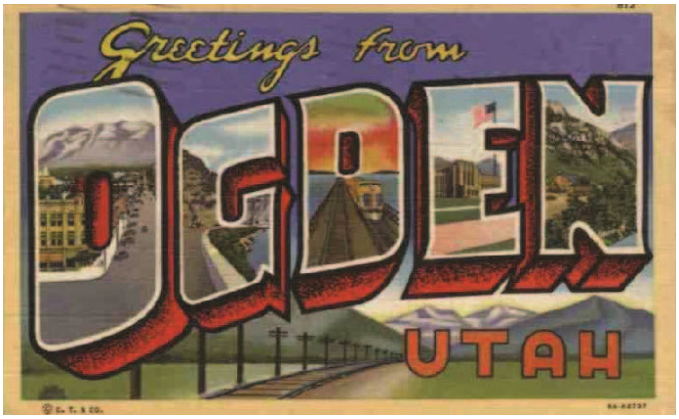
APPENDIX B6

Energy Technical Report



Energy Technical Report

Ogden/Weber State University
Transit Project

Ogden, Weber County, Utah

October 10, 2018

Contents

Tables

Figures

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1.0 Introduction

This technical report describes the impacts of the Action Alternative on transportation-related energy consumption. The energy analysis considers the long-term direct impacts related to energy consumption resulting from the Action Alternative. Direct energy consumption includes the fuel required for passenger vehicles (automobiles, vans, and light trucks), heavy trucks (with three or more axles), and transit buses. The Action Alternative is the Bus Rapid Transit on 25th Street Alternative, which was selected by the Ogden/Weber State University Transit Project partners and adopted by the Ogden City Council as the Locally Preferred Alternative.

Implementation of the No-Action Alternative would not result in adverse impacts to energy. The affected environment (existing conditions) would remain unchanged from current conditions.

Project Study Area. The project study area encompasses a 5.3-mile corridor between downtown Ogden, Weber State University, and McKay-Dee Hospital. The project study area is located in the city of Ogden in Weber County, Utah. The project study area encompasses a portion of downtown central Ogden bounded by the Union Pacific Railroad line to the west, 20th Street (State Route [S.R.] 104) to the north, the city limits at the base of the Wasatch Mountains to the east, and about 4600 South to the south, the southwestern part of which follows the Ogden/South Ogden municipal boundary (Figure 1).

This project study area includes the following major destinations and Ogden neighborhood districts that could be served by the Action Alternative (Figure 2):

- The Ogden Intermodal Transit Center (FrontRunner operates frequent service from Ogden to Provo, an 88-mile route)
- Lindquist Field, a minor-league baseball stadium with an 8,262-person capacity
- The Junction, a 20-acre entertainment, residential, retail, and office mixed-use redevelopment
- The Ogden downtown central business district, which includes city, county, and federal offices
- Seven neighborhood districts: Central Business (downtown), East Central, Taylor, Jefferson, T.O. Smith, Mt. Ogden, and Southeast Ogden
- Ogden High School, with an annual enrollment of about 1,000 students in grades 10–12
- Weber State University, with about 2,500 faculty and staff and about 25,000 students (up from 17,000 in 2007), 840 of whom lived on campus as of September 2016 (Sears 2016)
- The Dee Events Center, a 12,000-seat sports and entertainment venue with a 3,000-space parking lot
- The McKay-Dee Hospital Center (at 2,300 employees, the fourth-largest hospital in Utah)

