PROPOSAL
SUBMITTED TO
ROCKY MOUNTAIN RAIL AUTHORITY
MARCH 21, 2008

CONSULTANT SERVICES FOR
HIGH SPEED RAIL FEASIBILITY STUDY

SUBMITTED BY
TEMS
Transportation Economics & Management Systems, Inc.
in association with
Quandel Consultants, LLC
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March 21, 2008

Rocky Mountain Rail Authority
Mark Boggs, P.E.
PBS&J
4601 DTC Blvd, Suite 700
Denver, CO 80218

RE: Proposal for Rocky Mountain Rail Authority High Speed Rail Feasibility Study

Dear Mr. Mark Boggs:

Transportation Economics & Management Systems, Inc. (TEMs), in association with Quandel Consultants, LLC (QC), GBMS, HMMS and Interfleet are pleased to submit our proposal to undertake the Rocky Mountain Rail Authority High Speed Rail Feasibility Study. Per the addendum, please find enclosed 12 copies of the proposal, and one copy of the price proposal.

We believe the TEMs Study Team is uniquely qualified to assist in developing a Feasibility Study for the Rocky Mountain Rail Authority. We provide the proven ability to execute this type of assignment. Our team has the leadership, professional expertise, and hands-on experience in all aspects of high speed passenger rail strategic analysis, business and financial planning and implementation planning required for the successful completion of the Feasibility Study. TEMs has developed passenger rail demand forecasts, operating plans, engineering analysis, financial analysis, implementation programs, and business plans throughout North America including such major studies as the Midwest Regional Rail Initiative (MWRRI), Ohio Hub Study, Florida Statewide Passenger Rail Study, Northeast Corridor High Speed Rail Study.

TEMs is joined by Quandel Consultants, LLC, with offices in Chicago, which will provide rail engineering, environmental and planning services. TEMs and QC have worked extensively together on rail management and business plan studies over the last twenty years. QC has a good understanding of the rail right-of-way, key issues on the character and nature of the service to be provided, station locations, and station needs. In addition, TEMs is also joined by GBMS for public outreach, HMMS for noise evaluation, and Interfleet for technology assessment.

Members of the TEMs Team have been extremely active in performing similar business plans in the Northeast, the Midwest and Central Canada. We are currently performing or have recently completed the following relevant studies:

- Duluth-Twin Cities Feasibility and Business Plan Corridor Study
- Midwest Regional Rail Initiative for nine Midwest States, including Michigan, Illinois, Michigan, Minnesota, Indiana, Ohio, Missouri, Nebraska, and Iowa.
- Ohio Hub Regional Rail Initiative for the Ohio Department of Transportation including New York, Pennsylvania, Michigan, and Indiana
- Portland-Boston Rail Restoration Study for the Maine Department of Transportation
- VIA Rail Montreal-Toronto Passenger Rail Study
- Florida Statewide Passenger Rail Business Plan
- Rochester-Twin Cities Rail Corridor Business Plan
Members of the TEMS Team have also worked on a range of business plans and major investment studies and environmental impact for high-speed rail, which have involved joint private-public sector participation. Examples of these studies include:

- Florida High Speed Rail Authority Feasibility and Investment Grade Studies
- Alberta Investment Grade High Speed Rail Study
- Tri-State High Speed Rail Study - Phases 1 and 2
- New York Equipment Remanufacture Studies
- FRA Equipment Life Cycle Cost Studies
- Beeline Maglev Study
- Baltimore-Washington Maglev Study

Dr. Alexander Metcalf, a highly experienced professional with an outstanding rail planning background, leads the TEMS Team. Prior to moving to North America in 1985, Dr. Metcalf was Chief Economist at British Rail and led planning activities for British Rail on major investment studies for the 1975 HST program, Mainline Electrification and Channel Tunnel. Dr. Metcalf has directed TEMS' strategic, regional and multi-modal passenger rail planning studies, and has led more than thirty rail planning studies throughout North America. In addition, Dr. Metcalf has managed the development of a number of innovative techniques to increase the quality of products produced in strategic and feasibility studies. Specifically, he developed the RightTrack™ system that has been widely used to plan regional rail systems and the COMPASS™ Demand Forecasting Model.

Mr. Quandel, who will serve as deputy project manager has worked extensively with Dr. Metcalf providing engineering, environmental and public outreach input to a large number of high speed rail projects. These include the Midwest Regional Rail Initiative, Ohio Hub Study, Florida High Speed Rail Authority Report to the Governor, Madison-Milwaukee Environmental Impact Study, Northern Indiana Route Study, and the South of the Lake Alternatives Analysis Study. In addition, Mr. Quandel has led studies for Maglev in California, High Speed Rail in Florida, and Incremental Rail in the Midwest. Mr. Quandel is highly experienced in working with the TEMS RightTrack™ Business Planning System, and in particular the TRACKMAN™ model that identifies the condition of existing rail corridors, new corridors, and guideway alignments. The program contains unit cost systems that once calibrated to local costs, provides a quick and effective way of estimating infrastructure costs for projects.

We believe the TEMS Team brings to the business planning process a sound and effective approach, backed by proven management and technical expertise. Due to our involvement in the Business Plans for the Midwest Regional Rail Initiative Studies, Ohio Hub, Florida Statewide, Tristate Corridor, Madison-Milwaukee, New York Statewide Passenger Rail, Baltimore-Washington Maglev, Florida Beeline Maglev, and New Orleans Maglev studies.

We thank you for this opportunity to present our proposal and look forward to making a personal presentation of our capabilities. Should you have any questions or desire any future information, please do not hesitate to contact me.

Respectfully submitted,
Transportation Economics & Management Systems, Inc.

[Signature]
Alexander Metcalf, Ph.D.
President
SECTION B: PROPOSER QUALIFICATIONS

B.1 DESCRIPTION OF THE STUDY TEAM (FIRMS)

The TEMS Study Team is made up of five companies and some specialist rail consultants.

- **TEMS** has been in existence since 1989, and is widely accepted as one of the foremost rail planning firms in North America. Its twenty staff are made up of economists, statisticians, planners, and system analysts, all of whom have specialized in passenger rail planning. Led by Dr. Alexander E. Metcalf, TEMS staff are experts in rail ridership and revenue forecasting, operations planning, financial and economic analysis, and passenger rail feasibility and business plans.

- **Quandel Consulting, LLC** is a 400 man engineering firm located in Chicago. Charles Quandel who leads its rail engineering practice, has worked closely with TEMS on passenger rail feasibility and business planning studies since 1990. Together Dr. Metcalf and Mr. Quandel provide a highly experienced project management team that has completed over 20 passenger projects providing expertise in rail engineering, environmental analysis, implementation planning, and public outreach.

Joint projects completed by TEMS/Quandel project management team include:

- Ohio Hub Business Plan
- Midwest Regional Rail Initiative
- Florida High Speed Rail Authority Study
- Tristate High Speed Rail Study
- Rockford Airport High Speed Rail Study
- Rochester-Twin Cities Corridor Study
- South of the Lake Passenger Rail Reroute Study
- Toledo-Cleveland Capacity Study
- Iowa Passenger Rail Alternatives Study

For the Rocky Mountain High Speed Rail Feasibility Study, the TEMS/Quandel firms will be joined by the following specialists.

- **GBSM** is one of Colorado’s leading public outreach companies that specializes in transportation projects. Established in 1985, the firm is made up of highly experienced professionals who built successful track records as senior executives in business, news media, government and non-profit organizations long before becoming consultants. The firm understands the complex nexus of business, government, media and community in Colorado and particularly in the I-70 and I-25 corridors.

- **Harris Miller Miller & Hanson Inc. (HMMH)** is a firm specializing in noise and vibration evaluation analysis. HMMH will support the TEMS Study Team for the Rocky Mountain Rail Authority High-speed Rail Feasibility Study in the area of noise and vibration assessment. Their approach will be based on the methodology developed by HMMH for the Federal Railroad Administration’s guidance manual, “High-Speed Ground Transportation Noise and Vibration Impact Assessment” (U.S. Department of Transportation, Federal Railroad Administration, Office of Railroad Development, October 2005).

- **Interfleet Technologies, Inc.** is a specialist firm providing technology assessment to the rail industry. With over 550 professionals, Interfleet provides a comprehensive understanding of rail technology through research, design, and development. Has worked on major high speed projects throughout the world, including the U.S., U.K., Australia, Canada, New Zealand, and Malaysia. Their role on the project will be to help identify new technology options that can be used to meet the challenges of the I-70 corridor.
B.2 KEY PERSONNEL ON THE TEMS STUDY TEAM

TEMS has created a very strong management team for the project. This includes Dr. Metcalf, Project Manager for ridership, revenue, financial and economic analysis and business planning. Mr. Quandel for engineering, environmental and public outreach, and Dr. Kraft for operations planning, implementation, and freight railroad relations.

The following is a brief description of the role and expertise of the key personnel selected for the TEMS Team. Key Resumes are given subsequently in the proposal.

Alexander Metcalf, Ph.D., President of TEMS, will be the Project Manager. Dr. Metcalf is a leading transport economist who is known for his work in rail planning and the development of innovative ways of planning and operating rail systems. His projects include the Lansing-Detroit Commuter Rail Study, Michigan Triangle Study, Duluth-Twin Cities Passenger Rail Business Plan, Portland-Boston Rail Restoration Study, Midwest Regional Rail Initiative, Ohio Hub Regional Passenger Rail Business Plan, Rochester-Twin Cities Multimodal Corridor Study, Florida Incremental Rail Business Plan Study, New York Statewide Passenger Rail Study, Midwest Regional Rail Economic Impact Study, Ohio Regional Rail Economic Impact Study, and the Michigan Reroute Study. Dr. Metcalf’s passenger rail planning qualifications and experience make him an outstanding candidate for Project Manager of an intercity passenger rail business planning study.

Charlie Quandel, President of Quandel Consultants, LLC, Chicago, Illinois, will act as Deputy Project Manager. Mr. Quandel holds an MSCE from Lehigh University (1972) and a BS from the U.S. Naval Academy (1969) and is a registered professional engineer in twelve states. He has more than 30 years of experience as a professional engineer with the last 15 years mostly dedicated to the development of intercity ground transportation systems in the United States. He has served as the project manager or project engineer on more than thirty intercity ground transportation projects including the Ohio Hub, South of the Lake, Madison-Milwaukee, Florida High Speed Rail Authority Feasibility Study, and the Midwest Regional Rail Initiative. He has also served as a consultant to AMTRAK and Lockheed Martin on special rail projects and has participated in development workshops for the several commuter rail and intercity projects in the Midwest region. He has served as Chairperson of the High Speed Ground Transportation Association.

