TRAX Light Rail System Extension Before-and-After Study (2007)

Salt Lake City, Utah

U.S. Department of Transportation

Federal Transit Administration

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3 Review of Before and After Studies Completed in the Last Year

This is the second Before and After Studies report to Congress on and the first to include a completed study.

3.1 Utah Transit Authority – Medical Center Extension of the TRAX Light Rail System

The Utah Transit Authority and FTA signed an FFGA in May 2002 for the Medical Center Extension (MCE) project – the first FFGA subject to the then-recent requirement for a Before and After Study. At that time, FTA had neither formulated nor published any guidance on either the content of the Before and After Study or the topics to be addressed in the studies. As a result, UTA did not include a detailed plan for a Before and After Study of the MCE in its application for the FFGA and did not include a work plan or budget for the studies in the FFGA. UTA was required to conduct the Before and After Study for the MCE without having had the opportunity to identify and archive all of the information required for a complete study and without financial support from FTA. In spite of these constraints, UTA devoted considerable effort to recovering as much of the planning and forecast information as possible and to conducting analyses that are in the spirit of the Before and After Study program. The resulting Before and After Study provides some useful results and a model for the types of analyses that future studies will include, even though the study is not entirely complete or fully responsive to subsequent FTA guidance.

3.1.1 Project Background

Planning for light rail transit (LRT) services in the Salt Lake valley began in 1983. A North-South line was identified as an initial corridor in 1988 and a FFGA was executed for that initial light rail project in 1995. Planning began in 1993 for an East-West LRT line connecting the airport with downtown Salt Lake City and the University of Utah. Planning for the East-West LRT line proceeded through the planning process until late 1999, when it was determined that a design-build approach for the segment between downtown and the university offered the possibility of completing the line in time for revenue service before the 2002 Winter Olympics. The 1.53 mile MCE of the university rail line was identified as a separate project to be completed later.

Planning for the MCE occurred, for the most part, prior to the requirement for a Before and After Study. Further, for much of the planning period, the MCE was treated as part of a larger East-West LRT line rather than as a separate project. As a result, much of the original planning information was not preserved for before and after analysis and the information that still exists does not treat the MCE as a separate, clearly identifiable project. In order to approximate the MCE-specific forecasts of costs and ridership prepared during planning, UTA had to devise methods to allocate forecasts to the MCE segment and to adjust this information to common years. These procedures were necessary and laudable given the circumstances, but will not serve as a model for future Before and After Studies prepared for other projects.

The Medical Center Extension Light Rail Project opened for revenue operations on September 29, 2003, over a year ahead of schedule. An initial draft of the MCE Before and After Study was submitted by UTA on December 26, 2006, slightly over three years after opening for revenue

service. The East/West LRT project was segmented in final design, making direct comparison of cost estimates and ridership forecasts to actual results extremely difficult. UTA has attempted to isolate costs, ridership, and service levels attributed solely to the MCE from preliminary engineering through final design.

Table 1: Planning and Project Development – Key Milestones

Year	Activity/Milestone
1993	University Transit Study initiated to complement the Sandy LRT and identify transit improvements between downtown and the university.
1996	Study identifies transportation corridor that connects the airport, downtown, and the university and suggests that the project would help with planning for the 2002 Olympics. A formal evaluation of alternatives (MIS/DEIS) was completed with the choice of a 10.11 mile LRT line from the airport to the university as the locally preferred alternative (LPA).
1998	Entire project entered preliminary engineering, establishing a 10.85 mile refined version of the LPA.
November 1999	Project entered final design, but due to time constraints to complete a useful project for the 2002 Olympics and limited Federal funding, the project was divided into four separate projects: the Airport Extension, the Downtown Loop, the University Line, and the Medical Center Extension of the University Line
Spring 2000	Construction initiated on 2.50 mile University line.
July 2001	UTA entered final design for the 1.53 mile Medical Center line.
Winter 2001	Construction completed on University line.
May 2002	FFGA signed for the Medical Center Extension.
September 2003	Medical Center Extension opens for revenue operations.

3.1.2 Capital Costs

Due to the lack of information archived during planning and early project development, UTA was forced to use cost measures that are based on the costs of the entire project, rather than specific estimates for the MCE project itself. UTA developed cost-per-mile estimates from the planning and project development phases for the entire East-West project and compared them to the MCE's cost-per-mile estimated in final design and incurred in construction. While FTA understands the reasons for this aggregate approach in this case, the results are not likely to be conclusive since the conditions in the MCE alignment vary considerably from the full-length alignment that extends through downtown to the airport.