Figure 1. Project Study Area

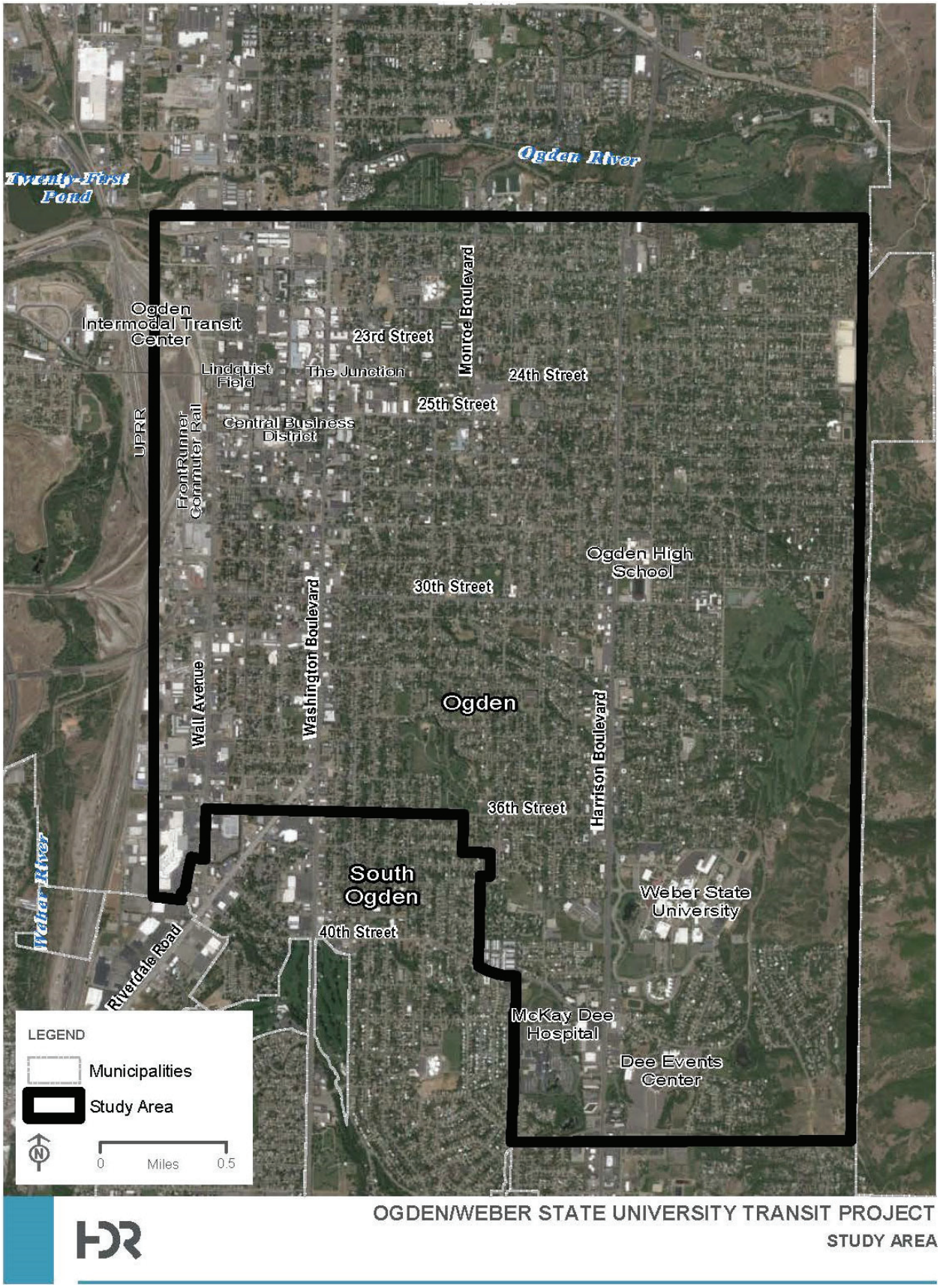
