September 15, 2009

Every successful organization learns from the past and improves for the future. When I assumed the duties of RTD Interim General Manager, one of my first directives to staff was to develop a Lessons Learned document to analyze the first five years of the FasTracks program. The idea is to gain direct knowledge from our experiences and use it as a guide in moving forward toward program completion.

In this initial document, we focus on nine primary areas including: Planning/Environmental Studies, Cost Estimating, Revenue Forecasting, Railroad Rights-of-Way, Property Acquisition, Management, Processes/Procedures, Project Delivery and Communications. Our team intends to implement an ongoing Lessons Learned process to capture and update these ongoing experiences throughout the program. We plan to publish this document on an annual basis to reflect upon the previous year’s practices.

While my intent is to use this document to ensure our continuous improvement in implementing the FasTracks investment, we welcome other agencies and even our federal partners to learn from our experiences as well.

Finally, this document is an agency-initiated undertaking to be honest and open about what has gone well and should be repeated, and also identify things that we would and will do differently. However, we know there will likely be some who criticize the District. We choose to be forward looking in our approach, and be very clear and transparent in our continued implementation of this great project. Our program objectives remain the same:

- Complete the FasTracks investment initiative
- Help create huge, community-wide economic benefits
- Provide a quality program and develop a world class transit system
- Ensure public and transit system safety
- Minimize impacts during construction
- Provide timely, accurate, clear, consistent information to the public
- Create jobs and opportunities for individuals and small businesses

We look forward to working hard and smart with the RTD Board and our stakeholders to complete the long-term investment called FasTracks.

Phillip A. Washington
Interim General Manager
# Table of Contents

Executive Summary .......................................................................................................................... 3

Lessons Learned .................................................................................................................................. 4

FasTracks Program Background ........................................................................................................ 5

FasTracks 2009 Lessons Learned – Master Contact List .................................................................. 7

Planning/Environmental Studies .......................................................................................................... 8

1. Overview ........................................................................................................................................ 8

2. Background ..................................................................................................................................... 8

3. The Lessons ................................................................................................................................... 9

Cost Estimating ........................................................................................................................................ 10

1. Overview .................................................................................................................................... 10

2. Background ................................................................................................................................... 11

3. The Lessons .................................................................................................................................. 12

Revenue Forecasting .......................................................................................................................... 13

1. Overview .................................................................................................................................... 13

2. Background ................................................................................................................................... 13

3. The Lessons .................................................................................................................................. 14

Railroad Right-of-Way ......................................................................................................................... 15

1. Overview .................................................................................................................................... 15

2. Background ................................................................................................................................... 16

3. The Lessons .................................................................................................................................. 17

Property Acquisition .......................................................................................................................... 18

1. Overview .................................................................................................................................... 18

2. Background ................................................................................................................................... 18

3. The Lessons .................................................................................................................................. 19

Management .......................................................................................................................................... 20

1. Overview .................................................................................................................................... 20

2. Background ................................................................................................................................... 20

3. The Lessons .................................................................................................................................. 21

Processes/Procedures ......................................................................................................................... 23

1. Overview .................................................................................................................................... 23

2. Background ................................................................................................................................... 23

3. The Lessons .................................................................................................................................. 23

Project Delivery ................................................................................................................................. 25
Executive Summary

Every major program has something to learn from its experiences. The FasTracks program is currently one of the most ambitious transit expansion efforts in the nation. The Regional Transportation District (RTD) has built four light rail projects on time and on budget and has drawn upon the many lessons learned on each of those individual projects to develop the long-range FasTracks program. A program of this magnitude is a unique venture that is positioned to benefit not only from the lessons of the past, but also to present a whole new slate of experiences that emerge from its trailblazing nature.

Nearly five years into the implementation of FasTracks, RTD has taken a look back at what’s gone well from the start and what we will do differently given what we know now as the program moves forward. These insights come together as the first FasTracks Lessons Learned Report. The report is presented as nine main categories that break down into a number of lessons within each topic area. The key lessons we’ve learned are summarized below.

- **Planning/Environmental Studies** – We’ve learned to appropriately staff projects from day one with experienced planning and engineering project managers and support personnel; to allot three to five years in the schedule for future planning/environmental studies; and that many third-party requested changes in plans or requirements require significant analysis that can delay studies.

- **Cost Estimating** – We’ve learned that it’s beneficial to provide a program-wide contingency to cover uncertainty and unknown issues rather than relying only on individual corridor contingencies; to maintain a 30% cost contingency until design reaches 30%; and to advance engineering to identify risks and the costs associated with them, ensuring the FasTracks plan is shovel-ready before requesting any additional tax increase to construct the projects.

- **Revenue Forecasting** – We’ve learned that it is more prudent to provide a range (best-case and worst-case cash flows) of potential sales and use tax collections, rather than an exact figure, for longer-term projections; the importance of educating stakeholders and the public on RTD’s forecasting methodologies; and it should be emphasized more clearly that long-term growth projections are averages, rather than exact forecasts of annual growth rates.

- **Railroad Right-of-Way** – We’ve learned that when establishing a budget for purchasing railroad right-of-way, the actual cost should include a larger corridor enhancement factor to be more on the conservative side; that there should be a greater emphasis on minimizing impacts to railroad operations to help contain the cost of relocation or enhancement; and to allow sufficient time to negotiate to accommodate the railroads’ approval process by their various departments.
• **Property Acquisition** – We’ve learned that more direct coordination among internal disciplines is essential to provide consistent communication with potentially impacted property owners as design progresses, always stressing that the acquisition of property takes place following the completion of the formal environmental process; and that designers providing certified rights-of-way plans as early as feasible is key to completing property acquisitions in a timely manner prior to construction.

• **Management** – We’ve learned that staffing resources must be at a sufficient level to adequately address the demands of the program; that the “matrix” organization works well as long as each corridor project has an adequate core group of personnel who are fully dedicated to that corridor; and that it’s essential to assign full responsibility and final decision-making authority on program implementation to the FasTracks Program Manager, in conjunction with the General Manager and Board of Directors.