Edwin “Chip” Kraft, Ph.D., Managing Operations Planner will lead TEMS evaluation of passenger train technology, train speeds, train schedules, capacity issues and develop estimates of operation and maintenance costs. He will lead the analysis of railroad impacts and railroad cost assessment Dr. Kraft formerly worked for CSX and UP in their operations planning departments. Dr. Kraft will work closely with Dr. Metcalf to manage the financial and economic analysis process and Mr. Quandel to develop the implementation planning process. Recent projects include the Midwest Regional Rail Initiative, Ohio Hub Regional Rail Business Plan, Florida Statewide Passenger Rail Business Plan, Indianapolis-Louisville Business Plan, St. Louis-Kansas City Rail Capacity Study, and the Butler County Rail Yard Study.

Giovanni Santoboni, Ph.D., TEMS’ Senior Demand Analyst will be responsible for developing the rail passenger corridor model. Dr. Santoboni will calibrate the COMPASS™ Demand Model to estimate rail ridership compared to auto, air, and intercity bus traffic, estimate revenues, and determine competitive fare levels. He will develop the market database including transportation network, origin-destination and stated preference data for the study area. Recent projects include the Ohio Hub Regional Rail Business Plan, Alberta Investment Grade Rail Ridership and Revenue Study, Florida Statewide Regional Rail Business Plan, and Indiana-Louisville Corridor Study.

Brian Scales, Ph.D., TEMS’ Rail Technology Expert has more than 45 years experience in rail technology assessment and evaluation. He has been heavily involved in the design, testing, research and development of passenger and freight rail technology, and related guided ground transportation systems. He has several U.S. Patents for rail technology, and is currently involved in the design of several new train systems.

Lyudmila Bzhilyanskaya, Ph.D., TEMS’ Financial Planner/Economist will develop the socioeconomic database for the demand model. This will include long-term projections of income, population, employment, and economic growth. Dr. Bzhilyanskaya will also develop the economic scenarios for central, upper, and lower economic growth and provide consistent disaggregate economic projections. She will also perform the financial and economic analysis, which includes estimating financial rates of return and economic benefits using US DOT FRA standards and
criteria. She recently completed financial and economic analyses for the Midwest Regional Rail Initiative and Ohio Hub Economic Impact Studies. Other recent projects include the Alberta Investment Grade High Speed Rail Study and Indianapolis-Louisville Corridor Study.

Robert Marros is a Planning Analyst with Quandel Consultants, LLC. He holds a Master of Science in Resource Analysis for Geographical Information Systems from St. Mary’s University of Minnesota. As planning analyst, he leverages a wide range of skills including GIS system design and spatial analysis, graphic map development support rail and transit planning and engineering projects. Mr. Marros was lead analyst for the GIS/mapping project to modernize the freight and passenger rail infrastructure throughout the Chicagoland area. He also serves as lead analyst responsible for GIS task management, extensive demographic analysis and map development for technical reports.

Brenda Bohlke, Ph.D. will serve as Managing Engineer for Quandel Consultants, LLC. Dr. Bohlke’s 23 years of experience include major rail engineering projects, such as, Washington Metro (WMATA) stations, and Dulles Airport Extension, Tyson’s Corner Tunnel Project for Dulles Metro Rail Extension, Chesapeake Crescent Regional Rail Study, Washington-Baltimore Maglev Study, Los Angeles to Bakersfield High Speed Ground Transportation Study, Alabama High Speed Rail Feasibility Study, and New York High Speed Rail Study.

Andy Mountain will lead the Public Outreach program. He is a proven communications and business consultant with a diverse background including management and senior-consultant positions with Fortune 500 companies, major non-profit associations and large public institutions. Andy has established a reputation as a leader on transportation issues in Colorado through his work directing stakeholder and elected-official engagement for a number of large, controversial public-transit projects in the Denver-metro area. He has also worked extensively on public infrastructure issues throughout Colorado, having served as a senior advisor to the City of Alamosa, Clear Creek County, Denver Water and the Metropolitan Wastewater Authority. Andy also provides strategic counsel to AARP’s national leadership in Washington, D.C., on a range of strategic, organizational and communications matters. Andy holds a BA in Journalism and Public Relations from Phillip Merrill College of Journalism at the University of Maryland at College Park.

Steve Coffin will serve as Senior Consultant for the Public Outreach program. Steve’s communications experience has taken several forms over the years including attorney, corporate executive and senior staff member for a senior member of Congress. The common thread running through all these has been the strategic use of words to communicate, persuade, advocate and shape perception, with target audiences ranging from customers to elected officials to the media to the general public. This breadth of experience is one of Steve’s strongest assets that he brings to his clients. His clients have included Aurora Water, CDOT, Clear Creek County, Metropolitan Wastewater Authority and the Colorado Water Conservation Board.

Carl Hanson will lead the noise and vibration analysis team. As a co-founder of Harris Miller Miller & Hanson Inc. (HMMH), Dr. Hanson specializes in noise and vibration control engineering projects, particularly related to rail transportation. He is active in a wide range of rail transportation projects including noise control designs of vehicles and facilities, compliance tests, environmental assessment, community measurement programs and expert testimony. He has been especially active in the area of high speed rail and maglev systems, having conducted research and consulting projects in the United States and Europe.

Larry Kelterborn, Vice-President of Interfleet will support the Technology Evaluation Assessment providing innovative engineering solutions and strategic consulting support. Interfleet is one of the largest and most experienced rail vehicle and systems engineering consulting firms.
B.3 Staff Organization

O R G A N I Z A T I O N  C H A R T

TEMS and Quandel Consultants provide the experience to excel in developing all aspects of the Business Plan, while providing the high level of attention to detail that is unique to niche firms.

B.4 Availability of Key Staff as of March 20, 2008

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<thead>
<tr>
<th>Staff</th>
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<td>Brenda Bohlke</td>
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<td>Andy Mountain</td>
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<td>Steve Coffin</td>
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<tr>
<td>Larry Kelterborn</td>
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B.5 Acceptance of Agreement - TEMS accepts the terms and conditions associated with Exhibit A.

B.6 Evidence of Insurance - Evidence of Insurance can be found in the Appendix.
SECTION C - RESPONSE TO SCOPE OF WORK

C.1 INTRODUCTION

The State of Colorado has awarded funds to the Rocky Mountain Rail Authority (RMRA) to conduct a study of the feasibility of providing high speed passenger rail service along the Colorado’s Front Range from Wyoming to New Mexico, and along the I-70 Corridor from Denver to the Utah state border. The study will address the six feasibility factors relating to Federal Railroad Administration (FRA) High Speed Rail Designation for each project corridor; and specifically the criteria set out by the FRA for public-private partnership, i.e., that a corridor can sustain a positive operating ratio thereby allowing franchising of the route, and secondly a positive Cost Benefit Ratio that shows that a corridor makes a positive contribution to the corridors, states, and countries economy. These criteria have been used extensively by the TEMS team to justify the development of rail and maglev corridors in the nine Midwest states; Midwest Regional Rail Initiative, Ohio Valley 5 states; Ohio Hub Study, both Florida’s Statewide Rail Plan and High Speed Rail Study; Minneapolis-Duluth/Superior Restoration of Passenger Rail Service Study, Baltimore-Washington Maglev Study, New Orleans Maglev Study, and Florida BeeLine Maglev Study.

In using the FRA criteria to evaluate rail/maglev corridors, the TEMS team has used a Business Plan approach that allows the selection of the most viable rail passenger service options for any given corridor. The key issues that will be addressed include:

- Types of technology for each corridor including speed, frequency, and type of vehicle.
- The level of financial costs, and the financial and economic benefits generated and how they match the public/private partnership criteria established by the FRA.
- The impact of developing the rail/maglev system on local communities and the benefits generated for each community.
- The best station locations based on population, demographics, ridership, train performance, revenue, and financial results.
- The potential for using existing rail lines and rail rights-of-way as well as other government (highway) or power utility rights-of-way.
- The opportunity to use emerging technology including vehicle, guideway, and control system technologies to minimize costs and improve performance.
C.2 BUSINESS PLAN APPROACH

To ensure all of these factors are fully evaluated, the TEMS team will use the Business Planning Approach that it has been successfully used in more than thirty states to develop intermodal rail, high speed rail, and maglev plans. The selection of an appropriate High Speed Rail System is “market driven”. The difference in the selection of one high speed option over another is heavily dependent on the potential ridership and revenue. The difference between 125 mph option and 150 mph option may be as little as 500,000 riders per year. To ensure such differences are properly measured, the TEMS Business Planning Approach carries out a very detailed and comprehensive market analysis. Using the output of the market analysis, the Business Plan can then determine the right rail technology for any corridor. The Business Plan Approach sets out a six step process for accessing corridors and measuring FRA issues and criteria. The steps are:

Step 1: Database Development - Assembling the engineering, market, operational, technology, and community input to the process.

Step 2: Formulation of Rail Service Scenario - Setting up the rail/maglev options to be considered for the study.

Step 3: Interactive Analysis - This assessment blends engineering, market, operational, technology, and social data to identify and develop the most effective rail/maglev solutions.

Step 4: Systems Forecasts - For the most effective options, generate ridership, revenue, operating costs, capital costs, financial and economic feasibility solutions. This includes both user and community benefits, as well as FRA criteria.

Step 5: Assess both Institutional and Financial Plan Options - Develop the institutional framework, and funding plan for developing the Rocky Mountain Rail Plan.

Step 6: Business Plan - Develop both Implementation and Business Plans along with proforma financial cash flows.

The use of the Business Plan will result in a proposal rail/maglev system for the Denver region with recommendations on:

- What rail speeds to use
- What technology to use
- Where to stop trains
- What will be the ridership and revenue
- What will be the operating and capital costs
- How to fund the system
- What will be the potential for a franchised operation
- What will be the economic benefits to both users and the community
- What the implementation process should be.

The Business Planning Process used by the TEMS team has proven successful in providing the output needed to satisfy Federal and State and local funding requirements, Private Sector investors, Wall Street Banks, and communities along the corridor in terms of the benefits they derive. The business planning process satisfies Wall Street Investment Grade needs and provides the basis for Private Sector Franchise. The six step process (see Exhibit 1) provides both financial and economic criteria to prove feasibility as well as ensure both public and private financing and funding options. It sets up the Implementation Plan and process, and provides a Business Plan with the proforma cash flows and economic benefits that are critical to a successful implementation. It ensures that funding and financing are fully identified and the roles that different public and private groups will play in the institutional structures needed to implement the project. The output of the Business Plan provides the information needed for public outreach programs.

In terms of carrying out the Business Planning process, at each step the study team will look for steering committee review and approval. In carrying out the Business Planning Process, the TEMS team will use the RightTrack™ Business Planning System. It provides an Investment Grade mechanism for collecting data; evaluating and integrating market, engineering, and operational aspects of each technology option; and assessing the financial and economic benefits of specific routes and technologies.
The RightTrack™ System contains the following models: Engineering Analysis (TRACKMAN™), Operations Analysis (LOCOMOTION™), Market Analysis (COMPASS™), and Financial and Economic Analysis (RENTS™).

