ROCKY MOUNTAIN RAIL AUTHORITY

Project Management Plan for

HIGH SPEED RAIL FEASIBILITY STUDY

FINAL REPORT

Group 2

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Introduction:

The Rocky Mountain Rail Authority (RMRA) High Speed Rail Feasibility Study is a multi-jurisdictional government body made up of 52 Colorado cities, counties, and transit authorities. They were awarded a budget for a study to put together a high-speed rail passenger service along Colorado's Front Range from Wyoming to New Mexico and along the I-70 corridor from Denver to the Utah state border including secondary corridors. The study will provide a judgment on if it's feasible to provide intercity rail services within the previously mentioned corridors. It also fully addresses the (FRA) Federal Railroad Administration's public/private criteria and six feasibility factors that have to be checked off in order to receive an FRA high speed designation for each project corridor.

Purpose:

The purpose of the study is to get a new assessment of if there should be a high speed rail service for the most part within the I-25 and I-70 west corridors and to figure out what are the following steps that should be taken by RMRA and partner agencies in the implementation of that service.

To provide some context of the area that this study is covering, most of the state's commercial and recreational centers are attached by the two aforementioned highway corridors, I-70 and I-25. I‐70 is pretty much an entrance to over twenty plus elite recreation resorts that bring in a huge number of visitors/clients every year. I‐25 binds Colorado's emerging metropolitan areas that ride along the Front Range. That area begins in the North at Fort Collins, heads on through Denver, then to Colorado Springs, and finally wraps up at Trinidad. These sections are made up of quickly emerging cities and communities with important enterprises and community centers. With that said, the I‐25 and I‐70 corridors not only have the normal urban area travel patterns of business, commuter and regular routine rides, but its demand is covered by heavily, highly condensed movements of local communities along I‐25 and random out of town travelers from the Denver Airport heading to the resorts and vacation spots along both the I-70 and I-25 corridors that this plan wants to study. All of this entails looking into Colorado's transportation framework in both corridors.

Project Scope:

The project scope of this research is to examine the various possibilities for high-speed passenger rail considering the criteria set forth by the Federal Railroad Administration (FRA), especially those related to everything regarding public-private partnerships and the technical feasibility of such a system.

Implementing a business plan that is tailored to the evaluation of various passenger rail technology alignments and service levels is central to the project strategy. This will supply the FRA and local decision makers with a wide variety of evaluation criteria, such as financial, economic, and community advantages. The RMRA is part of the project scope because everything would require a good amount of collaboration with other studies being conducted in Colorado and would reveal detailed knowledge of local and state expectations for passenger rail service in each route.

Objectives of the study are as follows:

* Establish the framework and process for the management and execution of the RMRA High Speed Rail Study.

* Outline the project scope, budget, resource requirements, roles, responsibilities, authorities of study team, the PMC and the RMRA Steering Committee, and other stakeholders.

* Outline the technical performance requirements for the management and control of the project from initiation of concept design through final delivery to the customer/user.

* Establish decision rules for the review of inquiries and proposals for changes.

The project altogether was given a start date of June 1st, 2008 with a projected finish of June 15th, 2009.

Project Planning:

Project Organization and Resource:

The framework of the project is its organization. It’s all developed independently, involving experts and employees from different divisions. The Resource Management Plan details the categorization, allocation, management, and release of all necessary resources (people, workspace, tools, and equipment).

Identification of Resources:

With the help of the Project manager, the "RMRA" team will engage in a brainstorming session to determine what tools and personnel would be needed. Here, they compile a spreadsheet of all the personnel, materials, assets, and equipment that will be needed to complete the session's scheduled activities by looking at the work breakdown structure (WBS). On the other hand, we have a project manager, an assistant project manager, a quality control manager, a managing operations planner, a public outreach specialist, an economist, a planning analyst, an engineer, a senior consultant, a team dedicated to noise and vibration analysis, an expert in rail technology, an assessment of technology's impact, a senior engineer, and a senior consultant.

Roles and Responsibilities:

For the flexibility of high-speed rail in the Rocky Mountain region, the following project roles have been established:

1.) Project Manager:

Dr. Metcalf's responsibilities as project manager include overseeing the planning and execution of the public outreach phase, the planning and implementation of the peer review, and the analysis of ridership and income for financial and economic purposes. Dr. Metcalf and Mr. Quandel will collaborate closely to look over the implementation of the interactive analysis that will be used to define alternatives and evaluate the most viable possibilities. The Feasibility Business Plan Report will be written primarily by Metcalf, Quandel, and Kraft.

2.) Deputy Project Manager:

Dr. Metcalf will be assisted in the management and organization of the study by Mr. Quandel, who will serve in the role of Deputy Project Manager. The Public Outreach process will be developed by Mr. Quandel and Dr. Metcalf in close collaboration with Mr. Mountain; the Peer Review process will be organized by the PMC. The final Feasibility Business Plan Report will be prepared by Ms. Celia Pew and Dr. Kraft. The Interactive Analysis, including the creation and selection of passenger rail options for the I-70, I-25, and secondary corridors, will be led by Mr. Quandel, who will also oversee the engineering analysis in close collaboration with Metcalf and Kraft.

3.) Quality Control:

Ms. Pew is the go-to person for QC tasks including writing reports and technical papers. She'll be in charge of making sure the research reports and other deliverables are flawless.

4.) Operations Planner:

Passenger train technology, train speeds, train timetables, capacity difficulties, and projections of operation and maintenance expenses will all be evaluated under Dr. Kraft's direction as he leads TEMS's evaluation. His team will be in charge of assessing railroad costs, and conducting an examination of railroad consequences. Mr. Quandel will be in charge of developing an implementation plan, and Drs. Kraft and Metcalf will work closely together to manage the financial and economic analysis process. As the Feasibility Business Plan Report nears completion, Dr. Kraft will be there to lend a hand.

5.) Public Outreach:

Public engagement will be headed up by Mr. Mountain. He'll oversee the PR department and coordinate with the business and government communities. Mr. Mountain will work specifically to improve communication between towns along I-70, I-25, and other routes. A workshop with the I-70 Coalition, another with the Denver Metropolitan Area, and a third with the I-25 communities will be organized by him as part of the scoping process. By the creation of three communications updates and the delivery of five community presentations across the region, he will organize the input of the general public. Included in this task are media relations, project updates, and a database of relevant stakeholders. With regards to public engagement, he will direct community workshops around the I-70, in the Denver Metro Area, and along the I-25 corridor. He will help Mr. Quandel and Dr. Metcalf with the Feasibility Business Plan Report, interim technical memorandums, and presentations.

6.) Senior Demand Analyst:

The task of creating the demand model for the rail passenger route falls on Dr. Santoboni's shoulders. To estimate rail ridership, vehicle traffic, and intercity bus traffic, Dr. Santoboni will fine tune the COMPASS Demand Model. Revenue projections and market research will be his responsibility. He'll compile information on the market, such as routes taken, places visited, and consumer preferences, for the area under investigation.