• **Policies/Procedures** – We’ve learned that we must focus progress reporting and issue resolution on critical schedule milestones; that integration of FasTracks-specific control systems with overall RTD processes and systems is critical; and that adequate business processes and internal controls need to be in place before entering into joint construction agreements for projects.

• **Project Delivery** – We’ve learned that design-build, design-build-operate-maintain and design-build-finance-operate-maintain delivery methods bring a significant private sector component into the management of these projects, which maximizes contractor innovation and participation; and that negotiated contract prices are extremely challenging to implement and should be avoided in the future.

• **Communications** – We’ve learned that it is important to clearly define an overarching Public Information and Public Involvement Program as early in a program as possible; that it is essential to communicate the stakeholder participation process and how involvement opportunities narrow as a project becomes more defined; and that the level of internal communication must accommodate the size and de-centralized nature of a multi-project program.

**Lessons Learned**

Lessons Learned are general statements that describe good practices or innovative approaches that are shared to promote repeat application. They may also be descriptions of challenges or areas for improvement that are shared to provide continuous improvement.

Effective organizations use past experience as a guide to improve future performance. A program as large and complex as FasTracks is especially prone to offer lessons that can be used
throughout the completion of FasTracks itself, as well as for future programs. As several FasTracks corridors move from the planning to construction phase, it provides an excellent opportunity to reflect on Lessons Learned from the FasTracks program – things that have gone well that should be repeated, and things the FasTracks team would recommend be done differently. The FasTracks team intends to apply these Lessons Learned moving forward, to ensure continuous improvement on its implementation of FasTracks and welcomes other agencies and organizations to learn from our experience as well.

In addition, FasTracks plans to implement an ongoing Lessons Learned program to capture and update these ongoing experiences throughout the program.

**FasTracks Program Background**

FasTracks is the Regional Transportation District’s (RTD’s) voter-approved, multi-billion dollar program to build 122 miles of rail transit, including six new commuter rail and light rail lines and extensions of three existing lines; build 18 miles of bus rapid transit service, add 21,000 new parking spaces, redevelop Denver Union Station and redirect bus service to better connect the eight-county District. FasTracks is funded through a combination of sources, including the voter-approved sales tax increase of 0.4 percent (4 pennies on every $10), passed in 2004. RTD has adopted program goals and objectives to guide the implementation of FasTracks.

**FasTracks Program Guiding Principles**

- Ensure every step contributes to the full vision
- Focus money available to the greatest good
- Spend public money wisely
- Maximize outside funding before returning to taxpayers
- Deliver key investments in all corridors

**FasTracks Program Goals**

- Provide improved transportation choices and options to the residents of the District – additional transportation choices add to the region's quality of life.
- Increase transit mode share during peak travel times – existing congestion during peak travel times of the day is frustrating for many drivers and is expected to worsen as the region grows.
- Establish a proactive plan that balances transit needs with future regional growth – the Denver metropolitan region is expected to grow from 2.6 million (2005) people to nearly 4 million in 2030.

**FasTracks Program Objectives**

The FasTracks team's mission is to provide a reliable and safe transit system that enhances mobility, responds to the growing transportation needs within the Regional Transportation
District, and creates a legacy for current and future generations. The team will accomplish this by achieving the following objectives:

- Complete the FasTracks investment initiative
- Provide a quality program and transit system
- Ensure public and transit system safety
- Minimize negative impacts to the community
- Provide timely, accurate, clear, and consistent information to the public
- Create opportunities for Small and Disadvantaged Business Enterprises

FasTracks – An Economic Driver

FasTracks is projected to create more than 10,000 construction jobs alone during the height of construction. Economists estimate that every $1 invested in transportation infrastructure translates into $6 of local economic activity. The FasTracks investment initiative will pump billions of dollars into the regional economy.
# FasTracks 2009 Lessons Learned – Master Contact List

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Project Web Site: [www.RTD-FasTracks.com](http://www.RTD-FasTracks.com)
Lesson Learned # 1
Planning/Environmental Studies

1. Overview

Planning and environmental studies are the first key element of a successful public project. When voters approved FasTracks in November 2004, one of the 10 studies needed was complete (West Corridor) and two environmental studies on joint CDOT/RTD projects were already underway (U.S. 36 and I-70/East Corridor/Central Corridor Extension). FasTracks provided a funding stream for the Regional Transportation District (RTD) to launch studies in the remaining six projects. The Regional Transportation District’s (RTD’s) original internal schedules for completion of planning and environmental studies allotted approximately two years for completion of these studies. Consistent with the average length of planning and environmental studies nationwide, the majority have taken four to five years to complete. Schedule changes resulted from a variety of impacts, including the number of studies underway simultaneously, the length of the procurement process, changes in requirements or alternatives that arose from outside entities, station location requests, and other project elements that differed from original plans. Additionally, conducting multiple concurrent studies created challenges early on for RTD to staff the projects with sufficient levels of planning and engineering management and support personnel. Following are some of the primary lessons we’ve learned during planning:

- An Environmental Methodology Manual helps to streamline coordination efforts with local and Federal agencies
- RTD’s planning and environmental study schedules should be based on national averages, and reflect the number of studies underway concurrently.
- Analysis of alternatives should be completed early in the planning and environmental process.
- Third-party requested changes in plans or requirements require significant analysis that can delay studies.
- Key stakeholder buy-in regarding plans and alternatives selected is critical to successfully advancing planning and environmental studies in a timely manner.
- Projects should be appropriately staffed with experienced planning and engineering project managers and support personnel from day one.

2. Background

Prior to implementing FasTracks, RTD successfully completed planning and environmental studies for a succession of projects, including the Southwest Corridor Environmental Impact Statement (EIS), the Southeast Corridor EIS – which was managed and funded by the Colorado Department of Transportation (CDOT), not RTD – the Central Platte Valley Environmental Assessment (EA) and the West Corridor EIS. These studies were performed with little overlap,
allowing RTD to focus staff resources on each study sequentially through planning, environmental analysis, design phase(s) and construction.

