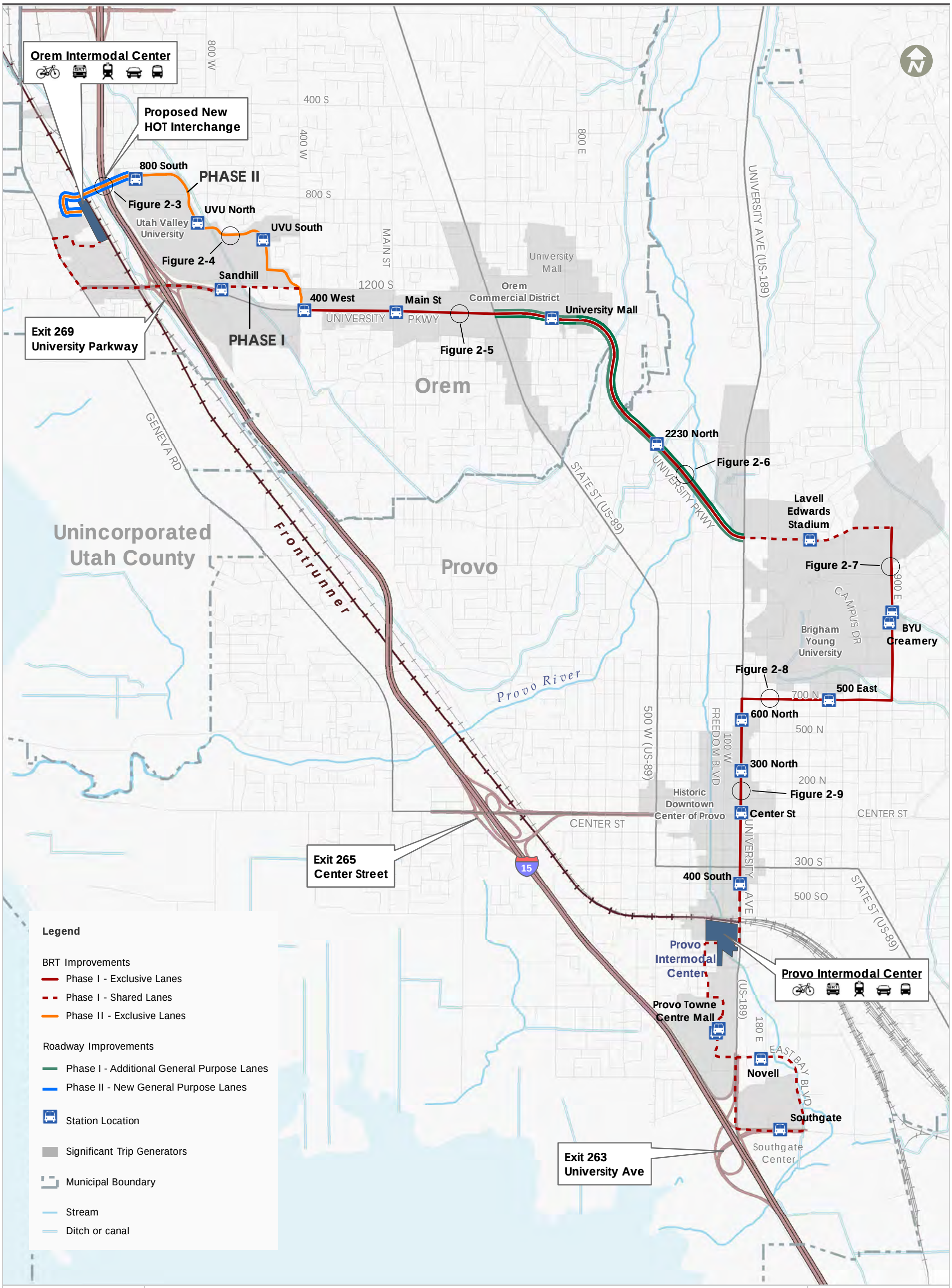
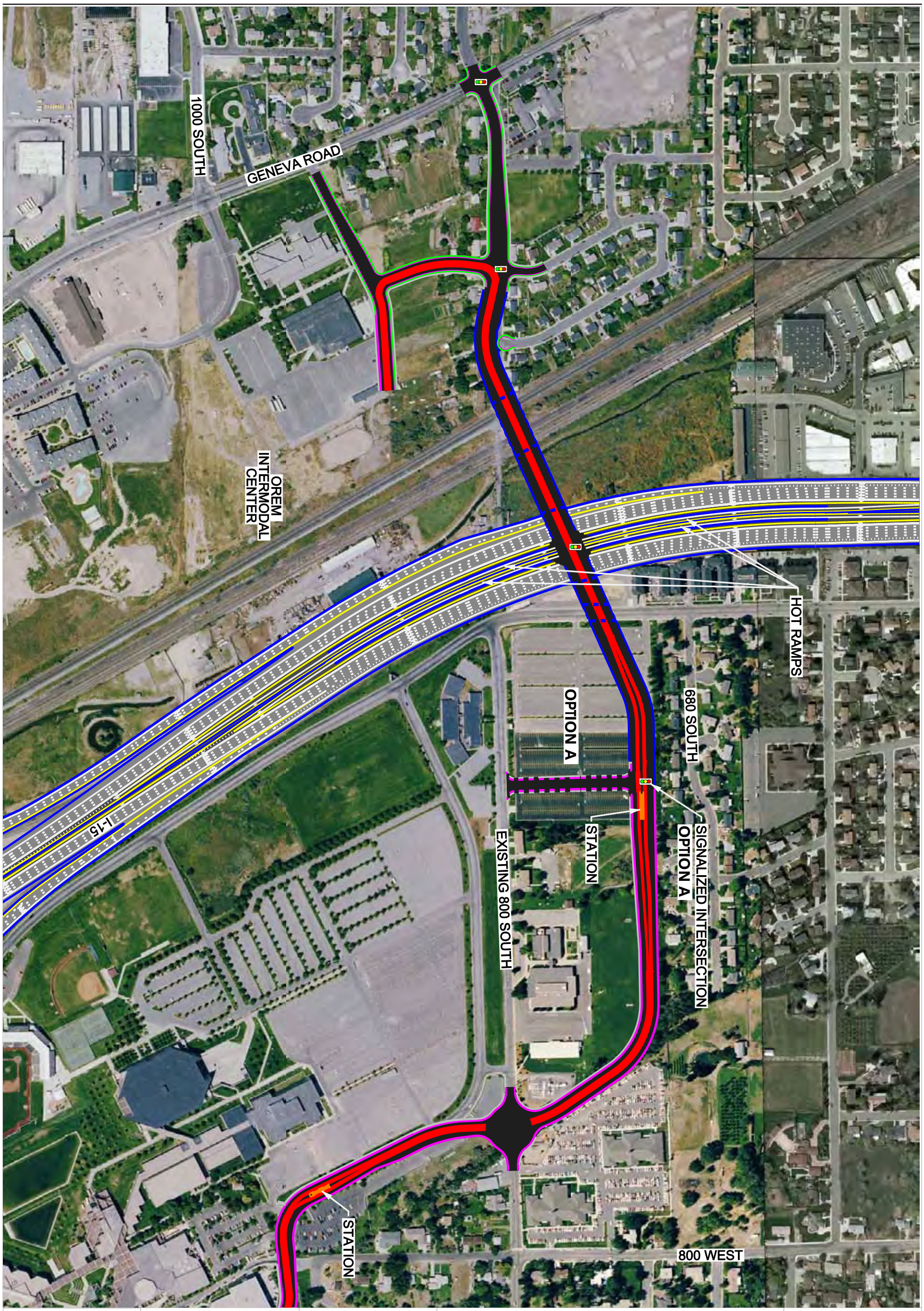


Figure 2-1 Preferred Alternative



Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

Scale
350:1
Approximately

Figure 2-2
Preferred Interchange Alternative (Phase II)