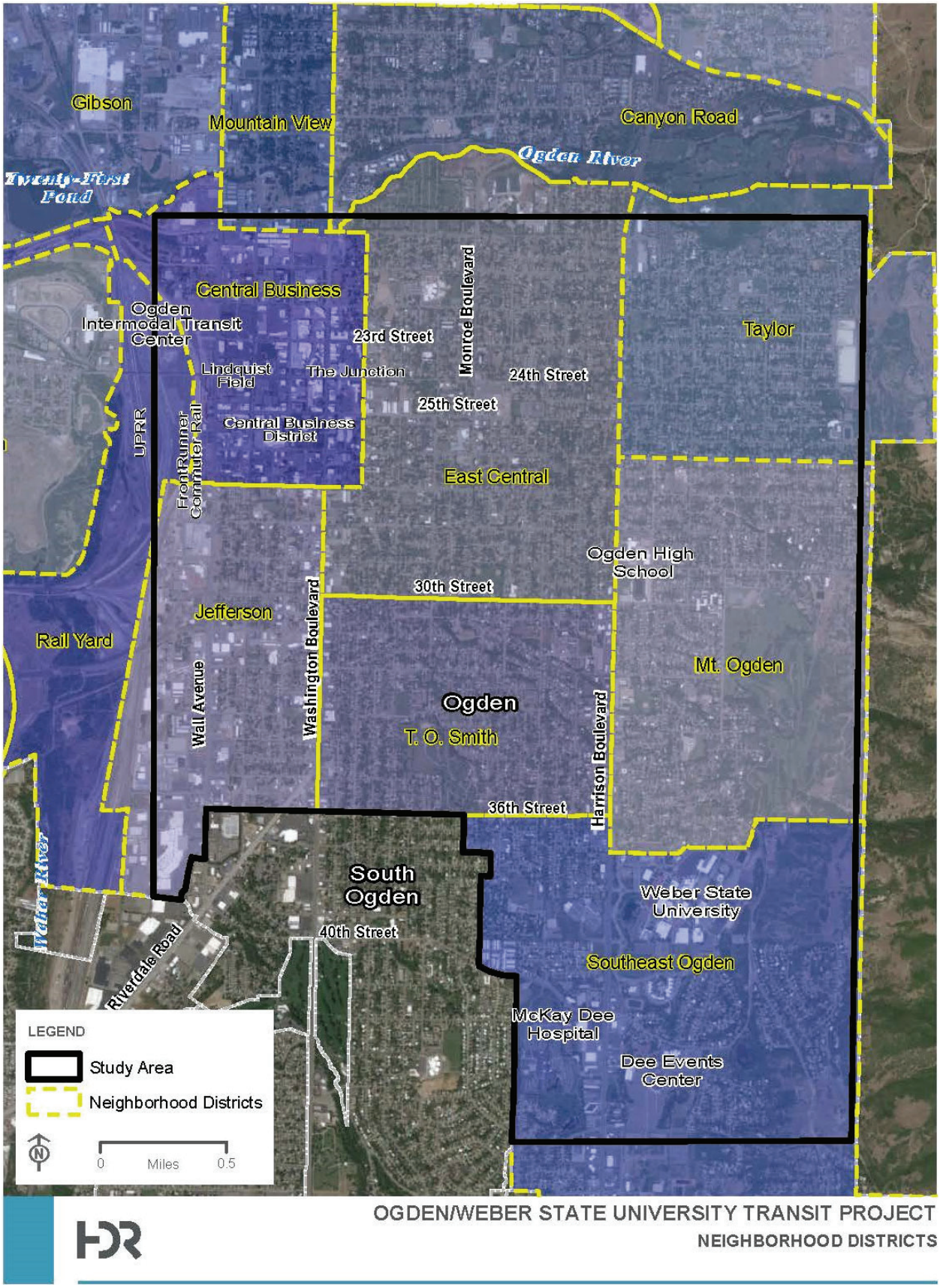