With FasTracks, RTD embarked on multiple environmental studies at the same time. As a result, RTD faced staff resource challenges across all disciplines, including planning and environmental staff. At the outset, some of RTD’s planning and environmental staff were assigned multiple corridor projects to manage, or were asked to manage a project while also leading key technical discipline analyses.

RTD also encountered numerous changes to corridor alternatives. Examples include the change in technology for the Gold Line from light rail to commuter rail as a result of Railroad (RR) requirements, the change in commuter rail alignments resulting from significant changes in RR negotiations, and the changes in location for the commuter rail maintenance facility as the process progressed. These types of changes had significant impacts to study schedules.

3. The Lessons

All of the FasTracks projects are nearing completion of the planning and environmental study process, with solid, implementable plans that have received extensive input and general concurrence from stakeholders, RTD staff and the RTD Board of Directors. As noted, many of these studies have extended beyond the original schedule, largely as a result of the issues addressed above, but remain within national averages of three-to-five years. Key lessons learned include:

- Allot three-to-five years for future planning/environmental studies.
- Early interaction and agreement with key stakeholders and third parties regarding project scope, alignments and stations is critical. This has helped project studies avoid further project delays as the projects progress.
- Begin studies fully staffed in all disciplines based on the scope and schedule identified.
- RTD’s Environmental Methodology Manual, which incorporated lessons learned in real time and streamlined coordination efforts with local and Federal agencies, has been a success that helped lead the Federal Transit Administration’s (FTA’s) to award the Gold Line Environmental Impact Statement (EIS) for Excellence in Environmental Document Preparation.
Lesson Learned # 2

Cost Estimating

1. Overview

The cost estimates for the original FasTracks plan were developed in 2002 and 2003 with the best information available at the time. The original cost estimates do not cover the program costs as they are now projected. Several reasons account for this, including changes in technology, new alignments for the corridors, negotiations with the railroads (RRs), the number of right-of-way (ROW) acquisitions, extraordinary inflation in material prices, and existing conditions associated with utilities, drainage and environmental requirements. In addition, requirements imposed on the Regional Transportation District (RTD) by the RRs in order to occupy their ROW for shared use along the corridors also affected the ultimate cost for the plan. While the conceptual FasTracks plan presented to the public always included language that the plan was subject to the results of the Environmental Impact Statement (EIS) processes, it is now clear that the 25% construction cost contingency in the original plan was not sufficient to accommodate these changes. The major impacts to the cost estimates include:

- **Changes in Technology:** Electric Multiple Units (EMUs) are now proposed for the East and North Metro Corridors, which will increase the initial capital cost due to the cost of electrifying the corridors for commuter rail service. This cost will be offset by operating cost savings in the future, but the impact to the capital cost is not recoverable initially.

- **Railroad Negotiations:** RTD was precluded from negotiating agreements until after the vote, when the RRs would be assured that project funding was available. The cost for acquisition of their property was higher than was originally anticipated, including new safety requirements imposed on RTD by the RRs for use of shared corridors following a September 12, 2008 commuter rail accident in Los Angeles, California.

- **Material Costs:** From 2005 thru 2008, the cost of construction materials substantially increased. The cost of fuel increased from less than $2 per gallon to over $3 per gallon, steel prices more than doubled, from around $600 per ton to more than $1,500 per ton, the price of copper and other construction related materials also increased at unprecedented rates. Many of these cost spikes were influenced by global consumption of construction materials. This was a marked change from the 15-year period prior to the development of the FasTracks plan, when material costs increased at a rate similar to the Consumer Price Index (CPI).

- **Level of Design:** The level of design used to estimate the cost of the plan was at a conceptual level in 2003/2004. While RTD would have liked to complete more extensive design prior to the 2004 FasTracks vote, it didn’t have the funding and was constrained from doing so by Federal regulations. FasTracks projects are now at a more advanced level of design which addresses these impacts and they are reflected in the current cost estimates.
Contingency: The amount of contingency used for the cost estimates was 25% of base construction costs, consistent with past regional projects done by RTD, CDOT and local agencies. Due to the size and complexity of FasTracks, a program-wide contingency applied to the entire cost of the plan, and not just construction, would be recommended.

2. Background

The original cost estimates for the FasTracks Plan were generated using the most current prices available at that time. The basis for the estimates were costs bid for the Transportation Expansion (T-REX) Project, the Southwest Corridor (SWC) and the Central Platte Valley (CPV) as well as costs generated for recent construction of park-n-Rides, CDOT construction bid items, recent City and County of Denver construction projects and costs used by the RRs for work of a similar nature. These costs were compared to other similar projects constructed throughout the United States using data generated by the Federal Transit Administration (FTA). In addition, an independent cost estimate comparing unit prices was prepared by EarthTech, an outside firm engaged by RTD to review RTD’s cost estimates, as a means of validation. These cost estimates were vetted by the Denver Regional Council of Governments (DRCOG) through a Peer Review and were reviewed by CDOT in separate meetings. The costs were determined reasonable and the estimates were submitted for acceptance by DRCOG through the SB208 (Senate Bill 90-208) process.

The cost estimates were based on certain assumptions that were later modified during the EIS processes. For example, train technology was changed on four of the corridors. It was subsequently determined that EMUs would be used on the East, North Metro and Gold Lines rather than the originally assumed diesel technology on the East and North Metro corridors, and the original assumption of light rail transit (LRT) on the Gold Line. Diesel Multiple Unit (DMUs) would be used on the Northwest Corridor rather than Locomotive-Hauled Coach technology. The analysis determined that the operation of EMUs would mean a higher capital cost to the program initially, but lifecycle cost savings to the program would be achieved over time through energy cost savings.