RightTrack™ has been widely used for high-speed rail business planning throughout North America. It has been used by equipment manufacturers (Bombardier, Talgo, Siemens, Alstom) to test the effectiveness of their equipment in a wide range of studies, as well as by federal and state authorities to plan intermediate and high-speed rail corridors in Midwest, Northeast, New York, Ohio, Pennsylvania, Illinois, Michigan, Minnesota, Indiana, Wisconsin, Florida, Texas, and California. The system has been used by VIA and Amtrak in developing long-range strategic plans (e.g., VIA FAST Project, Amtrak Northeast Corridor Project). The system has also been used by combinations of states and counties to plan passenger rail systems (e.g., MWRRI Program, Ohio Hub Project, Florida Statewide Study and Oklahoma-Ft. Worth Corridor Study and Boston-Portland Corridor).
Exhibit 1: Business Plan Six Step Process

Step 1 Databank Development
- Kick-Off Meeting
- Scope of Services
- Peer Review Panel
- Public Outreach
- Data Assembly
- Baseline Trip Tables
- Presentation & Review Meeting

Step 2 Service Scenarios
- Service Scenarios for Corridor
- Service Scenarios
- Presentation & Review Meeting

Step 3 Interactive Analysis
- Interactive Analysis
- Operating Strategies
- & Fare Structures
- Presentation & Review Meeting

Step 4 System Forecasts & Outputs
- Ridership & Revenue Forecasts
- Operating & Capital Costs
- Specific Infrastructure,
- Technology & Support
- Requirements
- Identification of
- Preferred Alternatives
- Presentation & Review Meeting

Step 5 Institutional & Financing Plan
- Financial & Economic Feasibility Analyses
- Financing & Funding Arrangements
- Institutional Framework
- Allocation of Costs & Revenues
- Potential Private & Institutional Support Structures
- Presentation & Review Meeting

Step 6 Business Plan
- Implementation Plan
- Business Plan Documentation
- Critical Path
- Work Plan

Business Plan Report
- PowerPoint Presentation
C.3 Scope of Work

**STEP 1 - PROJECT INITIATION, PEER REVIEW PROCESS, PUBLIC OUTREACH, AND DATA COLLECTION**

In setting out the study tasks, the TEMS Study Team has integrated its Business Planning process for passenger rail feasibility study with the tasks set out in the RFP. However, to fit these tasks, which are not comprehensive, TEMS has added additional analysis (e.g., community benefits analysis) and in one case a full task (Task 8) to ensure that the study products would provide a sound and effective guide that the RCRM Steering Committee will need to follow to implement the project.

**TASK 1 - STUDY DESIGN: PROJECT MANAGEMENT**

The TEMS Team will mobilize directly immediately upon execution of the agreement. An in depth study plan meeting will be held with the RMRA Steering Committee to identify priorities, finalize scope issues, and prepare the study management plan. This meeting will ensure the study scope is focused on the concerns and expectations of the RMRA Steering Committee, that appropriate timelines, milestones, and resource use is designed to meet the needs of the study. A final study scope will be prepared for presentation to the RMRA Steering Committee to ensure their review and approval.

**Deliverables:**
- Project Management Plan within 10 days of notice to proceed. This will include study scope, staff use, quality control procedures, timelines, and communications protocol.
- Monthly project meetings with RMRA Steering Committee.
- Bi-weekly PMC coordination meetings.
- Coordination with other study teams (I-70 Coalition).
- Preparation of meeting minutes for official meetings.
- Monthly progress reports and invoices

**TASK 2 - PEER REVIEW PANEL**

A critical element of an Investment Grade Study is the Peer Review process. An independent peer review improves the study process by allowing a value management assessment of the character of the assumptions, databases, technical methodology, and study outputs produced by the study team. Key areas for the Peer Review includes: travel demand, revenues and model systems, alternative technology, operating assumptions, and evaluation options; and overall system design, cost, finance and implementation. These represent the key elements of the study and the peer review process will help to ensure the most effective range of options, alternatives, and methodologies are adopted for the study. The panel will meet twice on each subject and this will help in providing firstly, an “Early Warning” on any questions or issues they have with the proposed approach, data and methodology, and then secondly, an “Independent Review” of the results and findings of the evaluation process. At each meeting the TEMS Study Team will make a PowerPoint presentation of its approach, assumptions, and methodologies, and findings and conclusions. For each meeting the TEMS Study Team will field its top professionals and one individual from the TEMS Study Team will lead the study team review. These individuals will be:
  - Dr. Alexander E. Metcalf (Project Manager) - Ridership, Revenue and Model System
  - Dr. Edwin Kraft (Managing Operations Planner) - Alternatives Development and Evaluation
  - Mr. Charles Quandel (Deputy Project Manager) - Overall System Design, Cost, Finance and Evaluation.

The TEMS Study Team will coordinate its work with the PMC who will organize and provide logistical support to the Peer Review Panel and process.

**Deliverables:**
- Six PowerPoint presentations
- Meeting minutes
- Study Team Review and response to Peer Review comments to PMC and Steering Committee
**Task 3 - Scope and Outreach**

Public outreach for the RFS must strike a delicate balance. Throughout the state and within the I-25 and I-70 corridors, there is likely to be significant interest and excitement mixed with doubts and skepticism. The study's outreach effort must respect and manage these expectations while focusing on engagement strategies that inform the public of study progress while eliciting study input from the right individuals/entities about the right issues at the right times.

The diversity in population and issues between the two corridors will require outreach strategies to be tailored to each corridor's requirements. At the same time, it will be critical to the success of the study that the approach, types of outreach strategies and input components be similar, if not identical, for both corridors. The aim of the analysis must be that whatever the feasibility of each corridor, communities recognize that they have had equal opportunity to make effective representation for their options, community, and corridor.

This situation is somewhat complicated by RMRA's desire to avoid conducting separate scoping and public involvement from the I-70 Coalition's land-use study. However, through preliminary discussions with the I-70 Coalition's director and the Land Use Study's deputy project manager (with whom our public involvement leader has worked extensively on other projects), we believe we have identified a collaborative approach that will benefit both the RFS and the I-70 Coalition's Land Use Study.

This public outreach strategy is designed therefore to address these issues while putting RMRA in a position to smoothly transition into the next steps beyond the RFS with community trust and support.

Our public outreach strategy includes:

- **Generating statewide interest and excitement about the study from day one.** One of our team's first tasks will be conducting a high-level statewide poll to identify the awareness, interest and support for high-speed rail on the I-25 and I-70 corridors. We expect the poll to show overwhelming public support. We will publicize the poll in print, radio and television media statewide to launch the RFS and position it as critical piece of the solution to Colorado's transportation problems.

- **Creating complimentary outreach/input structures on both corridors.** The I-70 Coalition Land Use Planning Study is forming “county-based groupings.” Each grouping will have representation from key municipal, business, community and transit stakeholders. We already have a conceptual agreement with the deputy project manager of this study to collaborate closely to leverage these groups as our formal input mechanism for the I-70 corridor and provide them with valuable input/information to benefit their study. We will establish similarly structured groupings for the I-25 corridor. These workgroups will meet at key project milestones (scoping, alternatives development, alternatives analysis) and serve as the official mechanism by which the public will provide input to the RFS.

- **Establishing a statewide community partnership program.** Conducting a statewide, RMRA-managed grassroots campaign is onerous and cost-prohibitive. However, partnering with influential and powerful groups (e.g. Club 20, Action 22, Progressive 15, Chambers of Commerce, etc.) across the state can provide RMRA a similar breadth of reach at a fraction of the cost. In addition, we plan to piggyback on the proposed Stated Preference Survey to be carried out as part of the Ridership and Revenue Analysis. This will provide a lot of “behavioural” data that together with the socioeconomic profile data gathered by the survey can be used to inform the public about the corridors response to rail systems. Our team will produce monthly updates/presentations summarizing our progress and analysis. We will forge relationships with key organizations throughout the state in order to get them to share RFS information and updates with their members and the broader community.

- **Conducting proactive outreach to media statewide.** Well-managed media coverage can be an effective tool to generate awareness of the RFS and keep the public informed and engaged in RMRA's efforts. This is particularly true in rural areas of the state where coverage is easier to generate than in more competitive urban media markets. We will work very closely with media throughout the state to generate positive news coverage of the RFS study at key milestones. Media strategies will include distributing news releases and other media materials at key milestones, placing Op-Ed articles at appropriate times and holding statewide media conference calls at key milestones to provide updates on...
progress made. When possible – for example, when the Community Benefits Economic Rent Analysis is completed and there is community-specific benefit data available – we will provide the media with compelling data and analysis on both a state and local level.

- **Providing Compelling Online Engagement Opportunities.** Depending on RMRA’s plans for the RockyMountainRail.org web site, we will be a strong strategic resource to their interactive-outreach strategy. If, as indicated in the RFP, that means simply providing content to be posted on the site, we can certainly develop content that is web-friendly and easy to read/navigate on screen.

  However, experience on similar projects throughout Colorado has shown that the public will expect more than just accessing content from the project web site. We propose a more engaging online experience for the RFS. Either integrated into the existing RMRA web site or as a stand-alone site, we recommend providing a higher-functioning online experience. Key features that we propose include accessing all appropriate study information as indicated in the RFP but also other features including: an interactive alternative map, mailing list registration, question/comment submittal, links to their representatives on the “county-based groupings,” and other study-specific information.

- **Engaging Diverse Communities.** Our team has a long and proud history of effectively engaging culturally diverse communities in our public outreach programs. In addition to providing appropriate study materials (e.g. web content, fact sheets) in Spanish, we will also proactively reach out to key organizations that reach diverse communities as part of our Community Partnership Program.

At the end of the day, our public outreach program will provide RMRA with a powerful, effective and cost-efficient way to engage stakeholders throughout the state in the RFS. Moreover, our strategic approach will address the needs of the RFS while also positioning RMRA for long-term success in implementing whatever recommendations come out of the study.

**Task 4 - Data Collection, and Assembly for Existing Conditions**

The analysis will consider both the I-70 corridor from the Utah border to Denver International Airport, and the Frontline corridor from Wyoming to New Mexico. In addition, the potential for secondary rail corridors from Central City, Winter Park, Breckenridge, Aspen and Craig will also be considered. Marketing, Engineering, and Operating data will be gathered on each corridor/secondary corridor so that analyses can be performed which allow a determination of both the short and long-term potential of a corridor. For example, if a corridor is not feasible in the short term, it is possible that it would justify a train by 2020 or 2025.