Figure 2. Neighborhood Districts



Ogden is one of the oldest communities in Utah and has a number of historic districts and neighborhoods. Much of central Ogden is served by a traditional grid street system, and a number of the major arterials are state highways managed by the Utah Department of Transportation (UDOT) which serve regional travel through Ogden. These major arterials are Washington Boulevard (S.R. 89), Harrison Boulevard (S.R. 203), and 30th Street (S.R. 79). Harrison Boulevard is part of the National Highway System and is a major north-south arterial that serves an important statewide transportation function through Utah by connecting Washington Boulevard (S.R. 89), Weber State University, and 12th Street (S.R. 39). The Union Pacific Railroad (UPRR) line and the Ogden Intermodal Transit Center are on the western edge of the city, and Interstate 15 is just west of the city.

Energy Evaluation Area. The energy evaluation area is the same as the evaluation area used for the traffic data analysis. Some general discussion of statewide energy use and potential energy impacts on local utilities is also included.

2.0 Project Description

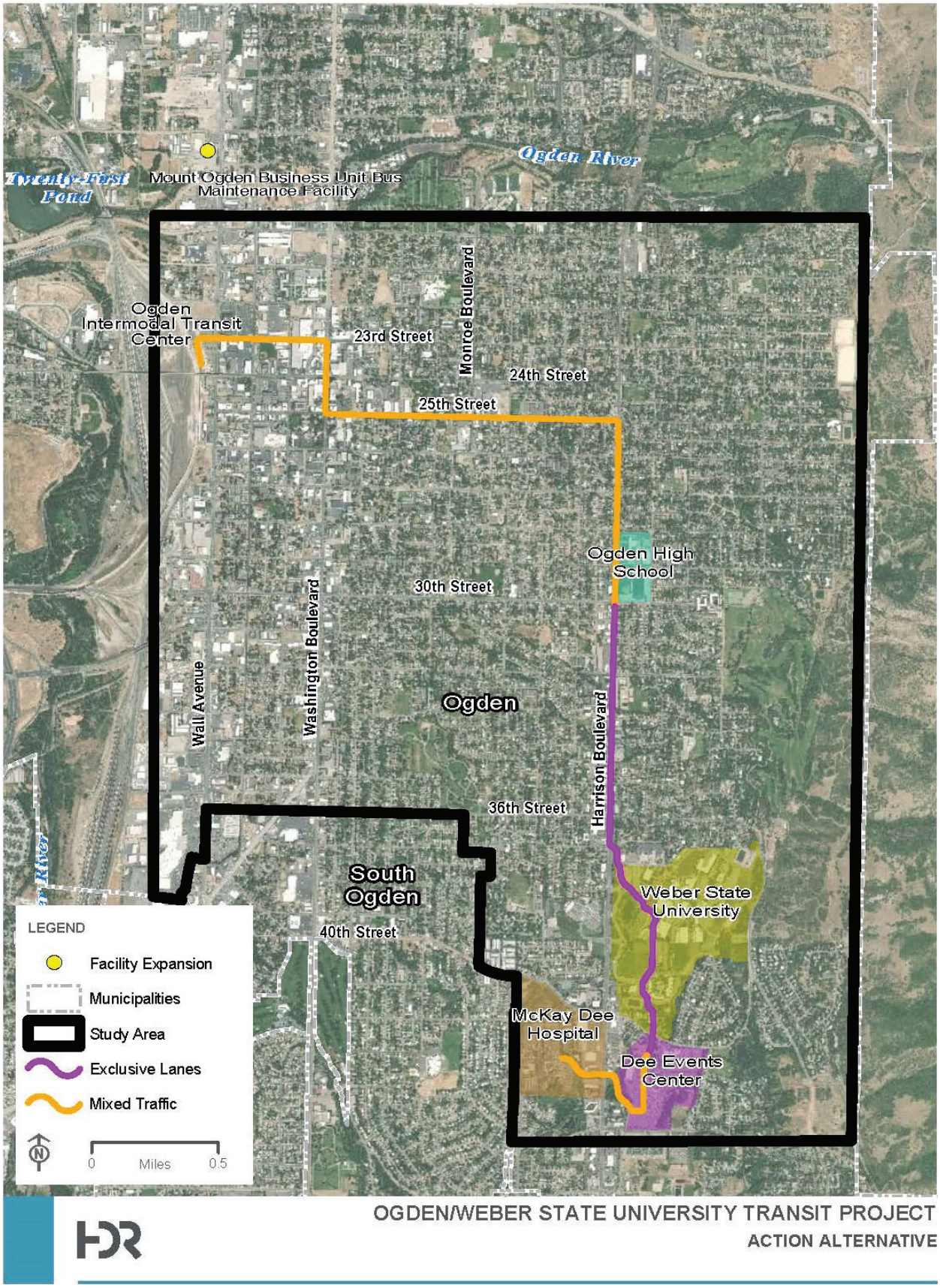
The Federal Transit Administration (FTA) and the Utah Transit Authority (UTA), in cooperation with project partners Ogden City, Weber County, the Wasatch Front Regional Council (WFRC), UDOT, Weber State University, and McKay-Dee Hospital, have prepared an Environmental Assessment under the National Environmental Policy Act (42 United States Code §§ 4321–4347) for the Ogden/Weber State University Transit Project.

Proposed Transit Corridor. The proposed transit corridor is the alignment of the Action Alternative (Figure 3). The bus rapid transit (BRT) route for the Action Alternative would be about 5.3 miles long (10.6 miles round trip), with a western terminus at the Ogden Intermodal Transit Center. From there, the BRT route would head east in mixed-flow traffic on 23rd Street to Washington Boulevard, south on Washington Boulevard to 25th Street, east on 25th Street to Harrison Boulevard, and south on Harrison Boulevard. At about 31st Street and Harrison Boulevard, the BRT route would transition to center-running, bus-only lanes. It would continue on a dedicated busway through the Weber State University campus and then travel west to McKay-Dee Hospital, where it would again travel in mixed-flow traffic. The BRT route would loop back on the same route.