Other general assumptions that were made initially also required adjustment as projects became more defined, including:

- Drainage requirements
- Deflection walls required by the RRs.
- RR ROW costs
- Impacts to existing infrastructure such as the rebuilding of streets
- Number of utility relocations

Finally, the cost of materials grew exponentially from the time the FasTracks cost estimates were developed, as evidenced by increases in the cost of steel, copper, fuel, and cement, accounting for approximately one-third of the program’s estimated cost increases.
3. The Lessons

The estimated cost for the FasTracks plan has increased substantially since the vote in 2004. The cost estimates were generated using the best available information at the time. Lessons learned include:

- Provide a program-wide contingency to the plan to address potential uncertainty and unknown issues.
- Provide an allocated contingency to specific cost elements. Perform formal risk management analysis to major corridors to identify risks and the contingency that must be allocated for each risk.
- Increase the percentage applied to unspecified items such as utilities and drainage, based on the level of design.
- Increase the construction contingency level from 25% to 30% of the total calculable cost at the conceptual level of design to help mitigate for increases in construction and unforeseen elements within the corridors.
- Do not decrease the contingency for the project until the level of design is at a point where all the impacts and changes have been identified and a mitigating solution has been reached (usually at a 30% or better design level).
- Continue to incorporate risk assessments into design reviews to identify potential additional cost elements.
- Continue to perform independent, bottom-up cost estimates when the design level reaches 30% to provide a high level of confidence in the estimate.
- Advance engineering to identify risks and the costs associated with them, ensuring the FasTracks plan is shovel-ready before requesting any additional tax increase to construct the projects.
- Instead of assuming that future construction materials costs will escalate at the forecasted CPI, use forecasts specific to the types of materials used for transit construction.
Lesson Learned # 3
Revenue Forecasting

1. Overview

The Regional Transportation District (RTD) is very reliant on sales tax revenues for operation of its existing system and the build-out of FasTracks, which makes it vulnerable to economic cycles and short-term fluctuations in sales and use tax collections. For the past four years, sales and use tax collections, which are the primary source of funding for the FasTracks program, have fallen below the annual projections made at the time the FasTracks plan was adopted. While the forecast for FasTracks funding took into account economic ups and downs over the long-term (30 years), the sustained downturn that has occurred throughout the early years of the program has had a significant impact on RTD’s ability to fund the increased capital cost of the program in the relative medium term (2017). Each year, staff revises the sales and use tax forecasts based on the most current available economic forecasts. The current forecast collections through 2035 are 31% lower than the original 2004 forecasts, resulting in insufficient funding to cover current projected program costs.

2. Background

The sales and use tax forecasts incorporated in the original FasTracks plan were based on the best available economic projections at that time. Short-term forecasts were based on statewide projections by the Colorado Legislative Council and the Office of State Planning and Budgeting. Longer-term forecasts were based on data from the Center for Business and Economic Forecasting. The long-term forecasts were adjusted downward prior to adoption of the final plan at the recommendation of the consultant engaged by the Denver Regional Council of Governments (DRCOG) to review the financial plan in the SB208 process. The resulting projections showed an average annual growth rate lower than RTD’s 20-year historic average annual sales and use tax growth. The financial plan approved by DRCOG though the SB208 process included the adjusted projections.

Each year, RTD staff reviews the sales and use tax projections and updates them based on the most current available information. The Colorado Legislative Council (CLC) continues to provide statewide short-term projections, and RTD has refined its use of their projections to incorporate more detailed information available from them. However, we no longer have an external source for long-term sales and use tax forecasts. Therefore, staff has developed a conservative methodology that combines the Consumer Price Index forecast and DRCOG population growth projections.

FasTracks sales and use tax projections cover a longer time horizon than those of other state and local governments. CLC projections for the state of Colorado look three to four years into the future; and most local governments forecast revenues no more than five years into the future. On
the other hand, RTD projections for FasTracks run 26 years into the future. Up to this point, many stakeholders have looked at RTD long-term growth projections through the lens of short-term economic trends, rather than recognizing them in the context of a 25-year planning horizon. RTD has realized that educating the public about the methodology for short- and long-term projections is necessary and will help clear up this misperception.

3. The Lessons

Sales and use tax revenue forecasting is not an exact science. It is unreasonable to expect that sales and use tax forecasts over a time horizon of 25 years will be 100% accurate. However, it is reasonable to look at forecasts within a margin of error, to ensure that RTD has a flexible plan to deliver FasTracks within the range of likely outcomes. To that end, RTD is implementing a combination of refinements to develop alternate sources of forecasts and examine a wider range of outcomes:

- Provide a range (best-case and worst-case cash flows) of potential sales and use tax collections, rather than an exact figure, for longer-term projections, and perform sensitivity analyses within the range.
- Investigate additional alternative sources for long-term economic projections and sales tax forecasts.
- Educate stakeholders and the public on RTD’s sales and use tax forecasting methodologies, and the differences between short-term (3-4 years) and long-term (15+ years) forecasts.
- Emphasize more clearly that long-term growth projections are averages, rather than exact forecasts of annual growth rates.
Lesson Learned # 4

Railroad Right-of-Way

1. Overview

Many of the FasTracks corridors are dependent on use of railroad (RR) right-of-way (ROW), as they are the only contiguous properties that extend the limits needed for the corridors. However, because the RR properties provide interstate commerce and any impact to their properties or operations requires an entity to ensure that their continued operations remain at or better than existing conditions, RTD has been reliant on complex negotiations in order to mitigate railroad impacts and acquire the necessary railroad properties.