7.) Rail Technology Expert:

Dr. Scales's analysis will help inform potential improvements to the I-270, I-25, and subsidiary corridors in terms of technological capability. With Dr.Kraft's guidance, he will explore technological possibilities for Interactive Analysis.

8.) Economist:

Dr. Bzhilyanskaya will create the demand model's socioeconomic database. Income, population, employment, and GDP growth forecasts will all be included. Dr. Bzhilyanskaya is responsible for creating growth scenarios for the middle, top, and bottom of the economy, as well as providing consistent disaggregated economic estimates. Using US DOT FRA standards and criteria, she will also complete the financial and economic analysis, which includes determining financial rates of return and economic benefits. In collaboration with Dr. Metcalf and Mr. Mountain, she will do the economic analysis of the neighborhood and provide a technical report and presentation.

9.) Planning Analyst:

Mr. Marros, in his role as planning analyst, will oversee all special analyses, task management, and GIS system design, as well as conducting significant demographic research and creating maps for use in technical reports.

10.) Managing Engineer:

Dr. Bohlke's expertise in tunnel engineering will be utilized in the design of new alignments. She will offer guidance on the structural design and possible positioning alternatives. In this role, she will assist Mr. Quandel in establishing Capital Costs for various tunnel alternatives.

11.) Public Outreach:

Mr. Coffin has the position of Senior Consultant for the Public Outreach initiative. As Mr. Mountain's assistant, he will help run seminars, create promotional materials, and create progress reports.

12.) Noise and Vibration Analysis Team:

Mr. Hanson is in charge of the group responsible for vibration and noise analysis. To this end, he will collaborate closely with Mr. Quandel and offer his expertise in the evaluation of alignments and environmental assessment.

13.) Technology Evaluation Assessment:

In his role as a consultant and engineer, Mr. Kelterborn will help the Technology Evaluation Assessment with creative ideas.

14.) Transportation Analyst:

Dr. Yang will oversee creating projection models for both passengers and cargo. This will involve polling, a new model for creating databases, calibrating, and making traffic and revenue predictions.

15.) Senior Engineer:

Mr. Moore, in his role as Senior Engineer, will assist Mr. Quandel in coming up with different potential routes, evaluating the available possibilities, and carrying out the Interactive Analysis. Furthermore, he will aid in the calculation of projected operating and capital expenditures.

WBS design and OBS design

A work breakdown structure (WBS) is a project management tool that identifies project deliverables based on hierarchy and consequently broken down into a granular level to identify smaller work elements. Deliverables are broken down into sub-deliverables to provide a better understanding of the project plan and outline key dependencies. The hierarchical breakdown of a WBS is as follows:

- Level 1: Project
- Level 2: Major project deliverables
- Level 3: Sub Deliverables or supporting deliverables
- Level 4: Lowest sub deliverable
- Level 5: Cost account, which is grouping of work packages for monitoring process and responsibility

The hierarchical breakdown assists in the evaluation of technical performance, time, and cost at all levels of the working structure. The WBS enables management to understand the details involved at both a high level and granular level.

To plan, schedule, and budget the RMRA High Speed Rail Feasibility Study, time and cost estimate are factored into the WBS. Inclusion of these two elements serves as a framework for tracking cost and performance over the lifetime of the project.

As the WBS is defined at each hierarchical level, subject matter experts are assigned responsibility for executing the work packages. Defining an organizational structure and persons involved in the work packages is key to integrating the organizational unit and work deliverables. An organization breakdown structure defines how a firm has decided to disseminate work responsibility at every level of the WBS. The purpose of the OBS is to provide a basis for summarizing organization unit work performance, identifying organization units responsible for work packages, and connecting the organizational unit to cost control accounts.

Figure 1 is the WBS for the RMRA High Speed Rail Feasibility Study. The WBS in combination with the project schedule (refer to the Gantt Charts below) will allow the project manager to track the progress of each project activity. Per the WBS, the major tasks for this feasibility study are the following:

- **Task 1: project management** to plan coordination
- **Task 2: peer review panel** to address ridership/revenue, alternatives in development and evaluation of those alternatives, and development costs and financing
- **Task 3: scoping & outreach** to provide coordination of public input and technical and policy outreach
- **Task 4: methodology, data collection, and existing conditions** to develop study databases and assess existing conditions
- **Task 5: preliminary service scenarios** to define the potential infrastructure technology and operations options
- **Task 6: alternative analysis** to carry out an interactive analysis of market, engineering, and operations to establish the ridership, revenue, capital and operating costs of alternatives and to further refine the alternatives under consideration
- **Task 7: feasibility determination** to provide a clear understanding of costs, finances and economic benefits of proposed options for the I-70, I-25 and secondary corridors
- **Task 8: task documentation** to document the results of the study.

Of these major tasks the below are identified as the major milestones:

- Task 2: Peer Review Panel
- Task 3: Scoping/Outreach
- Task 4: Methodology, Data Collection and Existing Conditions
- Task 5: Preliminary Service Scenarios
- Task 6: Alternative Analysis
- Task 7: Feasibility Determination
- Task 8: Task Determination

In addition, **Figure 2** is the OBS for the project plan, and in combination with the WBS defines the organizational unit sub deliverables in a hierarchical manner, i.e., provides a breakdown of the responsibilities for each organizational unit, which includes technical performance, time, and budget.

Figure 1 Work Breakdown Structure (OBS) for the RMRA High Speed Rail Feasibility Study