Station Locations. The Action Alternative includes 16 brand-identified stations. The station locations were chosen during the project's Alternatives Analysis update process. Station spacing ranges from about 0.25 mile apart to about 0.50 mile apart; several stations on Harrison Boulevard would be farther apart because of the spacing of major destinations.

Of the proposed 16 stations, 11 are existing bus route 603 stations (including the termini at the Ogden Intermodal Transit Center and McKay-Dee Hospital) that would be enhanced as part of the Action Alternative. The project team agreed that not all 16 stations would be constructed for the BRT service's opening day (2020). Three of the 16 stations are designated as future stop locations. The existing route 603 bus currently stops at two of these three locations, and those locations would be discontinued and new enhanced stations would be constructed in their place in the future based on ridership and station demand.

Figure 3. Action Alternative



Station Amenities. The Action Alternative stations would include a platform, canopy, landscaped planter, and station amenities. The station would sit on a concrete bus pad elevated above the sidewalk curb height between 6 and 9 inches above the street grade. Stations would be about 125 feet long, with a platform length of 100 feet to accommodate two 40-foot-long BRT vehicles. Station shelters would be roughly comparable in size to existing UTA bus passenger shelters in the area, though somewhat longer.

At present, UTA anticipates that the shelters would be designed to include a combination of glass panels and solid support members that would have a minimal visual "footprint." Station canopies would be opaque features that provide shelter from sun and rain and would be about 10 to 15 feet high, depending on the incorporation of decorative architectural features that would be determined during final design.

The platform provides the area for passenger waiting, boarding, and station amenities. The station platform would range from 8 to 25 feet wide, depending on the station location and the need for a platform to accommodate either single-direction travel or both southbound and northbound travel. Station amenities could include ticket vending machines, seating, lighting, a canopy and wind screens, garbage receptacles, and wayfinding information (maps and signs).

Mount Ogden Business Unit Bus Maintenance Facility Expansion. In conjunction with the Action Alternative, UTA would expand the existing Mount Ogden Business Unit Bus Maintenance Facility located at 175 W. 17th Street in Ogden. The Mount Ogden facility is currently operating at maximum capacity and cannot accommodate the additional eight BRT vehicles needed for the Action Alternative. As a result, the existing Mount Ogden facility would be renovated and expanded.

Operations at the Mount Ogden facility would continue to include maintenance, repairs, inspections, and cleaning for the existing bus fleet and the additional BRT vehicles. The BRT vehicles would be maintained and stored overnight at this facility. The north maintenance building would be expanded to the east by about 8,000 square feet, remaining within property currently owned by UTA and remaining within the existing parking lot pavement area; no additional right-of-way would be required. The expansion would consist of four new bus maintenance bays, which are covered areas for maintaining the new BRT vehicles as well as buses already in the fleet. The expansion would bring the existing facility from about 32,000 square feet to just under 40,000 square feet.

23rd Street and 25th Street Roadway Improvements. To further support the Action Alternative, Ogden City would upgrade portions of 23rd Street and 25th Street to better accommodate the Action Alternative. 25th Street would be rebuilt from the bottom up, and, in certain instances, water mains would be replaced, storm sewers would be installed, and sanitary sewers would be repaired. Depending on the extent of the utility work, curbs might be fully replaced. Ogden City would also upgrade the roadway infrastructure on portions of 23rd Street between Wall Avenue and Kiesel Avenue to better support the Action Alternative and active transportation (walking and bicycling). Improvements would include adding a traffic signal at Lincoln Avenue, restriping, adding bicycle lanes, adding crosswalks, reconstructing curbs, and reconfiguring parking.

3.0 Regulatory Setting

NEPA requires the consideration of potential environmental effects, including potential effects on public utilities and energy, in the evaluation of any proposed federal agency action. NEPA also obligates federal agencies to consider the environmental consequences and costs in their projects and programs as part of the planning process. General NEPA procedures are set forth in the Council on Environmental Quality's regulations at 40 Code of Federal Regulations 1500.

4.0 Affected Environment

The transportation sector is one of the primary users of energy in the United States. Energy supplies primarily include energy sources potentially used by the project. The project team conducted a qualitative assessment of the energy impacts of the Action Alternative.