RTD entered into the negotiation with an understanding of the RR design criteria, operations and concerns, which was fundamental to establishing the deals. However, requirements changed throughout the negotiations due to two key events outside of RTD’s control – a commuter rail accident in Los Angeles, California in January 2005 and another in September 2008. This placed RTD at a disadvantage in the negotiating process given that the railroads now required RTD to fund modifications to RR property to ensure the safety of ongoing RR operations. In addition, because the railroads have already assembled the necessary property for a contiguous corridor, there’s a price to pay for that. Therefore, the railroads apply a corridor enhancement factor to any transaction to reflect this reality, often times increasing the cost for the ROW. Negotiations also move slowly because any transaction or modification to the RR system must be fully evaluated and ultimately accepted by numerous divisions within a RR corporation, which include operations, engineering, facilities, property, legal, and management. Several factors have emerged through railroad negotiations:

- Negotiations have required more time than was originally estimated. Furthermore, the RR negotiating team changed throughout the process, depending on the impacts to their facilities and operations. Also, as RR employees retired or were transferred, new representatives were introduced into the negotiating process, causing a learning curve for the new members.
- Cost for ROW was more than estimated due to the corridor enhancement factor attached to the contiguous property, and property values as appraised by the railroads tended to be higher than RTD appraisals.
- Negotiations with Union Pacific (UP) changed significantly in January 2008 when acquisition costs for a key property were much higher than RTD had programmed. As a result, RTD had to pursue alignment modifications on some corridors and seek a new location for the commuter rail maintenance facility. This impacted the EIS schedules due to the added analysis and the time required to design the modified corridor alignments.
- Additional requirements were placed on RTD to provide wider distances between the RR’s freight tracks and RTD’s proposed tracks, including the requirement to provide for
massive deflection walls where the track separation was less than 50 feet. This added significant cost to the corridors and impacted the EIS schedules.

- The amount of insurance required for RTD to operate in the corridor was raised to $200 million, whereas the amount on the Southwest Corridor (SWC) was $50 million. In addition, the RR’s prerequisite for indemnification required RTD to have legislation passed by the State of Colorado, granting it the ability to indemnify the RRs before they would negotiate with RTD.

2. Background

RTD began discussions with the RRs in 2002 about the possibility of purchasing ROW for the various corridors in anticipation of proceeding with an initiative to construct additional rail lines for our system. RTD entered these discussions under the premise that the needs would be similar to the SWC requirements. Numerous relationships had been built with personnel from the RRs over the years and they were enthusiastic about continuing to work together. RTD approached management to determine if they would be amenable to selling RTD land on their existing corridors. The RRs appeared amenable to this approach.

Specific pricing was not discussed, but an understanding of what the cost would be was established, based on previous negotiations for the SWC and general estimates from the railroads for the potential value of RR facilities. RTD performed over-the-fence evaluations of property adjacent to the corridors and established a square-foot cost to be applied to the corridors. Based on this information, RTD proceeded with a plan it determined was reasonable.

After the vote was passed in 2004, RTD entered into negotiation with the RRs as they were then assured that funding for the plan was available. At the beginning of negotiations the RRs required indemnification and insurance coverage of $200 million, significantly more than was required on the SW Corridor. Concurrently, the January 2005 commuter rail accident in Los Angeles, California moved the RRs to require Federal Railroad Administration (FRA) compliant commuter rail vehicles to operate in their corridors, which required RTD to reconsider the light rail option for the Gold Line, impacting the Gold Line’s environmental schedule. As negotiations continued with UP, the cost for maintaining their current operations increased with their determination that they needed a new yard and freight corridor to replace their Kansas Pacific (KP) line which was to be used for the East Corridor. Cost became prohibitive and negotiations came to a halt.

RTD reopened negotiations with UP, at which time the RR required additional separation of the track and/or a massive deflection wall to separate the commuter rail from freight rail. The associated costs to accomplish this increased the budget required to purchase the necessary property.
3. The Lessons

Several lessons were learned during the railroad negotiating process:

- The actual cost for the ROW is based not only on the cost for the land, but also involves a corridor enhancement factor that RTD did not fully consider in the initial estimate. Future estimates should use a corridor enhancement factor of two times the raw land cost to be on the conservative side when establishing a budget.
- Any impact to RR operations should be minimized in order to contain the cost of any relocation or enhancement. RRs operate in a challenging, competitive environment and are understandably protective of their operations, facilities and capacity.
- Alternatives must be provided for RTD alignments so as to not be totally dependent on the outcome of a single alternative that is prohibitively expensive.
- The RRs have an anticipated price that is difficult to negotiate. The elements contained in that price are negotiable and therefore RTD should anticipate beforehand what is actually needed as part of the negotiations.
- Allow sufficient time to negotiate with the RRs, as there are many aspects of the deal that need the approval of numerous RR departments. Time has not been as critical to the RRs as it has been to RTD, due to program schedule constraints.
- Understand the RR’s standards, operations and concerns prior to negotiations, as this plays an important role in the negotiations.
- Be willing to prepare all the plans and designs for RR facilities, even though they may redesign them, as this provides the basis for negotiations.
Lesson Learned # 5

Property Acquisition

1. Overview

Property acquisition is a necessary part of public infrastructure projects like FasTracks. Property acquisition will be an integrated part of FasTracks implementation over the next several years. Several lessons learned thus far can be applied as FasTracks moves forward. These include:

- The relocation process on complex properties acquired for a project can take anywhere from 12 to 36 months. RTD will determine and acquire the necessary staff resources to accommodate the needs of the FasTracks schedule.
- Consistent communication guidelines have been developed to ensure both compliance with the specifications of the Uniform Act and early, proactive communication with stakeholders and potentially impacted property owners.
- Communication with potentially impacted property owners should reflect the level of design and the environmental clearance process. Communication should become progressively more definitive as Right-of-Way plans are defined.

While FasTracks has faced some key challenges with property acquisition during its early stages, the West Corridor is progressing with the purchase of properties needed to build the first FasTracks rail line. Consistent, progressive communication and adequate time for the education and negotiating process are two key areas for improvement as FasTracks moves forward.

2. Background

RTD’s Real Property group manages the agency’s real estate holdings and oversees all land transactions related to the buying, selling, or leasing of property. In acquiring property, RTD follows federal guidance established through the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as amended, 49 Code of Federal Regulations (CFR) Part 24, dated January 4, 2005 as well as Colorado Revised Statutes. Both the Uniform Act and Colorado law stipulate a very detailed process which is intended to protect the private property owner. RTD only acquires land that supports its primary mission related to the construction and operation of a mass transportation system.