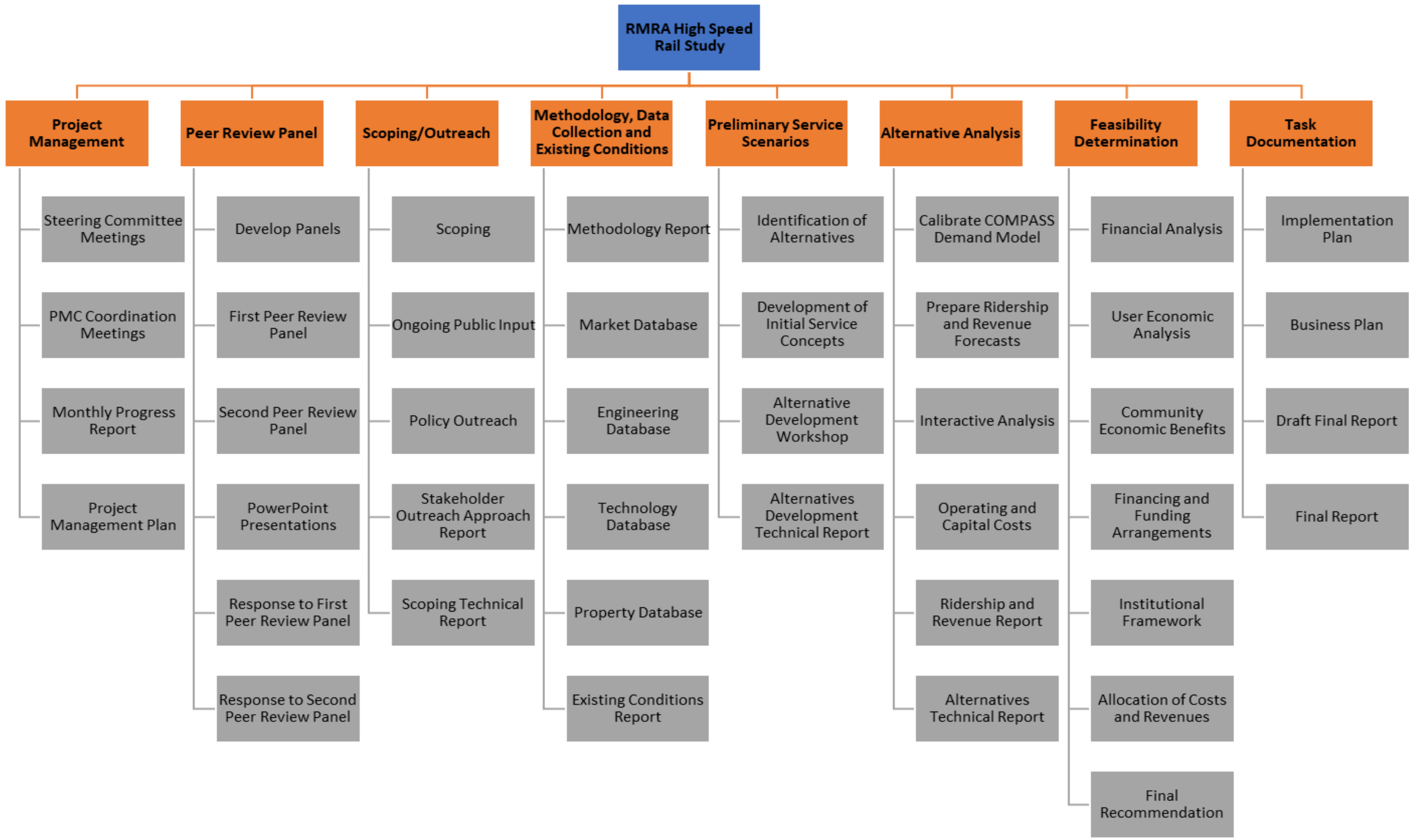
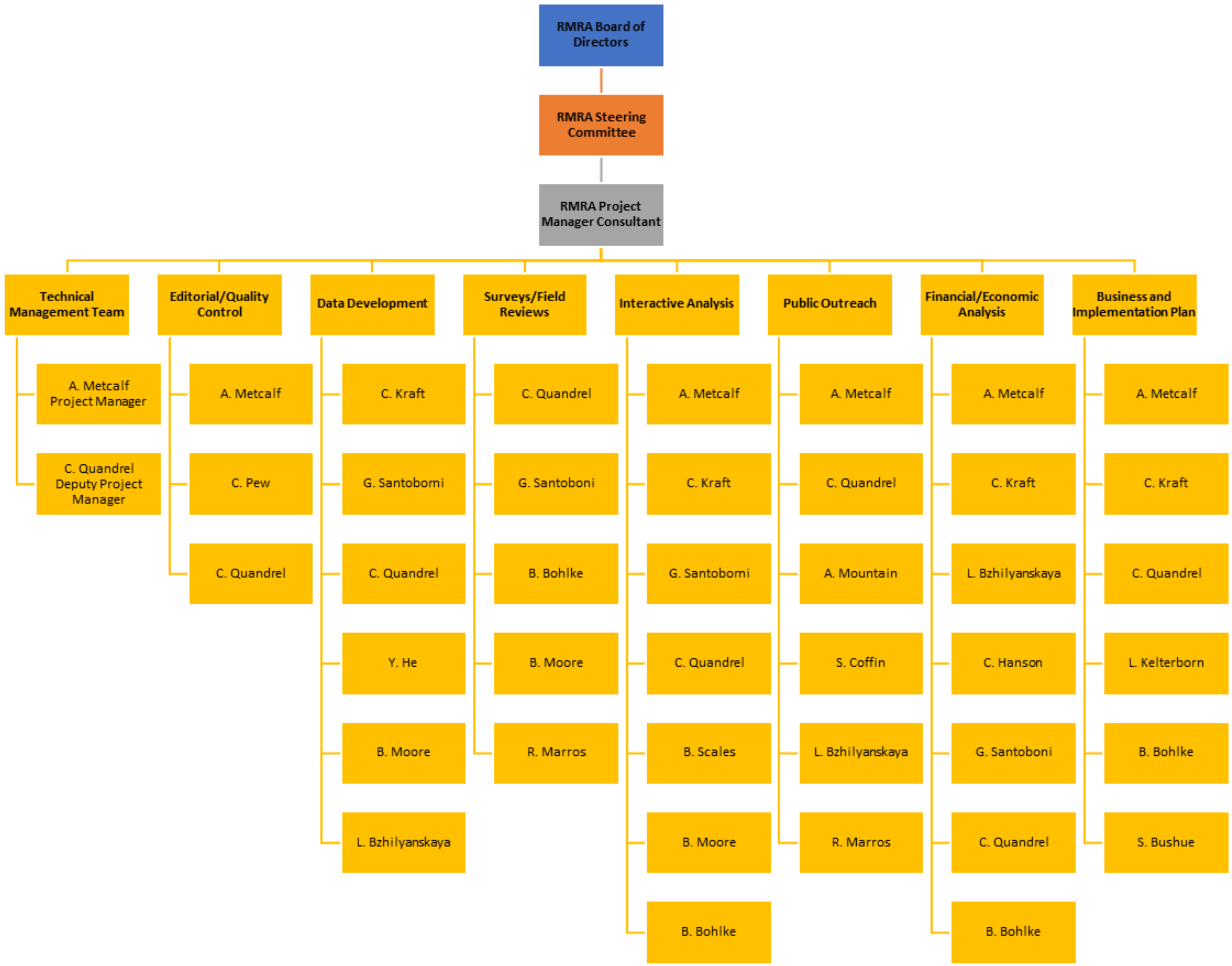


Figure 2 Organizational Breakdown Structure (OBS) for the RMRA High Speed Rail Feasibility Study