How is energy use described in this report?

Energy use is described in terms of the amount and types of energy (electricity from coal or solar, gasoline, diesel fuel, and/or natural gas) that would be used by the proposed project.

According to FTA, sharing rides through public transportation can save fuel. It also decreases the need for constructing more transportation infrastructure, manufacturing new vehicles, and extracting more fossil fuels, meaning further energy savings and fewer environmental impacts. Congestion relief from transit also saves fuel because vehicles stuck in gridlock waste fuel and generate air pollutant emissions (FTA 2016a).

On the Weber State University campus alone, University officials plan to have 25% of the trips to and from campus occur via transit, up from a transit mode share of 11% in 2004 (Weber State University 2004). Currently, 380,000 daily person-trips occur in the study area, and WFRC expects this number to increase to 515,000 (an increase of about 36%) by 2040 (Larsen 2015). Based on an extrapolation of this mode share target and the future campus population, over 4,000 daily boardings are estimated for the Weber State University campus alone by 2030. In addition, Weber State University runs a campus shuttle between the Dee Events Center parking lot and the campus's Stewart Library that carries about 3,200 riders per day, or 15,000 riders per week (McNulty 2015). All or some of these riders could become riders on the Action Alternative, thereby allowing the University to eliminate or reduce the required number of campus shuttle trips.

These changes in turn would reduce the number of vehicle-miles traveled (VMT) in the project study area with an accompanying decrease in the amount of energy used by motor vehicles. VMT are calculated per capita on an average daily basis and/or on an annual basis. For the Ogden/Weber State University Transit Project, WFRC used its travel demand model to estimate the VMT by residents living within a given geographic boundary and then determined the reduction in VMT that the Action Alternative would provide over the No-Action Alternative. According to WFRC (UTA 2015), the reduction in VMT per day was about 1,300 for the Action Alternative (which equates to about a 0.06%–0.07% reduction). VMT reduction is also a function of development patterns, and, once Ogden City's land-use

and development plans are realized, further reduction in VMT could be achieved in concert with the Action Alternative.

5.0 Environmental Consequences

5.1 No-Action Alternative

With the No-Action Alternative, the BRT and other facilities associated with the Action Alternative would not be constructed. The No-Action Alternative includes the existing transportation system and all projects in WFRC's 2015–2040 Regional Transportation Plan that are programmed to be completed in the project study area by 2020, the anticipated opening year for the Action Alternative's BRT.

The No-Action Alternative includes current UTA route 603 bus service in the Action Alternative transit corridor using standard buses. The No-Action Alternative does not include a significant new transit capital improvement (that is, BRT and enhanced amenities associated with BRT) in the project study area by 2020. Typical UTA buses would continue serving existing bus stops in the project study area with no additional infrastructure construction. The No-Action Alternative would not include bus-only lanes on Harrison Boulevard or through the Weber State University campus. In addition, the No-Action Alternative would not include roadway enhancements or enhanced station amenities. Increased traffic and congestion resulting from the projected growth in the region would increase overall energy requirements compared to existing conditions.

5.2 Action Alternative

By providing dedicated lanes for transit, the Action Alternative would separate transit from automobile traffic, thereby improving transit speeds and reliability. The frequency of transit service and hence transit VMT with the Action Alternative would increase compared to the existing bus route 603 service (No-Action Alternative); additionally, the improved transit performance (that is, improved speed and reliability) and experience provided by the proposed BRT would attract riders to the BRT service, resulting in mode shift for some drivers of motor vehicles to transit, thereby reducing the number of automobiles and automobile VMT.

The Action Alternative would support existing development and future commercial and residential redevelopment, thereby encouraging higher-density land uses that would presumably encourage fewer VMT. In addition, the Action Alternative would provide an alternative transit mode that can connect with other transit options (commuter rail or buses), thereby contributing to reduced single-occupant-vehicle travel in Weber County. Reducing VMT would decrease energy consumption and thus decrease air pollution from fuel combustion.

One of the primary strategies to reduce greenhouse gas emissions is to provide choices for travel so that options other than single-occupant vehicle travel are available. A study by the American Public Transportation Association found that public transportation can reduce harmful carbon dioxide emissions by about 41 million tons annually by reducing the growth

in vehicle-miles of travel, easing congestion, and supporting more-efficient land-use patterns. These savings represent the beginning of public transportation's potential contribution to national efforts to reduce greenhouse gas emissions and promote energy conservation (APTA 2008).