The data assembly will be oriented toward the specifications of four major data systems. They include:

- Market database
- Engineering database
- Technology database
- Station database

**Market Database**

The market database will consist of four components – origin/destination data, socio economic data, and network data, stated preference data. This will allow Investment Grade methodology to be developed, and high quality forecasts of ridership and revenue to be estimated.

**Origin/Destination Data** - As part of the study, TEMS will develop a comprehensive origin/destination database for the study corridors. The data will be drawn from existing MPO and statewide databases including origin destination data, statewide AADT data, bus schedules, and regional traffic flow estimates. The data will be for travel by rail, bus and auto and will be on a trip-purpose basis (business, commuter and social/tourism). The data will be aggregated on a county/sub county level in rural areas and at an aggregate MPO zone level for urban areas. For this study, the data and zone system will be refined to ensure it properly reflects demand in the I-70 and Frontline Corridors. It is anticipated that the rail corridors will be represented by 300 to 400 zones.
SOCIOECONOMIC DATA - As part of the study process an extensive socioeconomic database will be developed for Colorado. The data was developed from State and Federal BEA data as well as private sector sources (e.g., Woods and Poole). It will contain population, employment and income forecasts on a zone basis. These will be reviewed with the PMC and Study Steering Committee and adjusted to the proposed 300-400 zone system to provide an effective database for the Rocky Mountain Corridors.

NETWORK DATA - Comprehensive modal networks will be developed for each mode of intercity travel (auto, rail and bus). The networks, which will identify access and egress times, and costs, will be built for business and non-business travel. A refined set of networks will be developed for the Rocky Mountain Corridors to show the strength of modal competition and connections in the corridor.

STATED PREFERENCE DATA - To develop Investment Grade level forecasts the TEMS team will complete a Stated Preference survey. The survey will be similar to recent high speed rail surveys completed by TEMS in the Midwest (9 states), Ohio (5 states), Gulf (5 states), and Mid Atlantic (4 states). The survey will collect data on Value of Time, Value of Frequency, Value of Access, Value of Reliability, and Modal Attributes. Data will be collected using a quota survey methodology as approved for Investment Grade studies.

ENGINEERING DATABASE
The engineering database will consider both East-West corridors and the North-South corridors together with potential secondary corridors. In each case an engineering database will be gathered to provide the basis for estimating the likely level of civil engineering costs associated with the proposed rail service. The TRACKMAN™ Track Management System was used in the pre-feasibility study to provide a milepost-by-milepost record of the rail gradients and track geometry of the right-of-way. The data will be compiled from existing sources includes railroad timetables, track charts, ordinance survey maps, and land stat photometry. The data will be reviewed and updated as required. This will be achieved by a field review of the right-of-way and track in the corridor by the engineers and operation planner on the TEMS Team. Potential track upgrades and improvements for different passenger rail speeds and operations will be assessed and improvements will be identified and listed. Engineering notes will be developed and entered into the TRACKMAN™ program to provide a clear understanding of basic track conditions, and the upgrades needed to support higher passenger rail speeds. Particular attention will be given to existing and potential new crossings and difficulties with grade separation, environmental hot spots of potential concern, competitive uses of the right-of-way, and existing users, utilities, etc. that may need to be relocated. A sample output from TRACKMAN™ is given below.
TECHNOLOGY DATABASE
The technology database for the passenger rail speed options will be developed by reviewing the results of previous TEMS studies and soliciting information from manufacturers to update TEMS existing databank. It is anticipated that, as in a number of previous TEMS team studies (e.g., Florida, Tristate, Northeast Corridor), the focus will be on the full range of high speed technologies - 110 mph, 125 mph, 150 mph, 185 mph and 300 mph.

PROPERTY DATABASE: STATIONS
As part of a public outreach program, a property database will be developed for the corridors, which will assess existing properties along the rail line. The analysis will identify whether the property is residential, commercial and whether the property is publicly or privately owned. The data will be mapped and an inventory of property values will be derived from state and federal property valuation sources (i.e., Colorado Department of Taxation and U.S. Department of Commerce-BEA Statistics).

DELIVERYABLES:
- Technical Report describing the four major databases
- Existing Conditions Report
  - TRACKMAN™ track database for the corridors
  - COMPASS™ base year travel O/D matrix by purpose
  - LOCOMOTION™ technology report on train and system options
  - Station data base report

STEP 2 - SERVICE SCENARIOS: PRELIMINARY RAIL STRATEGIES
This task is added to the work program as a mechanism to identify the range of train systems/maglev to be considered in each corridor. The database will allow fatally flawed options to be eliminated and for a practical set of options to be defined to initiate the interactive analysis of ridership, revenue, capital and operating costs.
SERVICE SCENARIOS FOR THE I-70 AND FRONTLINE CORRIDORS

Working closely with the PMC and Study Steering Committee, an initial set of passenger rail service scenarios will be defined for each service scenario. The key factors considered in defining scenarios include:

- Train frequency
- Train speed
- Track speed
- Station stops
- Fares

SERVICE CONCEPTS

Once the range of options is established, the TEMS Team will explore opportunities to attract riders and create greater value and revenue. In addressing this issue, the TEMS Team will initially consider two potential levels of service, each targeted to different traveler needs. These include:

BASE LEVEL SERVICE CONCEPT – a base level service operating within the context of a “stand alone” service. A basic fare would be established for this service. The base level service provides a platform against which additional speed improvements can be evaluated in both financial and economic terms.

IMPROVED SERVICE CONCEPTS – service improvements that would be associated with a refined level of engineering and operation considerations given the character of the market. Improvements would include changes in travel times due to improved infrastructure, increased frequencies, improved reliability, improved train stopping patterns and higher quality of service. It would also provide for improved transportation access and connections at stations, such as taxis, limos and transit. Fares will be optimized to maximize revenue potential.

STEP 3: INTERACTIVE ANALYSIS

The Interactive Analysis is designed to develop the most efficient and effective alternatives for passenger rail service in the Rocky Mountain Corridors. In these tasks, ridership and revenue are assessed against infrastructure needs and costs, and operating requirements and costs.

TASK 5: DEMAND ANALYSIS

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, as well as a significant shift toward rail use as a result of higher gas prices.

To effectively predict the change pattern and overall rail travel demand levels for new rail systems, models are needed that can accurately forecast the impact of trip making increases and the role of the rail mode. To meet these needs, TEMS developed the COMPASS™ Model System, which is a fundamentally new approach to transportation analysis. It combines existing regional transportation planning techniques with new market research techniques. COMPASS™ has the advantage of having been tested in North America, and Europe on various high speed rail projects as they progressed from planning, to engineering, to implementation. It provides Investment Grade caliber forecasts, and meets Wall Street requirements for ridership and revenue analysis. It provided the foundation for the Midwest, Ohio, Florida, Gulf Coast, Northeast ridership and revenue forecasts, and will be calibrated to reflect conditions in Rocky Mountain Corridors.

Contrary to conventional methods of analyzing demand on the basis of existing or historical demographic/travel data, the COMPASS™ Model, while including such data in the analysis, subordinates it to a detailed dynamic behavioral assessment of an individual's innate travel characteristics. Using an advanced market research technique, Abstract Mode Trade-Off Analysis, these innate travel characteristics are formulated as preference utilities or demand elasticities, yielding a precise measurement of the responsiveness of travel demand to improvements in the overall level of service and the relative competitive position of alternative modes.
As shown in the exhibit below, the COMPASS™ Model includes three key sub-models:

- Total Demand Model
- Induced Demand Model
- Modal Split Model

### COMPASS™ Rail Demand Model Structure

Using the COMPASS™ approach to rail forecasting, the TEMS Team will:

- Eliminate the potential shortcomings of other model approaches, which often rely upon historical data that reflects rail’s current negative image and tend to underestimate a new and modern rail system.
- Overcome the propensity inherent in conventional planning models to fail to identify accurately the market share for all modes. Typical MPO models are geared to forecasting the dominant mode (auto) and are frequently biased in their calibration procedures to coefficients and parameters that reflect auto travel. Unless a model explicitly represents the response of individuals to the modes other than auto (rail, bus, and air) differently through model coefficients such as the value of time, it is inevitable that the model will not be able to provide effective rail forecasts.

To overcome the limitations of conventional models, the TEMS analysis will firstly adjust the local MPO data to a behavioural purpose basis. Instead of using such purposes as Home-Shop or Home-Work, the TEMS approach will use the behavioural purposes, i.e., business, commuter, shopper, social travel, and tourist travel. Secondly, the COMPASS™ model uses the output of a Stated Preference survey to develop mode and purpose, Values of Time, Values of Frequency, and Values of Accessibility to provide a correct behavioural response to travel options.

The basis of the TEMS Team’s approach to forecasting the potential for new intrastate passenger rail service will be to treat rail as an enhanced or new mode. The objective will be to focus the analysis on the response to the new mode’s performance by taking local behavioral attitudes into account, rather than simply extrapolating demand on the basis of historical or current travel relationships. This will allow for a more accurate and realistic ridership forecast. The output of the forecasting process can be used to ensure that the most appropriate route and technology combinations have been obtained and that potential revenue is maximized and capital costs minimized.
RIDERSHIP AND REVENUE FORECASTS

Using the preliminary rail service scenarios developed for the Rocky Mountain Corridor, total demand and market share forecasts for passenger rail traffic on a weekday, and weekend basis. The estimates will be prepared for five-year intervals for the study period 2008-2040. To forecast the impact of regional economic growth on total demand, socioeconomic scenarios will be prepared that identify how the likely changes in income, population, and employment will effect rail ridership and revenue over the study period.

For rail, the forecast strategies that will be developed include train frequency, commercial speed, stopping patterns and passenger interchange and access. Using these inputs, as appropriate, alternative strategies will also be prepared for other intercity transportation modes, so that the impact of investment in these modes is incorporated into the overall demand analysis. This task will consider likely MPO investment over the study period be carried out in conjunction with the PMC and Rocky Mountain Steering Committee.

The rail ridership forecasts will be assigned to show segment volumes, station volumes, and passenger miles and revenues on an annual basis. The forecasts will also be provided on an origin and destination basis and on a corridor, segment, and city pair basis. For each technology option, the rail revenues will be generated. Revenues will be based on a fare/tariff structure, which can be compared with fares and costs of competing traffic (auto, and bus). This will ensure that the optimum revenue stream is generated for the rail service, and will provide a basis for considering higher fares and lower subsidies for the Rocky Mountain passenger rail service. Revenues will be given in 2008 dollars. The resulting rail ridership and revenue will be benchmarked against comparable intercity corridor volumes and revenues. Benchmarking provides a high level of confidence to Wall Street investors.