The use of eminent domain for the acquisition of property can be controversial and one of the most difficult parts of a public infrastructure project. As FasTracks progresses, RTD will continue to follow a process that is consistent, provides appropriate communication with potentially impacted property owners and follows the prescribed process established by the federal government with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as Amended, 49 Code of Federal Regulations (CFR) Part 24, dated January 4, 2005 and all applicable state laws.
3. The Lessons

The following highlights how the lessons on property acquisition will be applied as the FasTracks program moves forward:

- Coordination among internal disciplines is essential to providing consistent communication with potentially impacted property owners. This coordination involves joint communication/meetings to discuss design issues and also to answer any questions about the property acquisition process. The intent is to provide early and continuous communication with property owners.
- Closely evaluate schedules for ROW acquisition. As FasTracks progresses, more schedule contingency should be considered for the right-of-way acquisition process to account for unknowns and the potential for challenges.
- In communicating with potentially impacted property owners, information will be consistent with the level of design so that property owners have a clear understanding of what is and is not known at any given point. Communication will continue to stress that the acquisition of property takes place following the completion of the environmental process.
- Providing certified ROW plans to the Real Property group as early on in design as is feasible is key to completing property acquisitions prior to construction.

Thus far, there has been much progress with regards to acquiring property, with about 45% of the property needed on the West Corridor either acquired or under agreement. Much of the railroad right-of-way (ROW) needed for the balance of the FasTracks corridors is committed and will be available to RTD within the next 12 to 18 months. These successes will be built upon as FasTracks moves forward and the lessons learned thus far are applied to additional property acquisition for the program.
Lesson Learned # 6

Management

1. Overview

Management and organization of a program as large and complex as FasTracks has presented several challenges. Most large transit programs focus on a single corridor. The multi-corridor nature and unprecedented size of the FasTracks program has been very complex to manage and has led to several findings.

- The staffing resources in certain areas have not always been sufficient to adequately address the demands of the program.
- While the matrix organization works well in most cases, each corridor needs an adequate core group of personnel who are fully dedicated to that corridor.
- Assign full responsibility and final decision-making authority on program implementation to the FasTracks Program Manager, in conjunction with the General Manager and Board of Directors.
- Decision-making needs to be delegated to the appropriate manager, particularly the Project Manager on each corridor.
- The role and assignment of consultants on the program needs to be clearly defined to take advantage of these resources.

A program like FasTracks has not been attempted before. The management systems that were established have worked well overall. However, actual experience during the first four years has led the organization to evolve based on lessons learned.

2. Background

The FasTracks organization consists of a multi-disciplinary group of managers, engineers, planners, project controls, public information and support personnel assigned to the program. These personnel are generally assigned full-time at an office location dedicated to FasTracks. The program is also supported on a part-time basis by other Regional Transportation District (RTD) departments interfacing with FasTracks.

The personnel assigned to the program consist of both RTD personnel and consultants. The consultants function as an extension of staff and the organization is set-up as one overall team, without distinctions between RTD and consultant. A matrix organization has been established where personnel from various disciplines support assigned corridors.

The experience during the first four years of the program can be categorized into three areas: 1) areas that need improvement; 2) areas that improved after specific issues were identified and; 3) and areas that have worked well. A major area that experienced problems and is being addressed is the staffing resources for each corridor. For example, the West Corridor was initially set up
with a Project Manager, two support professionals and support from the matrix organization. This proved inadequate to manage the complex issues during final design and movement into construction, particularly after one of the key personnel left the program. This particular case has been addressed – there is now a complete 20-person team dedicated to construction oversight on the West Corridor. However, as pointed out by the Federal Transit Administration (FTA) and our own peer review, inadequate project staffing is a false savings that must continue to be addressed.

In addition to staffing levels, management resources and processes must be evaluated. There are still several cases of key positions that are only “one-deep” with no ability to easily replace these resources. Top management is often forced to focus on day-to-day issues instead of strategic management decisions.

It is also important to assign full responsibility and authority to make the final decisions on program implementation to the FasTracks Program Manager, in conjunction with the General Manager and Board of Directors. In addition, the relevant FasTracks managers need to be involved in decision-making and should be delegated the appropriate level of decision-making authority.

3. The Lessons

The following describes how the lessons learned in management, organization and resources are being applied to the FasTracks program moving forward.

- Greater attention is being applied to the staffing of dedicated personnel on major corridors. Each corridor is being assigned a small team during planning that will increase as the project moves into design and construction. A full team has been deployed on the West Corridor, is being staffed on Denver Union Station and being planned on the Eagle P3 projects. Other corridors are being established with Project Managers, design managers and project controls personnel.

- Although a greater emphasis is to be placed on assigning dedicated personnel to corridors, we plan to continue the matrix organization. This enables efficiency in assigning personnel when a specific expertise or resource is required that may not be available on a corridor. It also assures a level of standardization and provides great experience for personnel who may later transfer or be promoted to a corridor position.

- Conduct a comprehensive evaluation of the FasTracks organization to identify gaps, succession planning and any staffing imbalances.

- Assign responsibility and accountability for program implementation to the FasTracks Program Manager including overall decision-making authority, in conjunction with the Board and General Manager. Assure that all decisions have the input and support of the appropriate team members.
Maintain the current “one-team” approach with RTD and consultant personnel. Consultants will continue to be utilized for specialized areas of expertise that would be difficult for RTD to recruit, and can be moved in and out of the program on shorter-term assignments, as needed.
Lesson Learned # 7

Processes/Procedures

1. Overview

The Regional Transportation District (RTD) began implementation of the FasTracks program in 2005. FasTracks brought a major change to RTD’s standard ways of doing business. Prior to FasTracks, RTD’s business processes and procedures, as well as its financial systems, were designed to meet the needs of an agency that was focused on system operations and delivery of major corridor projects one at a time.

FasTracks, as a major capital investment program constructing seven corridors at the same time, changed the RTD paradigm. Almost overnight, RTD transformed from a major bus and light rail agency into a major operating agency with a massive capital program. However, its business processes and procedures remained oriented toward its prior focus on operations and relatively independent capital projects. These processes were not suited to facilitating and controlling a large-scale integrated capital investment program. RTD needs to update and refine its control processes and procedures to provide appropriate controls for an integrated, large-scale capital program, while maintaining its ability to meet the program goals and schedule.