Costs/Budget

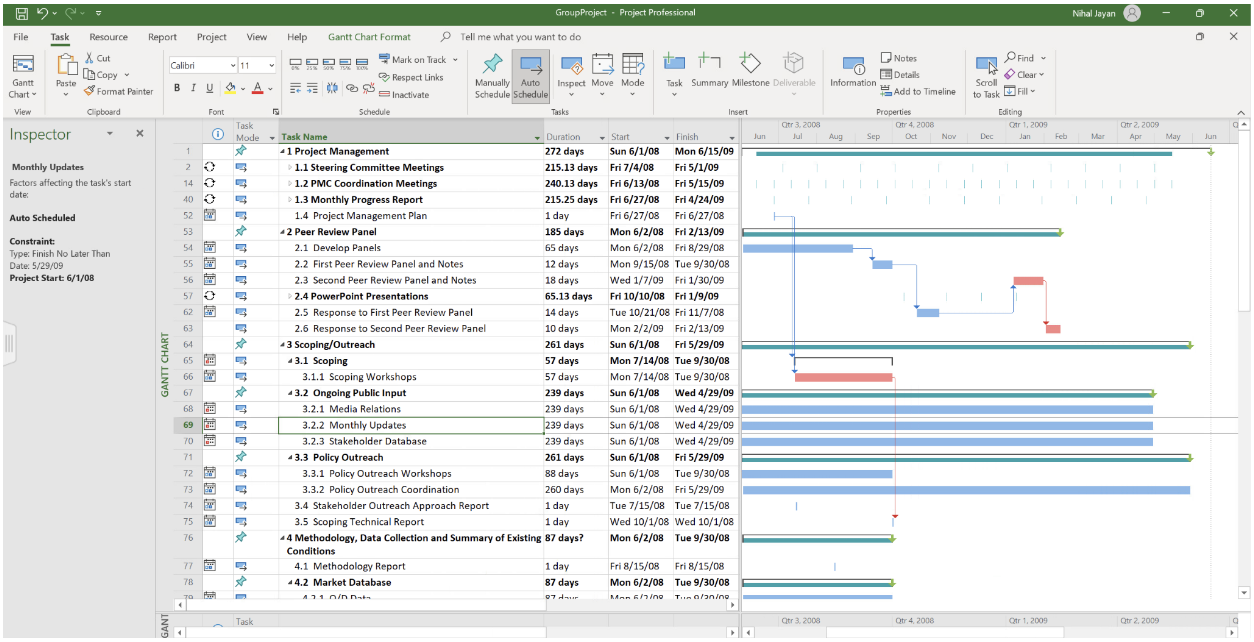
The project is estimated to cost $1.25 million, with the majority of budget allocated to Ridership and Revenue forecasts.

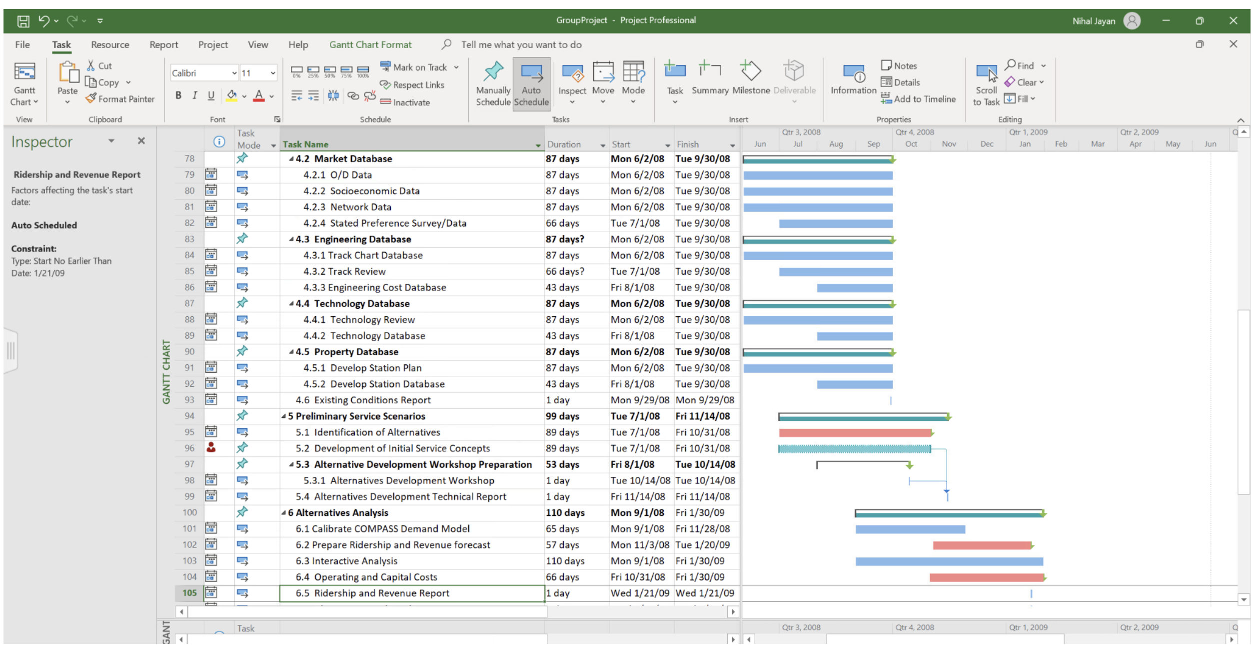
The project budgeting is divided into 8 Tasks. The total direct cost during the project is $1.10 million and total indirect cost is $0.15 million respectively. Below is the breakdown of direct costs and indirect costs:

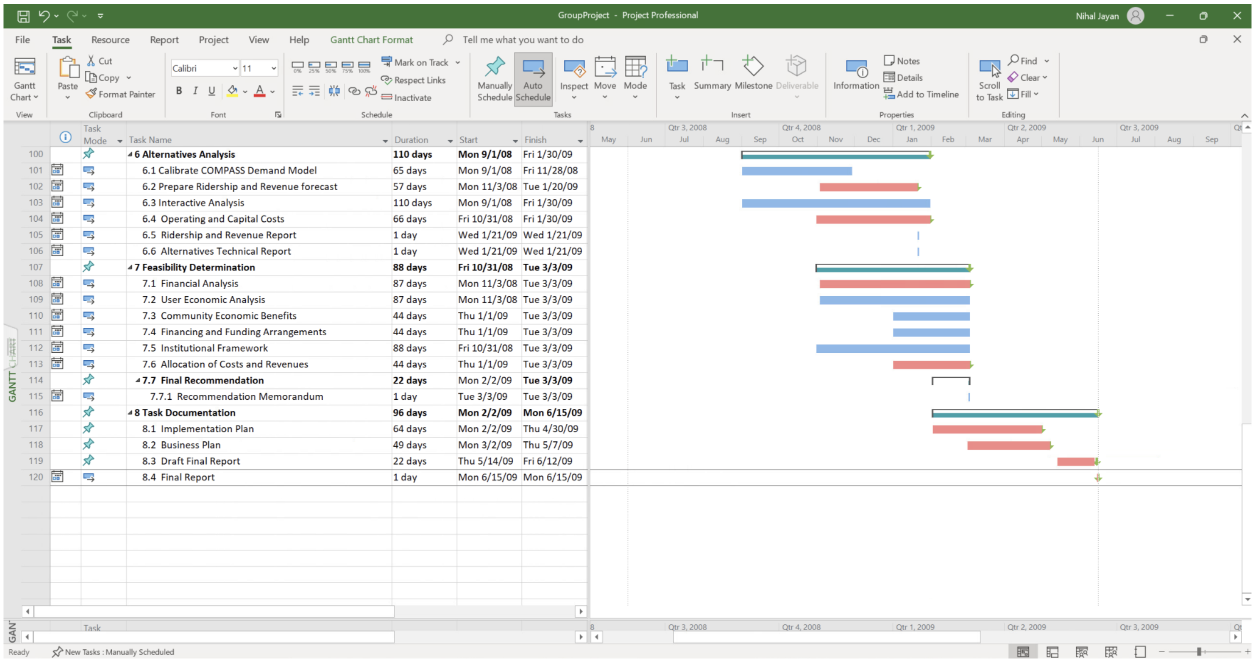
Direct Cost:	**Funds (In Million)**
Task 1: Project Management	$0.04
Task 2: Peer Review Panel Support	$0.08
Task 3: Scoping/Outreach	$0.19
Task 4: Methodology/Data Collection/Existing Conditions	$0.12
Task 5: Preliminary Service Scenarios	$0.06
Task 6: Alternative Analysis	$0.33

Task 7: Feasibility Determination	$0.13
Task 8: Documentation/Deliverables	$0.15
Total	$1.10
Indirect Cost:	
Other Expenses	$0.15
Total	$0.15
TOTAL COST	**$1.25**

Project Scheduling:



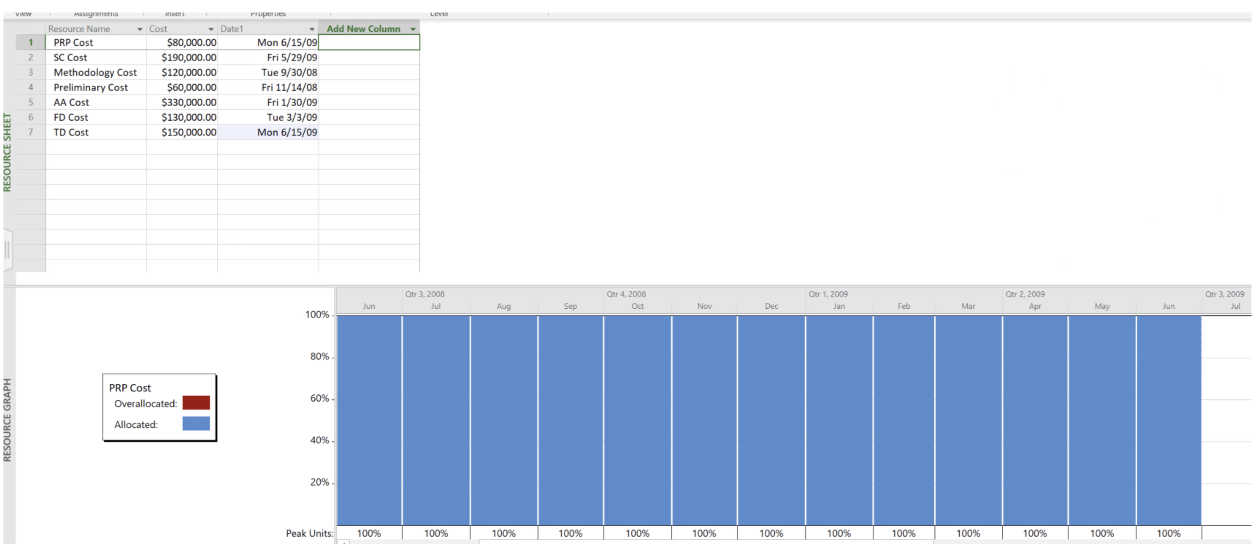




	Task Name	Duration	Start	Finish
100	6 Alternatives Analysis	110 days	Mon 9/1/08	Fri 1/30/09
101	6.1 Calibrate COMPASS Demand Model	65 days	Mon 9/1/08	Fri 11/28/08
102	6.2 Prepare Ridership and Revenue forecast	57 days	Mon 11/3/08	Tue 1/20/09
103	6.3 Interactive Analysis	110 days	Mon 9/1/08	Fri 1/30/09
104	6.4 Operating and Capital Costs	66 days	Fri 10/31/08	Fri 1/30/09
105	6.5 Ridership and Revenue Report	1 day	Wed 1/21/09	Wed 1/21/09
106	6.6 Alternatives Technical Report	1 day	Wed 1/21/09	Wed 1/21/09
107	7 Feasibility Determination	88 days	Fri 10/31/08	Tue 3/3/09
108	7.1 Financial Analysis	87 days	Mon 11/3/08	Tue 3/3/09
109	7.2 User Economic Analysis	87 days	Mon 11/3/08	Tue 3/3/09
110	7.3 Community Economic Benefits	44 days	Thu 1/1/09	Tue 3/3/09
111	7.4 Financing and Funding Arrangements	44 days	Thu 1/1/09	Tue 3/3/09
112	7.5 Institutional Framework	88 days	Fri 10/31/08	Tue 3/3/09
113	7.6 Allocation of Costs and Revenues	44 days	Thu 1/1/09	Tue 3/3/09
114	7.7 Final Recommendation	22 days	Mon 2/2/09	Tue 3/3/09
115	7.7.1 Recommendation Memorandum	1 day	Tue 3/3/09	Tue 3/3/09
116	8 Task Documentation	96 days	Mon 2/2/09	Mon 6/15/09
117	8.1 Implementation Plan	64 days	Mon 2/2/09	Thu 4/30/09
118	8.2 Business Plan	49 days	Mon 3/2/09	Thu 5/7/09
119	8.3 Draft Final Report	22 days	Thu 5/14/09	Fri 6/12/09
120	8.4 Final Report	1 day	Mon 6/15/09	Mon 6/15/09

From the scheduling report, we can definitely see that the project will end by June 15th, 2009.

Resource Allocation:



	Resource Name	Cost	Date1
1	PRP Cost	$80,000.00	Mon 6/15/09
2	SC Cost	$190,000.00	Fri 5/29/09
3	Methodology Cost	$120,000.00	Tue 9/30/08
4	Preliminary Cost	$60,000.00	Fri 11/14/08
5	AA Cost	$330,000.00	Fri 1/30/09
6	FD Cost	$130,000.00	Tue 3/3/09
7	TD Cost	$150,000.00	Mon 6/15/09

Project Execution:

The Project Execution phase of the RMRA High Speed Rail Feasibility Study involves the implementation of the project plan and the execution of project activities to meet the project objectives. During this phase, the project team will work to complete the various tasks and deliverables outlined in the project plan, while adhering to the project schedule and budget.