DELIVERABLES:

- Ridership and Revenue Forecasting Methodology Report
- Ridership and Revenue Forecasting Technical Report

TASK 6 - ALTERNATIVES DEVELOPMENT: INTERACTIVE ANALYSIS

The determination of appropriate high speed rail service depends on balancing the trade-off between revenues and costs for any given route and associated technology. Higher levels of ridership generate higher revenues, which permit a greater level of infrastructure investment, and thus higher speeds. Lower levels of ridership and lower revenues require that infrastructure investment be minimized and/or the use of more sophisticated vehicles (e.g., tilt technology to compensate for inadequate track geometry).

As a result, the TEMS Team proposes an Interactive Analysis as the most efficient means of developing an appropriate passenger rail service alternatives and identifying infrastructure needs.

The Interactive Analysis utilizes a number of computer systems, permitting a rapid evaluation and re-evaluation of route, technology, and/or ridership factors:

- TRACKMAN™ to assess the right-of-way and route improvement options
- LOCOMOTION™ Train Performance Calculator to assess the performance of technologies
- COMPASS™ Rail Demand Model to assess ridership and traffic levels

The result of the Interactive Analysis is an operating strategy for each route/alternative technology option that optimizes the infrastructure, technology and traffic levels.

For the proposed corridor, the first step in the Interactive Analysis is to identify the most appropriate route alignment and train speed. To achieve a desired train speed, the route is examined and specific infrastructure improvements are proposed for each mile track. For the purpose of this study, TEMS unit costs will be used as a basis to generate estimates for improvements. However, these unit costs will be adjusted to local conditions to reflect local labor, materials, and tax conditions.
The actual operating speed of the train along the track is calculated using LOCOMOTION™. Output from LOCOMOTION™ will be examined to identify specific bottlenecks, such as bridges, crossings, tunnels and curves that restrict train speeds unnecessarily and reduce the overall timetable performance of a specific technology.

The output of LOCOMOTION™ provides an assessment of train running times for any given set of infrastructure proposals. By reviewing the timetables, the level of infrastructure improvements can be increased or reduced to meet specific timetable and thus specific ridership needs. In this way, the Interactive Analysis will result in the development of an operating strategy for each right-of-way/corridor and technology that best combines infrastructure requirements, operating speeds and frequencies, and potential ridership.

It should be noted that the time saved by removing impedence would be different for different train technologies. For example, removing moderate curves is less important than removing bridge speed restrictions for trains with steerable trucks.

Where restrictions are found, TRACKMAN™ will be used to identify the cost of upgrading the right-of-way. By using LOCOMOTION™ and TRACKMAN™ together, a priority ranking of improvements can be developed. This consists of a cost per train travel time minutes saved and cost-per-revenue dollar earned.

The Interactive Analysis will identify key bottlenecks that prevent a given technology from achieving its maximum capability, listing the priorities for each train type, and estimating the civil engineering costs to overcome these bottlenecks. Equally, the analysis will be used to assess the effect of train speed on ridership levels and the cost of aligning the track to avoid locations with important environmental or cultural characteristics. In each case, the required infrastructure improvements will be quantified in terms of the full range of factors that affect infrastructure costs (grading, track quality, signaling, and grade crossing protection.)

**OPERATING AND CAPITAL COSTS**

For each of the technology options, a set of 2008 operating costs will be developed that are based on the operating timetable. The operating unit costs will include the following:

- Track maintenance
- Train crew
- Rolling stock maintenance
- Electrification maintenance
- Signals and communications maintenance
- Energy costs
- Public Acceptance
- Environmental Impacts
- Safety
- Local Development
- Implementation Impacts
- High Speed Rail Objectives

Capital costs for the passenger rail service include cost for rolling stock, as well as infrastructure costs. Rolling stock costs for the various technologies will be obtained directly from equipment manufactures.

As for infrastructure costs, the TEMS Team has a set of unit costs derived from the ongoing studies in Midwest, Florida, Mid Atlantic, Ohio, New York, and Gulf Coast, which have been updated to 2008 dollars. It is proposed that these will be reviewed and adjusted to reflect specific conditions in the Rocky Mountain Corridor. The infrastructure cost databank will include unit costs for the following:
CONSULTANT SERVICES FOR ROCKY MOUNTAIN RAIL AUTHORITY’S HIGH SPEED RAIL FEASIBILITY STUDY

• Land and right-of-way
• Sub-grade, structures, and guideway
• Track
• Rolling stock
• Signals and communications
• Electrification
• Demolition
• Stations
• Maintenance and facilities
• Highway and railroad crossings
• Farm and animal crossings
• Pedestrian crossings
• Fencing

STEP 4 - SYSTEM FORECASTS AND ANALYSIS
This includes the Ridership and Revenue forecasts prepared in Task 5, and the Operating and Capital Costs developed in Task 6.

ALTERNATIVES DEVELOPMENT WORKSHOP
Working closely with the PMC and Study Steering Committee, hold an Alternatives Development Workshop that will consider:
• Ridership/Revenue
• Operating Cost
• Capital Cost
• Interoperability
• Institutional Issues
• Potential for Existing Corridors

Train crew
• Control staff
• Terminal personnel
• On-board services
• Administration

DELIVERABLES:
• Capital Cost Report by Option
• Operating Cost Report by Option

The aim of the workshop is to reach consensus on the range of alternatives to be carried into the financial and economic evaluation process for each corridor.

PEER REVIEW
As part of the Alternatives Development process, the Alternatives Peer Review Panel will be convened to review alternatives. In conjunction with the Peer Review, a full and comprehensive evaluation of options and alternatives will be made to ensure that the most practical and realistic options will be developed. The TEMS Study Team will prepare a report describing the findings of the Peer Review, and the recommendations and conclusions to the RMRA Board and Steering Committee.

DELIVERABLES:
• Alternatives Development Technical Report
• Interactive Analysis Results

STEP 5 - FINANCIAL AND ECONOMIC RESULTS, INSTITUTIONAL AND FINANCING PLAN
The purpose of this step is to provide a clear understanding of the proposed alternatives for the main corridor and secondary corridors in order that the RMRA and other decision-making agencies have a clear picture of the way each option meets financial, economic and FRA requirements. To this end the TEMS Study Team will not only carry out Financial and Demand-side Economic Analysis that are required to meet these objectives, but it will also carry out a Supply-side Analysis, which will quantify the jobs, property value, and income impacts on communities which has proved so useful in justifying rail projects to local communities (e.g., Ohio Hub, and Florida Statewide Rail Plan).
**Task 7 - Financial and Economic Feasibility Analyses**

To provide a clear understanding of the value of different route investments, the TEMS Team will carry out the follow-up analysis –

- Comprehensive financial analysis
- Comprehensive user benefits (consumer surplus) and non-user benefits analysis
- Community Analysis (Economic Rent) identifying jobs, income, property values

**Financial Analysis** - The financial analysis will be based on a detailed cash flow analysis of passenger revenues, operating and maintenance costs, and infrastructure and rolling stock costs. The analysis will include the discounting of costs and revenues to an appropriate base year, the establishment of an infrastructure cost implementation program, and the assessment of both Net Present Values and Internal Rates of Return showing the overall worth of the rail service in financial terms.

In addition, a number of ancillary revenue/cost relationships will be defined in the financial analysis, including project profitability (rate of return), operating ratio (cost/revenue relationship), investment standards (investment dollar/passenger mile), and train efficiency (cost/train mile). These will be used to provide a comparative analysis of corridor performance. Proforma cash flow financial plans will be provided for the preferred alternatives.

**Economic Analysis of User and Non-User Benefits** - In the economic analysis, transportation user costs and benefits will be assessed in terms of increased user benefits (consumer surplus), increased trip making (regional mobility), reduced journey travel times and congestion (travel time savings), and improved quality of service (maximum service levels). The economic analysis will be based on the flow of economic costs and benefits over time and the impact of the proposed rail service on both users and non-users. This analysis will include resource savings, energy savings, accident savings, and producer surplus. The economic benefits and costs will be discounted to an appropriate base year and evaluated in terms of Net Present Values, Internal Rates of Return, and Cost-Benefit Ratios. The analysis will also include a public sector constrained capital assessment.

**Economic Benefits for Communities** - A critical output is the measure of community benefits generated by developing the corridor. This shows the communities the benefits they will get from the implementation of the high speed rail corridors. This has been used successfully in the public outreach program to develop community support (e.g., Ohio Hub, MWRRI, and Florida). TEMS has developed the Economic Rent Analysis as a mechanism for estimating the increase in Jobs, Income, Property Values, and the expansion of the Tax Base, as a result of implementing high speed rail projects. This is an additional task that TEMS feels essential to the public outreach process.

**Institutional and Financing Framework**

In addition to the financial and economic plan, the TEMS Study Team will develop Institutional and Financing Agreements for the project. This will include an allocation of costs analysis that shows who pays what to whom.

**Financing and Funding Arrangements**

The TEMS Team will work with the PMC Project Manager and RMRA Steering Committee to develop financing and funding plans for the rail service. The analysis will consider different ways to generate federal, state, local, and private sector support for the rail service. Specific issues to be considered include –

- Federal and state match
- Local funding of stations
- Private sector roles in provision of services and contracting
- Freight railroad contracting and funding options

The analysis will consider the full range of innovative financing proposed by the US DOT FRA and evaluate the potential roles of grants, TIFIA loans, Amtrak participation, franchising, GANS and other financial instruments.

**Institutional Framework**

Given a full understanding of the needs of the rail service, infrastructure costs, operating finances, and the potential role of the private sector, an assessment will be made of the potential institutional arrangements that will need to be developed for implementation of the rail service. The full range of potential arrangements will be assessed and recommendations made on the basis of the roles of different parties, potential financial commitments, cost and revenue sharing, and other organizational and efficiency considerations. Key criteria will include –
• Proforma cash flows
• Administrative and operating costs
• Legal requirements and related needs (e.g., insurance)

• Ease of implementation
• Transferability
• Pay-off year and financial attributes

**Allocation of Costs and Revenues**

Revenue and cost allocation procedures will be developed that show the financial responsibilities of each party along with the timeline for finalizing contractual arrangements. Critical issues to be assessed include –

• Cooperative arrangements
• Maximization of private sector opportunities

• Financing mechanisms
• Strengthening institutional capabilities

**Step 6 - Business and Implementation Plan**

**Task 8: Business Plan**

The TEMS Study Team would add a Business Planning task to the project that outlines the Implementation Plan, and Business Plan

**Implementation Plan**

Using the outputs of the previous seven tasks, an implementation plan will be developed that sets goals, timetables, and arrangements for implementing passenger rail service in the Rocky Mountain Corridor. The timeline for planning, environmental analysis, preliminary engineering, final engineering, and construction will be set out in a realistic program to show the implementation milestones and the opening year for passenger rail operations. Alongside the physical implementation process will be a second set of milestones that identify the funding needs and institutional framework for developing the system. Action plans for lead agencies, local communities and private sector partners will be identified in the implementation process. A key element of the plan will be the interaction of physical facility provision, funding, and institutional development. The implementation plan will seek to define authority and responsibility for ensuring the success of the development process. The implementation plan will recommend an action program that sets out the steps that need to be followed to ensure the successful implementation of passenger rail in the Rocky Mountain Corridors.