2. Background

The FasTracks program was approved by the voters of the District in November 2004, with tax collections starting on January 1, 2005. Prior to the start of the FasTracks program, RTD had never undertaken a program of that size or scope. RTD’s single largest construction project, T-REX, was a joint project with the Colorado Department of Transportation. It operated out of its own field office with a dedicated staff and its own internal procedures and control systems. Even though other RTD resources were involved in supporting the T-REX Project, the day-to-day impacts on most of RTD’s operations were isolated.

On the other hand, the FasTracks program involves the simultaneous construction of multiple rapid transit corridors using three modes of transportation – light rail, commuter rail, and bus rapid transit. Unlike T-REX, FasTracks is exclusively an endeavor of RTD, meaning that RTD resources alone are used to complete the program. This results in a much greater impact on the remainder of RTD, and a greater need for policies and procedures that integrate with overall RTD processes. It also drives a need for processes that address the impacts of the different FasTracks corridors on each other.

3. The Lessons

FasTracks is a program of a different scope and scale than anything that RTD has done in the past. As a result, RTD cannot assume that procedures developed for an operations-focused
agency will work for a capital development program at this scale. RTD needs to develop business processes and procedures that meet the program needs and schedule while maintaining adequate internal controls, rather than building an implementation program around business procedures designed for a very different situation. Specific areas to be targeted for improvement include:

- Focus progress reporting and issue resolution on critical schedule milestones.
- Improve communications/transparency of configuration change protocol, issues and decisions.
- Develop project change control procedures to expedite contract changes within allowable guidelines, allowing RTD to maintain the overall program schedule.
- Refine cost control procedures to account for the differences in funding structure between the FasTracks program and other RTD capital projects.
- Improve integration of FasTracks-specific control systems with overall RTD processes and systems.
- Ensure that adequate business processes and internal controls are in place before entering into joint construction agreements for projects.
Lesson Learned # 8

Project Delivery

1. Overview

There are several methods of delivering various projects on the FasTracks program – design-bid-build (DBB), design-build (DB), construction manager/general contractor (CMGC), design-build-operate-maintain (DBOM) and design-build-finance-operate-maintain (DBFOM). The Regional Transportation District (RTD) has successful experience with design-bid-build and design-build.

The FasTracks program is currently using or plans to use these project delivery methods based on experience gained and conditions specific to each project. Major findings in these areas include:

- DB, DBOM and DBFOM bring a significant private sector component into the management of these projects, which maximizes contractor innovation and participation into the implementation of these projects. These methods also enable the fastest schedule to be accomplished.
- Negotiated contract prices are extremely challenging to implement and should be avoided in the future.
- CMGC contracts require the buy-in of the designer who works under a separate contract.
- DBB is appropriate for smaller projects and those that involve extensive risk and stakeholder involvement.

FasTracks has now defined its project delivery methods for each project based on this experience.

2. Background

The original FasTracks schedule was developed assuming DBB delivery for all corridors. This provided the most conservative schedule and still allowed for future analysis of delivery methods. After a workshop in 2005, the preferred method of delivery was largely changed to CMGC in an attempt bring contractors on-board earlier in the process while still affording RTD with greater control over final design. As the program has progressed, FasTracks has moved away from CMGC to largely DB or DBFOM, with DBB being utilized for projects with specific requirements.

CMGC involves bringing a contractor in early in the design process to provide input, value engineering and develop cost estimates. After the design is at 100%, the owner and contractor negotiate an acceptable price. CMGC is being used on the West Corridor project. Experience on the West Corridor showed that RTD, the designer and the contractor weren’t always on the same page, as illustrated by the design engineer’s (who was working under a separate contract and at a separate location) decision not to embrace many of the value engineering recommendations.
made by the CMGC contractor. Integration of RTD, designer, and contractor personnel, including co-location, along with fully assigned RTD design professionals could have addressed this gap. Although RTD believes that we have negotiated a fair and reasonable final price with the CMGC contractor, the negotiations were extremely challenging and RTD staff firmly believes that there is no substitute for the discipline of the marketplace under a competitive bidding environment. In addition, the benefits of contractor-designer collaboration are best secured under a DB contract.

The design-build project delivery method draws on many of the lessons learned from the T-REX project (NOTE: a separate lessons learned report was developed for that project). DB brings the contractor in as an essential part of the overall management for that project. Given that the contractor is so essential to the success of a design-build project, a best value selection (combination of price and technical capability) should be used as selection criteria with price as a major element. DBFOM is an extension of design-build, which is integrated into the Public-Private-Partnership (PPP) program for the Eagle P3 project.

3. The Lessons

The selection of project delivery methods is an example of where FasTracks has used its experiences and lessons learned to develop its program moving forward.

- Large corridor projects will take advantage of design-build and design-build-operate-maintain, with design-bid-build used mainly on specific, smaller projects.
- Contracts or delivery methods with negotiated contract prices are no longer planned for construction projects.
- Contracts relying on the experience of contractors as a key to success will use the best value method for selection.
- Co-locate RTD, design and construction personnel to the greatest extent possible.

These experiences will be critical as the FasTracks program moves largely into construction.
Lesson Learned # 9

Communications

1. Overview

The Regional Transportation District (RTD) FasTracks Public Information/Public Involvement (PI) Program was developed to establish and maintain a high level of communication and outreach to project stakeholders throughout the implementation of the FasTracks program. The communication function is an essential part of keeping communities connected and engaged throughout the FasTracks process, ensuring public confidence, and identifying and resolving issues and concerns. The FasTracks PI Program provides the communication integration necessary for consistent, accurate, and reliable internal and external communications. During the environmental planning phase, the public involvement process is a key element of determining and defining the project. Through the National Environmental Policy Act (NEPA), there are requirements an agency must follow regarding the public’s input and involvement in helping to shape a project. The difference between the NEPA public involvement process and the public information program, which includes public involvement elements, is important to communicate so that internal team members understand the roles, responsibilities and purpose of these two facets of the PI program. One of the big challenges of a program of this magnitude with many individual projects that integrate into an overall program is keeping all of the various team members coordinated and disseminating consistent and updated information to stakeholders and the public. It is also a challenge to set clear expectations of the public’s role and participation in the program as it evolves from one stage to the next.