To ensure successful project execution, the project team will closely monitor project progress, track project costs, and manage project risks. Team will also effectively communicate with stakeholders, manage project resources, and ensure that quality standards are met.

Throughout the Project Execution phase, the project team will be flexible and responsive to changes in project scope, schedule, and resources. Team will regularly review and update the project plan, risk management plan, and other project documents to ensure that they remain relevant and effective.

Overall, the success of the Project Execution phase will depend on the project team's ability to work collaboratively, manage resources effectively, and maintain a strong focus on project objectives.

For RMRA, keys steps are:

1. Database Development: This involves collecting and analyzing data on existing rail lines, potential ridership, operating costs, capital costs, financial feasibility, and other relevant factors.
2. Formulation of Rail Service Scenario: This involves evaluating different high-speed rail technologies and determining the most suitable options for each corridor.
3. Interactive Analysis: This step requires close collaboration with stakeholders, including government agencies, local communities, and transportation providers.
4. Systems Forecasts and Outputs: This includes user and community benefits, as well as FRA criteria.
5. Assessment of Institutional and Financial Plan Options: This step involves evaluating different funding options, including public-private partnerships, federal and state grants, and other sources of financing.

6. Implementation and Business Plan: This step involves developing a detailed plan for implementing the high-speed rail service, including station locations, route planning, technology selection, and other critical factors.

Technical Challenges:

There are some possible technical challenges that could impact RMRA Project are,

1. **Design and Engineering Challenges:** Require careful consideration of track alignment, train speed, signaling, power supply, and train control. Any flaws in the design or engineering could lead to safety risks and costly delays.
2. **Technology and Equipment Challenges:** Require the use of advanced technology and specialized equipment, such as high-speed trains, track components, and signaling systems.
3. **Topography and Terrain:** Will traverse mountainous terrain, which will present unique challenges in terms of construction, operation, and maintenance. Need to design and build the infrastructure to withstand extreme weather conditions and geological events, such as landslides, rockfall, and avalanches.
4. **Construction Challenges:** Managing multiple construction sites, coordinating with various contractors and suppliers, and ensuring that construction meets quality and safety standards.
5. **Environmental and Sustainability Challenges:** Minimizing land use and energy consumption, reducing emissions, and minimizing the impact on local ecosystems.
6. **Safety and Security:** To prevent accidents, incidents, and acts of terrorism.
7. **Stakeholder Management Challenges:** Managing the expectations and concerns of various stakeholders, such as local communities, landowners, regulatory agencies, and other interested parties.

Scenarios/ Risks

For RMRA High Speed Rail Feasibility Study, there are two risk scenarios to be considered. The first scenario is a risk event of a **Wildfire**, and the second is a risk event of an **Infrastructure or System Integration failure.**

With each of these scenarios, the risk management process is utilized to further analyze and evaluate these risks. There are four steps in the **risk management** process: **Risk Identification, Risk Assessment, Risk Response Development, and Risk Response Control.**

Approaches to handling changes:-

"Building trains is a complex task that requires specialized knowledge and skills in engineering, design, manufacturing, and logistics. However, building trains during wildfires can present additional challenges and complications that make the process even more difficult."

-Risk Team

Scenario 1: Wildfires

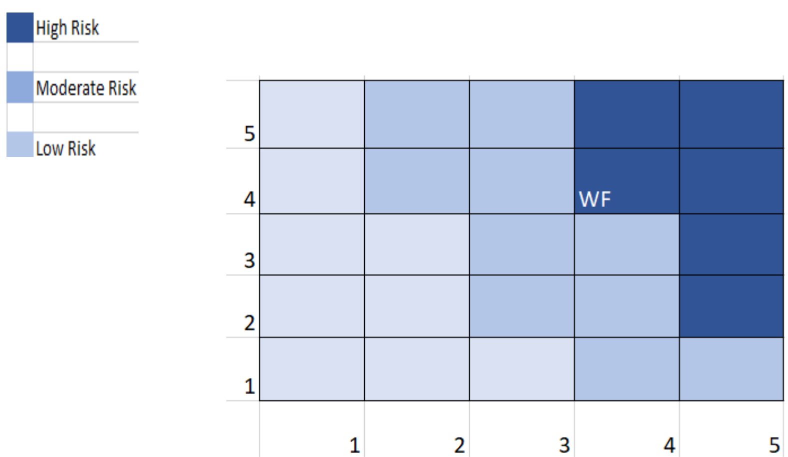
Wildfires are a significant risk scenario for the RMRA High Speed Rail project. The project area includes several regions with a high risk of wildfires due to dry and hot weather conditions. Wildfires can cause damage to the railway infrastructure, such as tracks, bridges, and tunnels, and lead to significant delays in the project timeline. Additionally, wildfires can pose a threat to the safety of workers and the local communities in the project area.

Risk Identification: This step involves identifying all potential risks associated with Wildfires, including the likelihood of a wildfire occurring in the project area, the severity of its impact on the project, and its potential to cause damage to the environment and nearby communities. This step is done through **Planning analysts (Mr. Marros)** and their Team, stakeholders opinions, expert knowledge, historical data, and analysis of previous wildfire incidents in the area. This can help stakeholders and teams stay informed.

Risk Assessment: In this step, the risks linked to the Wildfire scenario are evaluated by considering their likelihood and impact, and are then ranked based on their level of importance. The possibility and impact of the wildfire risk can be rated using a scale ranging from **1 to 5** or from **low to high**. By using an assessment form, the seriousness of the risk can be determined.

Risk Assessment Form and Severity Matrix

(1= Very Low, 2= Low, 3= Moderate, 4= High, 5= Very High)



	Likelihood	Impact	Detection	When	
Wildfires	4	4	4	During Project	

Risk Response Development: This step involves developing strategies to respond to the wildfire risk. The response strategies can be **mitigating, avoiding, transferring, or accepting the risk**. For example, the project team and **Operations Planner Dr. Kraft** and his Team can choose to mitigate the risk by creating firebreaks or installing fire-resistant materials, avoiding the risk by rescheduling work during periods of low fire danger, preemptively scheduling the project during moderate to cold weather conditions, transferring the risk by purchasing insurance, or accepting the risk by developing a contingency plan to manage any potential impacts.

In the case of wildfires, the best response would be mitigating the risk. This is because wildfires are a known risk in the area, and it is possible to take measures to reduce their likelihood and impact. While it may not be possible to completely eliminate the risk, taking these measures can significantly reduce the potential impact of a wildfire ,and in return we have made a contingency fund and plan to implement if the event does in fact occur in future.