**Business Plan Documentation**

A Business Plan report will be prepared describing databases, research methods, ridership and revenue forecasts, results of the financial and economic feasibility analyses, proposed institutional framework, financing and funding arrangements, and implementation plan. The report will describe the study results in the context of a corridor implementation program and make recommendations to the RMRA Steering Committee for maximizing the benefits of a passenger rail service in the Rocky Mountain Corridor.

**Deliverables**

The TEMS Team will provide the following deliverables for the study –

• Ridership and Revenue Forecasts
• Corridor Engineering and Environmental Review
• Operating Schedules and Timetables
• Implementation Plan
• Financial/Funding Plan
• Business Plan
• Project Progress Presentations (PowerPoint)
• Summary Report (12 bound copies and CD in Word™ format)
• Technical Report and Appendices (12 bound copies and CD in PDF format)
SECTION D - PROJECT CONTROLS

D.1 PROJECT MANAGEMENT PLANNING AND RESPONSIVENESS

The TEMS Team recognizes that strong management systems, technical credentials, personnel resources, and geographic familiarity are necessary to guarantee successful project management. The project management system recognizes, understands and addresses the functions of planning, organizing, directing and controlling project activities, and also the inherent relationships among tasks, schedules, and resources that must be optimized to provide a quality end product in a cost-effective manner.

The project management system will be based on a Work Breakdown Structure (WBS) formulated to address the objectives of the RMRA Steering Committee. The WBS identifies all tasks necessary to complete the products required for successful project completion. The WBS identifies individuals responsible for task completion, schedule and budget available for task completion, input requirements, output relationships and Steering Committee approvals/decisions. The WBS enables efficient tracking, auditing and reporting to the PMC Project Manager and RMRA Steering Committee.

Primary benefits of the TEMS Team project management system will be providing the PMC Project Manager and Steering Committee with –

- Single Point-of-Contact – A Project Manager with overall responsibility who will actively participate in project activities from start to finish.
- Efficiency/Close Coordination – An efficient management plan that clearly defines the roles and responsibilities of the individual members of the TEMS Team and, at the same time, incorporates the needs and concerns of other interested parties.
- Capability and Capacity – Multi-disciplinary, creative member firms experienced with the Steering Committee policies and procedures, with a thorough technical understanding of the alternative analyses process for concept and feasibility studies.
- Continuity and Responsiveness – The commitment to ensure staff continuity and quick response to the needs and concerns of the PMC Project Manager and RMRA Steering Committee.
- Flexibility – The ability to adapt and respond to project requirements as new information becomes available.

D.2 PROJECT CONTROL

Effective use of TEMS’ project management program provides the key to meeting project schedule milestones. Project reporting and control procedures will be specifically tailored to the needs of the WALLY Project Manager and Steering Committee. TEMS will utilize its Cost/Schedule Control Program to provide internal management data to the management team and task managers along with reporting data and progress to the Steering Committee. The Cost/Schedule Control Program will be adapted to the project work plan and project tasks. This program provides the following tools for the Project Manager to ensure that budgets and schedules are met –

- Detailed Contract Schedule – Using the Critical Path Method (CPM) format, the Detailed Contract Schedule will be prepared within 14 days of receipt of the Notice to Proceed. The detailed schedule will identify all the major project activities and work elements and will be submitted in a time-scaled logic diagram along with the appropriate schedule analysis narration. This schedule will be updated monthly to reflect actual progress of the project in terms of individual tasks and overall percentage completion. This schedule will be consistent with the information included in the Consultant Progress and Performance Report (CPPR).
- Summary Contract Schedule – This schedule will summarize the detailed Contract Schedule, depicting the detailed schedule elements in a bar chart format. This schedule will provide the original control schedule baseline for the CPPR. Based on monthly updates to the Detailed Contract Schedule, this schedule will also be updated.
• Consultant Progress and Performance Report (CPPR) – A CPPR report, generated within 14 days of receipt of the Notice to Proceed, will serve as the basis for monitoring consultant performance and tracking accomplishments versus resources expended. The CPPR task breakdown, prepared in accordance with the Steering Committee guidelines, will quantify as realistically as possible the time-phasing and planned accomplishments for the design effort.

• Project Control – Monthly reports detailing budget hours, labor budgets by task and team expenditures including sub-consultant costs will allow project resources to be monitored and evaluated against pre-established budgets.

**D.3 QUALITY MANAGEMENT PROGRAM**

TEMS Team members were selected not only on the basis of technical expertise, but also for their commitment to quality management. Quandel Consultants, LLC and has an internal quality assurance program that complies with that of TEMS.

The TEMS Team’s Quality Management Program is founded on a belief in “Quality Focus and Customer Service.” This program centers on Total Quality Project Management, beginning with the strong commitment of company management. It is a continuous program wherein all members of the team focus on on-time product delivery within the project budget. Through this program, the Project Manager is empowered to provide services to the client without impedance from unnecessary corporate bureaucracy. The program can be summarized as follows –

• Quality Commitment – Project management team members are empowered to work with clients as their customers and make decisions to ensure we are meeting project needs and objectives.

• Total Involvement – Quality begins with a commitment of the management of the firm and is practiced by all employees.

• Measurement – Quality is defined as conformance to client requirements. Once project requirements are established, client satisfaction is measured by the team’s performance in meeting these requirements.

• Technical Experience – Quality management requires that knowledgeable and experienced technical specialists be matched to project needs. We develop project teams with experienced project managers and technical specialists committed to solving project issues and implementing project solutions.

• Data Management – Data/record management programs are designed to allow the TEMS Team and the client to reconstruct project decisions after project completion.

• Quality Control Plan – A Quality Control Plan is specified for each client and project to ensure the technical quality of the project throughout all phases of a project. Each plan is developed to ensure that appropriate project coordination and reviews are completed for all disciplines.
D.4 **TIMELINE AND MAN HOURS BY TASK**

**TIMELINE**: Using the RightTrack™ system, the work can be completed in twelve months. The TEMS Team would recommend allow an extra six month schedule to allow more time for review and assessment by communities. This will allow a decision to move forward with implementation after eighteen months.

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As shown in the accompanying Work Plan, anticipated completion dates are as follows –

- Project Management and Peer Review process by end of month 1
- Study databank development by the end of month 4
- Formulation of the service scenarios at the end of month 4
- Interactive analysis (ridership, engineering and operations) by the end of month 7
- Feasibility Analysis by the end of month 9
- Institutional and financial plan by the end of month 9
- Implementation plan and business plan documentation by the end of month 12
- An Ongoing public outreach program with deliverables at the end of month 3, 8, 10 and 12

**MEETINGS**

At monthly intervals during the course of the study, the TEMS Team will attend meetings and make a PowerPoint™ presentation to the RMRA Steering Committee. The meetings have been scheduled at key decision-making point to ensure that the RMRA Project Manager and Steering Committee fully understands and approves the work underway before the TEMS Team proceeds to the next task. Critical meetings are as follows –

- Work Plan – end of week 2
- Study Public Outreach, Databank, Preliminary Service Scenario – end of week 12
- Ridership and Revenue – end of week 28
- Interactive Analysis – end of week 28
- Financial and Economic Analysis – end of week 38
- Draft Report – end of week 48
- Implementation Plan and draft Business Plan report – end of week 52
### MAN HOURS BY TASK: THE FOLLOWING TABLE GIVES A BREAKDOWN BY MAN HOURS BY FIRM AND INDIVIDUAL

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Extra Tasks
SECTION E: DEMONSTRATION OF EXPERIENCE AND REFERENCES

TEMS Study Team is one of the leading North American experts in High Speed Rail Planning. Prior to coming to the U.S. in the 1980’s, Dr. Metcalf (TEMS Study Team Project Manager), was the Chief Economic at British Rail, and was responsible for the planning of the British HST 125 mph program, the 150 mph Mainline Electrification Program, and the Channel Tunnel 185 mph Program. To meet the needs of High Speed Rail Feasibility Planning, he developed the RightTrack™ Business Planning System that has so successfully been used across North America to plan high speed rail projects. To plan these projects, Dr. Metcalf linked up with Mr. Charles Quandel (Deputy Project Manager) in 1990 to provide the engineering and engineering and environmental input to TEMS Business Planning projects. Together they have completed over 20 projects in the last 18 years.

E.1 RELEVANT PROJECTS INCLUDING REFERENCES

NINE MIDWEST STATES AND THE FRA
MIDWEST REGIONAL RAIL INITIATIVE (MWRRI)

The MWRRI is an ongoing effort to improve and expand the passenger rail system in the Midwest. The program is sponsored by the Federal Railroad Administration, and the transportation agencies of nine states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.

TEMS led the consultant team and provided ridership and revenue forecasts, operations planning, technology assessment, financial and economic analysis, institutional arrangements, implementation, and business planning, and directed the work of the other members of the consultant team.

SERVICES PROVIDED: Operations analysis, demand forecasting, technology assessment, station planning, financial planning, market and economic assessment, institutional planning and public financing.

REFERENCE: Mr. Randall E. Wade - 608.266.2972

OHIO RAIL DEVELOPMENT COMMISSION
OHIO AND LAKE ERIE REGIONAL RAIL OHIO HUB STUDY - BUSINESS PLAN

As part of the Midwest Regional Rail Initiative, TEMS was retained to develop a business plan for the Ohio and Lake Erie Cleveland Hub Regional Rail System. In developing the business plan, an extensive analysis of the engineering, operations, ridership, and revenues associated with the project was carried out. Using this data, TEMS built a business plan that assessed both the financial and economic potential of the system. The evaluation assessed the potential for public/private partnerships and the role of federal funding for the project. To meet this need, the economic evaluation used both US DOT, and a private sector evaluation of the economic benefits of the project.

SERVICES PROVIDED: Demand forecasting, economic analysis, market assessment, project funding

REFERENCE: Mr. Matt Dietrich- 614.644.0295
CONSULTANT SERVICES FOR ROCKY MOUNTAIN RAIL AUTHORITY’S HIGH SPEED RAIL FEASIBILITY STUDY

ST. LOUIS COUNTY AND LAKE COUNTIES REGIONAL RAIL AUTHORITY
MINNESOTA-DULUTH/SUPERIOR PASSENGER RAIL STUDY
TEMS recently completed a passenger rail business plan for the Minneapolis-Duluth/Superior corridor. TEMS was responsible for using the RightTrack™ Business Planning System to develop a feasibility analysis of 79 mph, 110 mph, and 125 mph passenger rail service in the corridor. The analysis included engineering, market assessment and operations planning. The feasibility analysis included financial and economic analysis, which were used to develop Institutional, Implementation, Funding Plans and Business Plans. The work included station development and evaluation assessments and the identification of public-private partnership potential. The work has lead of an implementation program.