2. Background

The FasTracks PI Program is a comprehensive communications program, which includes an array of strategies and activities related to public outreach, public involvement, media relations, government relations, internal communications, issues management and crisis communications. The PI Program is implemented at two levels: a program team to establish and implement public information, involvement and outreach activities at the program level; and project teams to facilitate the specific day-to-day corridor level public involvement and information efforts with project stakeholders. Corridor public involvement teams have carried out PI duties during the environmental processes and public information teams will be part of the construction contractors’ teams during design and construction. The West Corridor, being the most advanced project of the FasTracks program, completed its EIS process in 2004 and was awaiting the outcome of the FasTracks vote to progress to the final design phase. There was nearly a two-year period from the end of the EIS and beginning of the final design phase, which presented a communication challenge – conveying to project stakeholders how their participation evolves from the very extensive public involvement during the environmental process to a more narrowed approach in design and construction. As a program transitions from planning to design to construction, the needs of the project and the public change, with input and involvement
opportunities narrowing as a project becomes more defined. During construction, communication centers mainly on public information and focused issue resolution. Explaining the stakeholder participation process at the beginning and then re-emphasizing the changing nature of the public’s role as a project progresses, helps to set appropriate expectations. The Senior Management Team, in partnership with the FasTracks Citizens Advisory Committee, developed a Stakeholder Participation Policy outlining this process, which was ultimately approved by the RTD Board of Directors. In addition, the PI Team developed graphics to help depict the stakeholder participation process.

3. The Lessons

- It is essential to clearly define the Public Information and Public Involvement Program as early in a program as possible. While public involvement is two-way interactive communication that fosters the public’s participation in helping to shape a project or process, the one-way public information or public outreach effort is designed to help inform and educate stakeholders. Both should be integrated and fall under the larger umbrella of communication, so coordination and understanding of roles at the program and corridor levels are crucial for all internal team members so that communication efforts can complement each other.

- Establishing and communicating stakeholder engagement opportunities throughout the whole program is critical. It is important to have a policy and process in place at the beginning of a program of this nature.

- Internal policies and procedures should be defined up front so the entire team can adhere to decision-making and communication processes. This allows the project team to stand united on decisions that have been made and, when communicating those decisions, be confident of the information.

- Internal communication is one of the most important components of any program. Internal team members can be the best ambassadors for the program based on how well informed they are. The whole internal team – with the RTD Board of Directors at the top – needs to understand developments and changes in the program so that everyone is working from the same information. It is essential to make sure that the internal team is the first layer of communication before information is shared externally.

- The PI Liaison concept has worked well, with a member of the program PI team assigned to each corridor project as the central communication link between the program PI team and the corridor team. This structure establishes a liaison for the duration of the program to maintain consistency and familiarity with the project, its stakeholders and historical issues. It is important to have roles and responsibilities of the program PI Liaison and the corridor PI contractors clearly defined at the onset of the project.
FasTracks at Work

Since implementation began in January 2005, the FasTracks program has made substantial progress on a number of fronts, especially on the various environmental and design processes. As the program transitions from planning and design into construction, RTD remains committed to delivering key investments in all corridors.

- Ceremonial Rail Pulling Event – May 2007
- McCaslin Bridge grand opening on the U.S. 36 Corridor – June 2008
- West Corridor retaining walls being erected along Kipling Street – May 2009
- North Metro Corridor station planning meeting – 2008
The first of FasTracks’ 55 new light rail vehicles arrives at the Elati Light Rail Maintenance Facility – August 2009

West Corridor construction crews prepare to relocate utilities – November 2007

Students from the Ride to Dream Program learning about the I-225 Corridor– December 2008
A FasTracks public meeting in Boulder – September 2008

Disadvantaged Business Enterprise members at the P3 industry forum – July 2008

Placing a pedestrian bridge on the West Corridor – November 2008

Architectural rendering of Old Town Arvada along the Gold Line – 2015 (est.)
## Acronym List

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>CCD</td>
<td>City and County of Denver</td>
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<tr>
<td>CDOT</td>
<td>Colorado Department of Transportation</td>
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<td>CFR</td>
<td>Code of Federal Regulations</td>
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<td>CMGC</td>
<td>Construction Manager/General Contractor</td>
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<td>CPI</td>
<td>Consumer Price Index</td>
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<td>CPV</td>
<td>Central Platte Valley</td>
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<tr>
<td>DB</td>
<td>Design-Build</td>
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<td>DBB</td>
<td>Design-Bid-Build</td>
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<td>DBFOM</td>
<td>Design-Build-Finance-Operate-Maintain</td>
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<tr>
<td>DBOM</td>
<td>Design-Build-Operate-Maintain</td>
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<tr>
<td>DMU</td>
<td>Diesel Multiple Unit</td>
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<td>DRCOG</td>
<td>Denver Regional Council of Governments</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>EMU</td>
<td>Electric Multiple Unit</td>
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<tr>
<td>FONSI</td>
<td>Finding of No Significant Impact</td>
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<td>FRA</td>
<td>Federal Railroad Administration</td>
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<td>FTA</td>
<td>Federal Transit Administration</td>
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<td>KP</td>
<td>Kansas Pacific</td>
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<td>LRT</td>
<td>Light Rail Transit</td>
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<td>MIS</td>
<td>Major Investment Study</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>PE</td>
<td>Preliminary Engineering</td>
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<td>PI</td>
<td>Public Information</td>
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<td>PPP</td>
<td>Public-Private-Partnership</td>
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<td>ROD</td>
<td>Record of Decision</td>
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