Risk Response Control: The wildfire risk is observed and managed to ensure that the response strategies are efficient and the risks are well-handled. It involves periodic reviews and updates to the risk management plan as required. The project team should consistently observe the wildfire risk and modify their strategies to handle the risk effectively. The technical teams are responsible for implementing the risk response strategies, while the finance and legal teams are responsible for assessing the financial and legal implications of the risk response strategies, including workers compensation in situations like workers getting sick or even dying.

Overall, the risk management process for the Wildfire scenario in the RMRA Project is an ongoing process that should be continuously monitored and managed.

Scenario 2: System Integration Failure

System integration failure is a term used to describe a situation where the various subsystems and components of a high-speed rail system fail to work together effectively. This can occur when the different systems are not properly integrated or are incompatible with each other. For example, the signaling system may not be able to communicate with the power system or the communication system, which could cause delays or even accidents.

There are various reasons why system integration failure can occur. One reason is design flaws in the system itself. For example, if the subsystems were not designed to work together or if there were errors in the design process, this could lead to integration failures. Poor testing is another factor that can contribute to integration failure. If the systems are not properly tested to ensure that they work together as intended, problems may arise in actual operation.

Inadequate training is another factor that can contribute to system integration failure. If the staff responsible for operating and maintaining the high-speed rail system are not properly trained, they may not be able to identify or address integration issues when they arise. This can lead to further problems and exacerbate the situation.

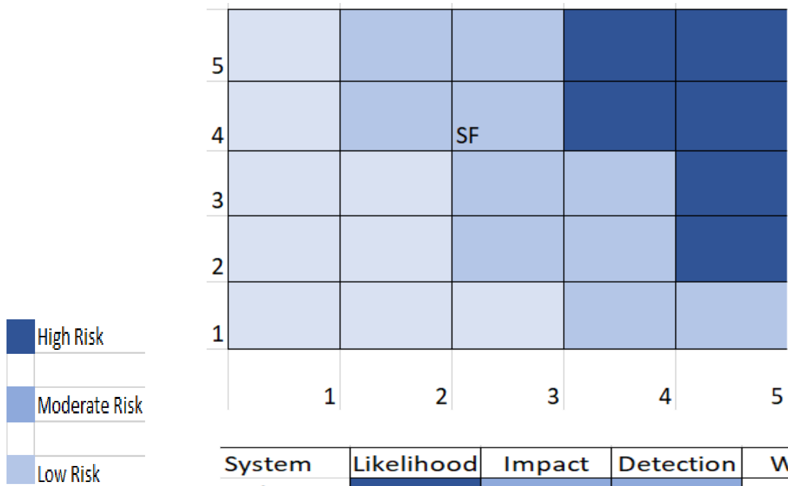
Overall, system integration failure is a serious issue that can have significant consequences for high-speed rail systems. It is important for the subsystems to be properly designed, tested, and integrated to ensure that they work together effectively and safely. Additionally, ongoing training and maintenance are essential to address any integration issues that may arise over time.

Risk Identification: The project team identifies the potential risks associated with system integration failure in the RMRA project. This can be done by conducting a thorough analysis of the project plan and identifying any potential points of failure in the infrastructure or system integration. This would involve a multidisciplinary team that includes technical experts in engineering, construction and information technology.

Risk Assessment: During the "Risk Assessment" stage of the risk management process, scenario analysis was employed to assess the probability and impact of a system failure risk event. According to Larson and Gray's (2018) textbook, risks must be evaluated based on their likelihood of occurring and the potential consequences of their occurrence. In the case of the RMRA project, the probability of a system failure event was determined to be high, while the impact would be moderate.

Risk Assessment Form and Severity Matrix

(1= Very Low, 2= Low, 3= Moderate, 4= High, 5= Very High)



System	Likelihood	Impact	Detection	When	
Failure	4	3	4	During Testing	

Risk Response Development: In the third step of the risk management process, which is the Risk Response Development, a system failure in the project is not considered a major issue. If such an event occurs, it will lead to a waste of time, and only troubleshooting can solve the problem. Therefore, the chosen risk response strategy for a system failure is risk mitigation. The project team can work on reducing the likelihood and impact of a system failure by taking appropriate measures.

Risk Response Control:

In the last step of the risk management process, which is "Risk Response Control," reducing the risk of a system failure can be extremely advantageous for this project. To lower the chances and effects of a system failure happening within this project, the system engineers will carry out a trial run of a smaller network of this system before rolling it out. Moreover, during the testing stages, extra resources like quality assurance specialists will be employed to guarantee the correct operation of the communication network.This involves regular risk reviews and updates to the risk management plan as necessary. The team will continuously monitor the infrastructure and system integration to adjust their strategies as necessary to manage the risk effectively. The risk response control also involves ensuring that the implemented strategies are sustainable and do not introduce new risks.

Resources and cost impact due to changes, internally or externally

The intent of the RMRA is to complete the Rail Feasibility Study in 18 months following signing of the CDOT Contract. During a project tenure, many factors are involved which impact the cost due to internal and external factors.

The FRA public/private partnership criteria are:

1. Positive (>1.0) operating ratio - Unlike public highways and local transit systems, the project does not require any government subsidies to cover its cost of operation
2. Positive (>1.0) cost-benefit ratio - For every dollar of capital and operating costs, the project creates economic benefits greater than one dollar

Colorado's strong tourism base created greater fare sensitivity among travelers. The study found that a high-speed rail system in Colorado would support fares closer to $0.25-$0.35 per mile. This had a direct impact on the ability of the options to achieve a positive cost-benefit ratio.

When submitting invoices, a warning of the estimated expense level for the upcoming month is given, rounded to the nearest $20,000. This is done to provide an indication of expected cost levels.

Construction Cost Index (CCI) in major cities like Denver have typically been 20-30 percent lower than national construction costs, and 25-40 percent lower than the average of costs in the Midwest. Heavy Construction Index (PCUBHVY) is also the key factor which was used for our analysis of cost of construction. Considering the regional CCI difference and the relative uniformity of railroad material prices, an adjustment factor of 0.85 is reasonable. The unit cost adjustment value considering regional cost differences and inflation from June 2002 to December 2008 is computed as follows:

- Colorado Unit Cost (2008) = MWRRI Unit Cost (2002) x 0.85 x 1.825

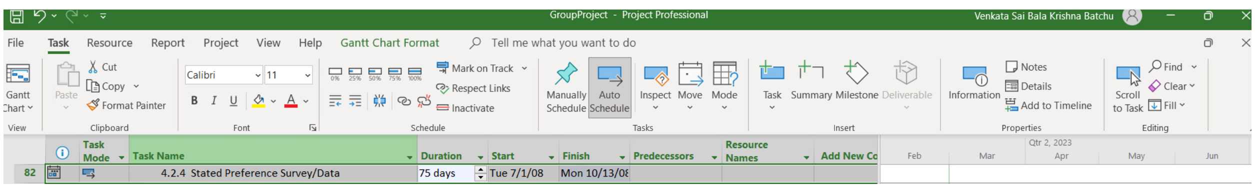
Changes, for example, including examination of the feasibility of rail service in the I-25 corridor, must take into account any likelihood for the relocation of rail freight service to a new corridor east of Denver. The final evaluation must clearly identify the risks (e.g. availability of freight railroad trackage and right-of-way) and propose strategies for reducing the impact of those risks.