SERVICES PROVIDED: Engineering, operations planning, market analysis, implementation planning, service programming and funding plans.

REFERENCE: Mr. John Ongaro - 218.726.2455

FLORIDA DEPARTMENT OF TRANSPORTATION
FLORIDA HIGH-SPEED RAIL AUTHORITY–2002 REPORT TO THE LEGISLATURE
TEMS evaluated the potential for implementing a high-speed rail service to connect St. Petersburg with Orlando. The future extension of the service to Miami (Phase II) was examined at a lesser level of detail. TEMS provided ridership and revenue projections, as well as operating and maintenance estimates for four different technologies and nine route alternatives. TEMS also completed the financial and economic analyses and assessment of the feasibility of the system. TEMS’ analysis served as the basis for the evaluation of high-speed rail in Florida by the state legislature and the governor.

SERVICES PROVIDED: Ridership and revenue forecasts, operations planning, financial and economic analysis.

REFERENCE: Mr. Nazih Haddad - 608.266.2972

MINNESOTA DEPARTMENT OF TRANSPORTATION
TRI-STATE II HIGH-SPEED RAIL FEASIBILITY STUDY - PHASE I AND II
The study assessed the growing need for high-speed rail service in the Tri-State Corridor. TEMS provided policymakers with information needed to make optimal route/technology decisions, including demand forecasts, economic/engineering/freight analyses, financial and institutional arrangements, and a realistic timetable for successful implementation. To this end, TEMS evaluated the potential for various high-speed rail options in the Chicago-Milwaukee-Minneapolis/St. Paul corridor. The study considered incremental improvements from one speed threshold to another for five- to fifteen-year planning and implementation.

SERVICES PROVIDED: Demand forecasting, economic and engineering Analysis

REFERENCE: Mr. Cecil Selness - 651.366.3666
MASS TRANSIT ADMINISTRATION
BALTIMORE-WASHINGTON MAGLEV
TEMS developed the demand forecast for the Baltimore-Washington Maglev study, one of seven projects competing for Federal Railroad Administration FRA Maglev Deployment funding. TEMS’ analysis identified ridership and operating revenues for the Baltimore-Washington corridor and for the eventual build-out that would extend from Charlotte, NC, to Boston, MA. TEMS also identified potential economic, environmental and resource benefits.

SERVICES PROVIDED: Ridership and revenue forecast, financial and economic impact analyses.

REFERENCE: Jack Kinstlinger, CEO - 410.316.7803

WISCONSIN DEPARTMENT OF TRANSPORTATION
MILWAUKEE TO MADISON PASSENGER RAIL CORRIDOR STUDY - CAPACITY ANALYSIS
The Milwaukee-to-Madison Passenger Rail Corridor Study is part of the Phase I startup of the Midwest Regional Rail Initiative (MWRRI) and sets out a ten-year implementation program that will provide daily passenger rail service from Chicago to Milwaukee, Madison, Green Bay and the Twin Cities by the year 2010. A key requirement for implementing such a project is mitigating the use of right-of-way that is currently owned by the freight railroads. As such, the Wisconsin Department of Transportation (WisDOT) and Canadian Pacific Railroad (CP) agreed to carry out a track capacity analysis study for the Chicago/Milwaukee/Twin Cities corridor. The goal of the study was to identify the short- and long-term capacity needs of the corridor in terms of both freight and passenger train operations.

SERVICES PROVIDED: Capacity analysis, track and train database development, freight forecasts, infrastructure analysis, engineering assessment, operating integration analysis.

REFERENCE: Mr. Randall E. Wade - 608.266.2972

MINNESOTA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION
ROCHESTER AIRPORT MULTIMODAL STUDY
This study is concerned with assessing the role of Rochester Airport as a second airport for the Twin Cities. The study evaluated the potential for developing a Multimodal Passenger and Freight Terminal at Rochester Airport. The study assessed the market potential for freight and passenger traffic and the impact of improved accessibility with the Twin Cities airport. The analysis evaluated the financial and economic costs and benefits of the project. The study concluded that Rochester Airport could develop both freight and passenger services and identified the potential infrastructure required to support the terminal operations.

SERVICES PROVIDED: Freight and passenger demand forecasting, project evaluation, financial analysis, cost benefit analysis

REFERENCE: Mr. Cecil Selness - 651.366.3666
Florida Department of Transportation
Florida Intercity Rail Business Plan/Vision Plan
The Florida Vision Plan is an ongoing effort to improve and expand the passenger rail system in Florida. The program is sponsored by Florida DOT and is designed to develop an affordable, realistic short and long term plans to develop Florida’s intercity rail plan.

TEMS provides ridership and revenue forecasts, operations planning, financial and economic analysis, institutional arrangements, implementation, and business planning. The study has identified the public’s likely response to improvements in rail service including reliability, frequency, accessibility, and speed of service; and amenities such as enhanced station and on-board services (food, communications, baggage service, etc.) using stated preference survey techniques.

Services Provided: Operations analysis, demand forecasting, financial planning, market and economic assessment, institutional planning and public financing.

Reference: Mr. Nazih Haddad - 608.266.2972

Important Rail Business Planning Issues:
This key issues that TEMS has identified as critical to effective high speed rail planning are –

- Realistic Market Forecasts: MPO models are very poor at forecasting high speed rail traffic. As a result, TEMS developed the COMPASS™ model in order to produce Investment Grade forecasts.

- Proper integration of Ridership, Engineering, and Operations. This is typically poorly done as few transportation projects properly evaluate the demand, and supply issues (ridership, infrastructure and operations) that are essential to properly assess high speed rail projects. As a result, TEMS developed the Interactive Analysis.

- High Speed Rail Projects raise many “What If” questions about ridership, stations, technology, infrastructure etc. To answer these questions quickly and effectively is difficult. To overcome this problem TEMS developed the RightTrack™ System. The RightTrack System is described in the Appendices.
APPENDICES
APPENDIX A: PROJECT EXPERIENCE (ADDITIONAL PROJECTS & RIGHTTRACK™ SYSTEM)
Minneapolis-Duluth/Superior Intercity
Passenger Rail Feasibility and Business Plan Study

Services Provided: Business plan, rail operations analysis, transportation strategy development, demand forecasting, market and economic assessment and implementation plan.

Description of Project: For the Minneapolis-Duluth/Superior Corridor, TEMS developed a comprehensive business plan. The business plan was based on a market analysis for the corridor that defined base and forecast ridership and revenues for business, commuter, social and tourist travelers. The market analysis was used to evaluate three different technologies - 79 mph, 110 mph, and 125 mph. Specific operating and engineering plans were developed for each technology, and they were assessed using USDOT/FRA public-private partnership criteria. This required a positive operating ratio and cost benefit ratio. To support the public outreach for the project, TEMS completed an Economic Rent Analysis showing the benefits to each community of developing the passenger rail system.

Project Start Date
June 2007

Total Constructed Project Cost
$390 Million

Total Value of Services Provided
$550,000

Budget and Schedule Performance
All phases have been completed within budget and on schedule.

Client’s Project Coordinator
John Ongaro
St. Louis County
County Courthouse-Rm 202
Duluth, MN 55802
Tel: 218-726-2455

Similar Issues
Demand Forecasting
Operations Planning
Engineering
Economic Analysis
Cost/Benefit Analysis
Financial Planning
Passenger Freight Rail Integration
**Midwest Regional Rail Initiative (MWRRI) Nine Midwest States and FRA**

**Services Provided:** Operations analysis, demand forecasting, financial planning, market and economic assessment, institutional planning and public financing.

**Description of Project:** The MWRRI is an ongoing effort to improve and expand the passenger rail system in the Midwest. The program is sponsored by Amtrak, the Federal Railroad Administration, and the transportation agencies of nine states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.

TEMS leads the consultant team and provides ridership and revenue forecasts, operations planning, financial and economic analysis, institutional arrangements, implementation, and business planning, and directs the work of the other members of the consultant team.

The study identifies the public's likely response to improvements in frequency, accessibility, and speed of service; connections among services in Chicago; and amenities such as enhanced station and on-board services (food, communications, baggage service, etc.) using stated preference survey techniques.

TEMS’ TRACKMAN™ and LOCOMOTION™ models are being used to quantify ranges of potential track infrastructure and train technology improvements and their impacts on timetables, operating costs, and capital expenses. COMPASS™ was calibrated and applied to determine passenger forecasts and associated revenues. Specific equipment studies were completed to evaluate horsepower, train performance and life cycle costs.

TEMS developed significant information on the development potential for stations in the Midwest through on-site visits and discussions with local officials and developers for 70 of the 100 Midwest stations. The remaining stations were classified as to development potential based on the economic principles established in the Great American Station Foundation study, as refined through the specific Midwest examples for similar situations and population.

**Project Start Date**
April 1997 - ongoing

**Total Constructed Project Cost**
$6.3 Billion

**Total Value of Services Provided**
$4.0 Million

**Subconsultants Involved**
HNTB
PaineWebber, Incorporated
Davis O’Connell, Incorporated

**Project Director**
Alexander Metcalf

**Client’s Project Coordinator**
Randall E. Wade
Wisconsin DOT
Tel: 608.266.2972

**Similar Issues**
Passenger Rail Analysis
Demand Forecasting
Cost/Benefit Analysis
Financial Planning
Transit Integration
Station Development

**Budget and Schedule Performance**
To date, all phases have been completed within budget and on schedule.
**Ohio and Lake Erie Regional Rail System**

**Services Provided:** Demand forecasting, economic analysis, market assessment

**Description of Project:** In this study, TEMS was charged with the development of a business plan for the Ohio and Lake Erie Regional Rail System. The system consists of a 1,000-mile rail line in four corridors that connects two of the nation’s largest regional rail systems: the Midwest Regional Rail System and the Northeast Corridor System. Additionally, the Ohio and Lake Erie Regional Rail System will connect to nearly all of the urban communities of the states (Michigan, New York, Pennsylvania and Ohio) so that 90 percent of the region’s 24 million population will be within one hour’s drive of this integrated rail and feeder bus system. In order to develop the business plan, TEMS carried out an extensive analysis of the engineering, operations, ridership, and revenues associated with the project. Using this data, TEMS built a business plan that assessed both the financial and economic potential of the system. The evaluation assessed the potential for public/private partnerships and the role of federal funding for the project. To meet this need, the economic evaluation used both US DOT as well as a community evaluation of the economic benefits of the project.