The Action Alternative is expected to reduce regional VMT by about 1,300 miles per day, which in turn would reduce direct greenhouse gas emissions. If ridership numbers increase and corresponding VMT are further reduced, then further reductions of greenhouse gas emissions would occur. The project team expects that the Action Alternative would contribute to improved energy efficiency and improved air quality compared to the No-Action Alternative.

UTA is considering using a new generation of environmentally friendly buses for the Action Alternative that would be all-electric, hybrid diesel-electric, or diesel buses. All three types of buses are currently being used in Utah and throughout the country, with diesel buses as the most common type. Of the newer buses (manufactured 2010 to 2016) operating in the United States, 54% are diesel, 15% are hybrid diesel-electric, and 0.3% are all-electric (FTA 2016b). As of 2010, the U.S. Environmental Protection Agency requires highway diesel vehicles to use ultra-low-sulfur diesel. Because of these requirements, new diesel buses emit significantly less sulfur dioxide and particulates than older diesel buses. Hybrid diesel-electric buses are subject to the same recent standards but use less diesel fuel than diesel-only buses because they operate partly on battery power.

Because of the reduced diesel consumption and engine operation of the all-electric or hybrid diesel-electric buses, the project team expects that hybrid diesel-electric buses or all-electric buses would produce even less sulfur dioxide and particulates than new diesel buses as well as less carbon monoxide and oxides of nitrogen. (Note that newer diesel buses emit less pollutants than older-model diesel buses.) Furthermore, the project team expects that hybrid diesel-electric buses would reduce greenhouse gas emissions by 30% to 45% compared to new diesel buses (Grütter Consulting 2014). If all-electric buses are selected, greenhouse gas emissions would be reduced even further.

Table 1 compares the annual tailpipe emissions for various bus technologies and further supports that hybrid diesel-electric buses or all-electric buses would further reduce tailpipe emissions.

All-electric buses require electricity for charging their battery. The type of charging technology and charging strategies used affect the amount of power drawn and the efficiency of the charge. Conductive charging (which requires a physical connection such as a cable or pantograph) uses less than 650 kilowatts (kW) of power and has over 99.5% efficiency, whereas inductive charging (which uses an electromagnetic field) uses less than 300 kW of power but is only 80% to 95% efficient. Standard overnight charging of the battery results in up to 450 kilowatt-hours (kWh) of battery power, compared to fast charging at bus route end points (up to 150 kWh of battery power) or fast charging at intermediate stops (up to 80 kWh of battery power). The average energy consumption of a 12m (12-volt, lithium-ion) battery electric bus is 1.6 kWh per kilometer, or 2.6 kWh per mile. This is 3 times more energy-efficient than a diesel bus (Joanneum Research 2017).

Table 1. Annual Tailpipe Emissions for Various Bus Technologies

In pounds

Emittent	All-Electric Bus[a]	Hybrid Diesel-Electric Bus	Diesel Bus
Greenhouse gases	0	221,760	300,960
Carbon dioxide (CO_2)	0	158,400	243,980
Black carbon	0	579	891
Methane (CH_4)	0	103	158
Nitrogen oxides (NO_x)	0	46	59
Carbon monoxide (CO)	0	38	59
Hydrocarbon	0	7	11
Particulate matter (PM)[b]	0	1	1

Source: Proterra, no date

[a] The all-electric bus used for study was the Proterra Catalyst. UTA would not necessarily use Proterra buses, but the project team assumes that the Proterra Catalyst represents a typical all-electric bus.

[b] PM includes $PM_{2.5}$ (particulate matter less than 2.5 microns in diameter) and PM_{10} (particulate matter less than 10 microns in diameter).

If all-electric buses are used, bus-charging equipment would be installed at the Mount Ogden Business Unit Bus Maintenance Facility and at the new enhanced station near the Dee Events Center on the Weber State University campus. In order to build an energy load profile, UTA would work with the bus manufacturer to determine how much electricity each bus needs. UTA and the bus manufacturer would then work with Rocky Mountain Power to create a plan to support the load profile (APTA 2017). Because only eight vehicles are needed for this route, the project team assumes that existing Rocky Mountain Power infrastructure would support the bus load profile.

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