This change can impact the project planning activity and budget and cost allocation changes and scope requirements schedule.

Impact Due to Internal Factors:

Internal constraints may arise due to diverse task challenges such as inadequate information and unexpected technical problems (e.g. tunnels). These obstacles can delay progress in the design and development stages, leading to repercussions for other tasks, resources, and project costs. Anticipating internal change factors can create proactive management and the possibility of prevention.

This includes levels of passenger ridership, location of stops, train speeds and schedules, potential alignments, implementation plans, and the financial and economic benefits of building major milestones, which provide an overview and status to the RMRA Steering Committee. The project team, and the public.



It is assumed that due to some changes internally the survey data collection activity would need an additional 9 working days and this would cause the activity to delay to October 13, 2008. This delay can impact the successor activity and in turn delay the project and have an affect on the budget cost and alternative analysis. The financial analysis team would need to spend additional time to complete the project or introduce the crash activity by adding resources with some additional budget.

It has been assumed that highway traffic and adjacent high speed vehicles will be separated by concrete barriers. These planning assumptions may be subject to modification as a result of federal or state rule making.

Impact due to external factors

External changes can result from stakeholders, resource changes, or constraints due to physical limitations (e.g. right-of way). Risk factors like wildfire or unexpected failure in machinery which was explained in the previous section can cause an impact on the project tenure and budget costs. This is important because plans for the construction need to be during optimum weather conditions which also have a huge impact on the schedule. Sudden increase in demand during sports events or activities. Workers strike should be avoided by foreseeing or estimating beforehand.

While high-speed rail corridors with strong intercity business travel (e.g. the Acela in the Northeast Corridor) are capable of supporting fares in the range of $0.40-$0.50 per mile, Colorado's strong tourism base created greater fare sensitivity among travelers. The study found that a high-speed rail system in Colorado would support fares closer to $0.25-$0.35 per mile. This had a direct impact on the ability of the options to achieve a positive cost-benefit ratio.

Contingency costs

Contingency costs were added as an overall percentage of the total construction cost. Contingencies are an allowance added to the estimate of costs to account for items and conditions that cannot be realistically anticipated.   The contingency is expected to be needed as the project develops, 30 percent of the construction cost elements (split between design contingency and for construction contingency based on requirement).

Managing the Change Control: Changes are likely to occur in the design or construction phase of a project, and these are often manageable through routine management procedures without requiring a formal change control process. However, changes that must comply with the change control process are as followed:

- Changes that impact the project baseline (such as cost or schedule)
- Changes that have an effect on the work specified in a contract

Change control procedures implement necessary changes while achieving the overall objectives of the project. The change control procedures introduce needed modifications that aline with the overall project objectives. These procedures form a system that work alongside the overall project objectives for managing cost, schedules, and quality. The change control process is made up of the following components:

- Timely identification of any potential changes
- Prompt evaluation of the change's impact and justification

Change Orders

Proposed changes to objectives during the project will be presented to the construction management consultant, ODOT resident engineer, and ODOT construction contract coordinator for review. Depending on the scope and suggestion of the change order, DEF, PDM, and PMC may also review the changes needed to be made.

Decision Rules for change:

Managing change is essential for success as change can have either a positive or negative impact. The process of managing change involves several steps that must be followed to be implemented effectively.

1. Identify the source and nature of the change. Determine the type of change, such as scope creep, and assess the impact of the change in terms of its size and scale
2. The change issue must be communicated to management, documented with PMC, and presented to the Study Steering Committee. In this step, present change options to PMC and gain their direction on how to manage the change.
3. Once the direction is given, the work plan must be adjusted accordingly. Resource estimates are also given to make sure the implementation of the change plan is successful.
4. The change plan must be implemented by making any necessary revisions to the work plan, resources, and timescales. The team's adjustment to the change must be evaluated to show the effectiveness of the changes.

By following these steps, the impact of change can be effectively managed, leading to positive outcomes for the organization.

Alternatives Development:

- Alternatives Development Workshop: The TEMS Team schedules workshops for alternative development with the RMRA board for each primary objective. TEMS Team prepare for the Steering Committee and PMC to review the Alternatives Development report which includes the Alternatives Development workshop.

- Alternatives Analysis: Interactive Analysis is designed to develop the most efficient and effective alternatives for passenger rail service in the Rocky Mountain Corridors.

Expected results

When assessing these possible risk scenarios, we are determining the likelihood and risk impact into our decision making.

The expected results of the possibility of a wildfire can cause significant negative impacts to on-site workers resulting in physical injury, smoke inhalation, and possibly death depending on the wildfire conditions. The wildfire poses risks to neighboring individuals, as well as wildlife in the surrounding areas similar to the risks of the workers. Furthermore, from a company standpoint the wildfire will cause project delay and possible cancellation, disruption to the projects budget, negative publicity as the wildfire started when RMRA was in progress of project completion in the same area.

The expected results from infrastructure or system integration failure is a highly catastrophic event which can yield a fruitless project. The entire basis of the project is to integrate the line seamlessly in order to upgrade the current line infrastructure. This can result in a canceled project requiring a wake, and inadequate return on investment.

Conclusion

The introduction of new rail systems, which provide substantially reduced travel times, higher comfort levels, and frequently lower fares has radically changed travel patterns and brought communities closer together. In general, intercity travel is increasing, marked by a substantial increase in travel demand and distances traveled.

While the costs of implementing a high-speed rail system is large, as would be expected given the mountainous conditions in completing the project and other suggested corridors, analysis indicates that investing in high-speed rail would generate an impressive $33 billion of benefits to Colorado. These benefits are generated by the rapid growth of the state and its need to accommodate a doubling of its population over the next 30-40 years.

This project would provide a more efficient and cost-effective means of connecting Colorado's commercial centers with one another as well as the national and international destinations served by the state's airports. High-speed rail is by no means the silver bullet that solves all of Colorado's transportation challenges. But, as this study clearly shows, it is a critical part of that solution and will be invaluable to the growth of the state's economy.

In conclusion, with observing the work schedule and the budget allocation we have determined that this project should move forward with high confidence. There are underlying risks which can create an unfavorable outcome to the project as well as creating the possibility of project cancellation, such as system integration failure which is the most catastrophic outcome but we have determined with high confidence that this will be a low probability risk which will be factored into project scope to ensure integration is a high priority.

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