Table 2: Capital Cost by Phase

Phase	Scope (miles)	Capital Cost (millions of 2002$)	Cost per Mile	Change from Prior Phase
Alternatives Analysis	10.11	$434.9	$43.0	NA
Preliminary Engineering	10.85	$521.9	$48.1	11.82%
Final Design	1.53	$89.3	$58.4	21.45%

Actual	1.53	$83.6	$54.6	-6.47%

The Utah Transit Authority suggested that the reduction in costs between final design and the actual costs resulted from the efficiency gained by allowing the construction contractor that had just completed the University line to immediately initiate construction on the MCE project.

3.1.3 Service Levels and Operating and Maintenance Costs

Due to the evolution of the MCE segment from the larger East-West line, planned service levels also evolved to serve the smaller University and Medical Center population with a specific set of transit needs. Throughout alternatives analysis and preliminary engineering, UTA planned a full-length East-West line that would have weekday service spanning 19 hours with service beginning at 5 a.m. Actual service on the MCE today spans 19.5 hours, beginning at 5 a.m.

During alternatives analysis and preliminary engineering, UTA planned for East-West line headways of 10 minutes during the morning and afternoon peak periods, 20 minutes during the mid-day, and 30 minutes for early morning and late evening service. In final design, as the Medical Center Extension became a separate project, the headways were simplified to 10 minutes throughout the day and 20 minutes in the evening. Actual service on the MCE today is consistent with all UTA light rail operations – 15 minutes at all times of the day.

Estimates are available from planning documents for O&M costs for the University line and the MCE together, but not for the MCE segment by itself. UTA changed the O&M cost estimating procedures between project-development milestone; so it is very difficult to make comparisons between O&M costs in different project phases. In addition, the actual costs are from annual UTA budget documents for rail service. These are aggregate figures for the entire TRAX LRT system rather than incremental costs for just the MCE. Figures presented are a result of a methodology UTA employed to scale costs to the MCE project in 2004 dollars.

Table 3: Service Levels and O&M Costs by Phase

Phase	Service Levels	O&M Costs (millions/year)
Alternatives Analysis	10 min peak, 20-30 min off-peak	$1.40
Preliminary Engineering	10 min peak, 20-30 min off-peak	$1.26
Final Design	10 min peak, 20-30 min off-peak	--
Actual	15 min all day	$1.21

UTA reports that the procedures and information developed for the Before and After Study will promote better O&M cost forecasting for future planned projects. UTA specifically recommends the use of local operating experience rather than national data in the development of O&M cost models to ensure that unit costs in the models reflect local wage rates and labor costs.

3.1.4 Ridership

Comparisons of predicted and actual ridership have proven to be the most difficult aspect of UTA's Before and After Study. The ridership forecasts prepared during the planning stages

were not developed by UTA, but rather by others using travel models developed and maintained by the Wasatch Front Regional Council (WFRC), the local Metropolitan Planning Organization for the region. Over the course of project planning from 1993 to 2001, WFRC updated its travel models and, in the absence of a requirement for Before and After Studies, retained only sparse documentation of the forecasts. The many details of the forecasting process and of the key drivers of the forecasts (population and employment predictions, for example) were not archived and were no longer available when the requirement for a Before and After Study was established. Further, because the MCE was not treated as a separate project during the planning stages, forecasts of MCE ridership are an undifferentiated component of the forecasts for the entire University LRT line.

Between preliminary engineering and final design, WFRC expanded the geographic area considered in its travel model and advanced the travel forecast year from 2015 to 2020. WFRC created a supplemental model in December 2005 for the purposes of approximating an MCE specific forecast to use in the Before and After Study analysis as the preliminary engineering estimate. This model was calibrated with data on actual light rail ridership (whereas previous models were not). This approach is not entirely satisfactory, but the absence of archived data left little choice. The ridership estimate for final design reported in Table 4 is from FTA's Fiscal Year 2001 New Starts Report. The actual ridership exceeds the "recreated" preliminary engineering forecast while existing ridership will need to grow by a little over 50 percent by 2020 to achieve the estimate reported to FTA for Final Design.

Table 4: Ridership by Phase

Phase	Ridership (average weekday boardings)
Alternatives Analysis	No data
Preliminary Engineering (2020)	2,473
Final Design (2020)	4,100
Actual (2005)	2,640

4 Conclusions

The UTA Medical Center Extension Light Rail project was the first complete project subject to the requirement for a Before and After Study. UTA made every effort to accurately capture and quantify how the project changed over time. However, the inconsistency and lack of archived data was troublesome and made an accurate comparison over time impossible. As projects undergo changes in scope, costs, and ridership forecasts, it is imperative that grantees archive data in a consistent manner. This study has shown the need for more precise instructions and better project documentation by grantees and is one reason that FTA issued guidance for the Preservation of Information for Before and After Studies referenced in the introduction.