**Project Start Date**
October 2001

**Project Completion Date**
September 2002

**Total Constructed Project Cost**
$3.5 billion

**Subconsultants Involved**
HNTB

**Client’s Project Coordinator**
Mr. Don Damron
ORDC
Tel: 614.466.2509

**Similar Issues**
Demand Forecasting
Economic Analysis
Market Assessment

**Budget and Schedule Performance**
The study was completed on schedule and within budget.
MAINE, NEW HAMPSHIRE AND MASSACHUSETTS DEPARTMENTS OF TRANSPORTATION: RESTORATION OF PORTLAND-BOSTON COMMUTER RAIL SERVICE STUDY

Services Provided:
Demand Forecasting

Description of Project: TEMS’ staff was responsible for the demand forecasting and alternatives analysis for the restoration of rail service between Portland, Maine, and Boston, Massachusetts. The analysis identified the financial and economic benefits of restoring the rail service and recommended its implementation. Specific tasks included:

- Development of a study plan for State and FTA approval
- Completion of stated preference and origin-destination surveys and development of an origin-destination matrix for auto, air, bus and intercity/commuter rail
- Calibration of COMPASS™ traffic forecasting model for total demand and modal split, including the new integrated intercity rail/bus service.
- Development of 25-year traffic forecasts for three purposes and four modes, including market shares and level of induced demand
- Development of operations plan using the LOCOMOTION™ TPC Model, which provided stringline diagrams of train timetables and a fleet analysis of rolling stock needs.
- Financial and economic evaluation using RENTS™ Model of alternative rail and integrated rail/bus strategies.
- Development of an implementation plan.

Project Start Date
November 1993

Project Completion Date
January 1997

Total Constructed Project Cost
$7.5 Million

Total Value of Services Provided
$350,000

Client’s Project Coordinator
Mr. Michael J. Murray, P.E.
Special Projects Engineer
Maine Dept. of Transportation
State House, Station #16
Augusta, Maine 04333
Tel: 207.287.2346

Similar Issues
Ridership and Revenue Forecasting
Cost/Benefit Analysis

Budget and Schedule Performance
Within budget and on schedule.
ORLANDO-PORT CANAVERAL CORRIDOR: INDEPENDENT PASSENGER AND FREIGHT TRAFFIC AND REVENUE ANALYSIS FOR BEELINE, INC.

Services Provided: TEMS provided transportation ridership and revenue analysis and forecasting.

Description of Project: TEMS conducted a traffic and revenue analysis for the Beeline Monorail/LRT System in the Orlando-Port Canaveral Corridor. The system connects Orlando attractions and hotels with the Orlando Airport, Kennedy Space Center, and Port Canaveral. TEMS developed a corridor database using existing Florida DOT statewide origin-destination data, and specific corridor data and statistics provided by the City of Orlando Planning Department. TEMS calibrated its COMPASS™ forecasting model to estimate total corridor passenger traffic, induced demand, market shares and passenger and revenues for the system. The forecast included tourist and cruise ship passenger analysis. A separate forecast was prepared of cruise ship potential and passenger volumes. The GOODS™ model was used to estimate the role that the Beeline System can play in the drayage of containers from the Port of Cape Canaveral to Orlando rail yards. Estimates were made of both traffic volumes, market shares and revenues. Commodity type revenue yield techniques were applied to maximize revenues. The forecasts prepared gave segment, corridors, station volumes, and passenger miles. Forecasts were made for the period 2003 to 2022, the estimated project life.

Using the output of the COMPASS™ and GOODS™ models, TEMS prepared a detailed financial plan for the project that included proforma balance sheets, financial statements, and sources of funds.

Project Start Date
September 1998

Project Completion Date
December 1998

Total Constructed Cost
$600 Million

Total Value of Services Provided
$500,000

Budget and Schedule Performance
The analysis was performed within budget and completed on schedule.

Client’s Project Coordinator
Beeline Monorail, Inc.
c/o Vanasse Hangen Brustlin, Inc.
135 West Central Boulevard
Suite 150
Orlando, Florida 32801
Tel: 407.839.4006

Similar Issues
Ridership/Revenue Forecasts
Financial Analysis
Freight Forecasts
Financing Strategies


**Florida Department of Transportation:**

**Florida Intercity Rail Business Plan**

**Services Provided:** Operations analysis, demand forecasting, financial planning, market and economic assessment, institutional planning and public financing.

**Description of Project:** The Florida Vision Plan is an ongoing effort to improve and expand the passenger rail system in Florida. The program is sponsored by Florida DOT and is designed to develop an affordable, realistic short and long term plan to develop Florida’s intercity rail plan.

TEMS provides ridership and revenue forecasts, operations planning, financial and economic analysis, institutional arrangements, implementation, and business planning.

The study identifies the public’s likely response to improvements in rail service including reliability, frequency, accessibility, and speed of service; and amenities such as enhanced station and on-board services (food, communications, baggage service, etc.) using stated preference survey techniques.

TEMS’ TRACkMAn™ and LOCOmOTION™ models are being used to quantify ranges of potential track infrastructure and train technology improvements and their impacts on timetables, operating costs, and capital expenses. The COMPASS™ demand model was calibrated and applied to determine passenger forecasts and associated revenues.

**Project Start Date**
July 2005 - ongoing

**Total Constructed Project Cost**
$1.5 Billion

**Total Value of Services Provided**
$200,000

**Budget and Schedule Performance**
To date, all phases have been completed within budget and on schedule.

**Client’s Project Coordinator**
Nazhi Haddad
Florida Department of Transportation
605 Suwannee Street
Tallahassee, Florida 32399
Tel: 850.414.4534

**Similar Issues**
Passenger Rail Analysis
Demand Forecasting
Operations Planning
Economic Analysis
Cost/Benefit Analysis
Financial Planning
Transit Integration
Station Development
**Tri-State II High-Speed Rail Feasibility Study**

**Services Provided:** Demand Forecasting, Economic/Engineering Analysis

**Description of Project:** The study assessed the growing need for high-speed rail service in the Tri-State Corridor. TEMS provided policymakers with information needed to make optimal route/technology decisions, including demand forecasting, economic/engineering/freight analyses, financial and institutional arrangements, and a realistic timetable for successful implementation. To this end, TEMS evaluated the potential for various high-speed rail options in the Chicago-Milwaukee-Minneapolis/St. Paul corridor. The study considered incremental improvements from one speed threshold to another for five- to fifteen-year planning and implementation.

This highly interactive study explored the interaction between various routes and technologies. TEMS used its **LOCOMOTION™** model to calculate operating times for each route/technology option. Their **COMPASS™** demand forecasting system projected ridership and revenue for each option using forecasts based on travel characteristics, survey findings and demographics. The study also estimated capital and operating costs and identified the optimum trade-off between capital investment and operating speed.

**Project Start Date**  
January 1998

**Project Completion Date**  
April 1999

**Total Value of Services Provided**  
$400,000

**Subconsultants Involved**  
Charles H. Quandel Associates  
William L. Gallagher

**Client’s Project Coordinator**  
Mr. Dan Krom  
Principal Planner/Supervisor  
Minnesota Department of Transportation  
Transportation Building  
395 John Ireland Boulevard  
Room 470  
St. Paul, MN  55155  
Tel: 651.296.1611

**Similar Issues**  
Ridership and Revenue Forecasting  
Economic/Financial Analysis  
Engineering/Freight Traffic  
Operations Planning

**Budget and Schedule Performance**  
The analysis was performed on schedule and within the specified budget.
Maryland Mass Transit Administration, KCI, and Parsons
Brinckerhoff Quade & Douglas: Baltimore-Washington Maglev

Services Provided:
Ridership and revenue forecast, financial and economic impact.

Description of Project:
TEMS developed the demand forecast for the Baltimore-Washington Maglev study, one of seven projects competing for Federal Railroad Administration FRA Maglev Deployment funding. The analysis identified ridership and operating revenues for the Baltimore-Washington corridor and for the eventual build-out that would extend from Charlotte, NC, to Boston, MA. TEMS also identified potential economic, environmental and resource benefits.

Project Start Date
October 1999

Completion Date
Ongoing

Total Project Cost
$660,000

Subconsultants Involved
None

Clients’ Project Coordinator
Jack Kinstlinger, CEO
KCI
10 N. Park Drive
Hunt Valley, MD 21030
Telephone: 410.316.7803

Similar Issues
Tolls and Pricing
Traffic Forecast
Economic Analysis
Financial Analysis

Budget and Schedule Performance
On time and within budget.
TEMS is an innovator in systems and software design. TEMS uses its extensive industry experience to develop systems that provide an interface between tactical, day-to-day management problems and overall corporate and public goals of the industry. TEMS’ systems are user-friendly and easily accessible by engineers and planners with little or no computer expertise. They prioritize the decision-making process and interact directly with both existing and developing databases.

**RightTrack™ Business Planning System**

**TEMS** designed the **RightTrack™ Business Planning System**, a suite of software that operates interactively to formulate alternative scenarios in order to optimize outcomes by balancing capital investment and projected ridership and revenue. TEMS’ team of experienced specialists analyze the output generated by the system and make informed recommendations to clients from federal, state, and local government agencies; railroad companies; international development organizations; banks; and a wide range of industrial and commercial companies.

The **RightTrack™** system is designed to interface with condensed profiles, timetables, track condition, and other databases already in existence. The system incorporates an “Interactive Analysis” that allows a wide range of demand, revenue, technology, service levels, capital investment, and right-of-way condition issues to be assessed by a “what if” evaluation of possible options. In this way, “fatal flaws” can be identified and more favorable options developed.

**RightTrack™** enables transportation planners to:
- Develop realistic operating strategies that relate ridership and revenues to a specific level and quality of service. Rapidly evaluate and re-evaluate different route (speed), technology (speed), operations (service levels), and ridership (fare) options. Identify the capital investment needed to maintain track and other infrastructure at the optimum level for a given rail service. Interpret traveler behavior to determine the level and quality of service that create incentives for train use.
- Maximize ridership and revenues while minimizing costs by achieving a balance among service, operations, and infrastructure investment. Evaluate projects in terms of their financial return, user benefits, and the increase in jobs, income, and development opportunities.
**TRACKMAN™** (Track Inventory System) is a corridor track inventory and assessment system that analyzes track infrastructure and estimates the cost of upgrading for various scenarios. It stores, on a milepost-by-milepost basis, data on track condition and track geometry such as curvature, gradient, and turnouts; structures such as bridges, crossings, and stations; maximum operating speeds; and unit costs for engineering improvements.

**LOCOMOTION™** (Train Performance Calculator) provides the rail operations planner with a highly sophisticated, yet easy-to-use tool for creating and analyzing rail operations schedules. **LOCOMOTION™** also provides a single, easily accessible source of detailed information on rail corridor characteristics and attainable train speeds. The system creating and altering train technologies enables users to describe their acceleration and deceleration profiles. With **LOCOMOTION™**, it is possible to model rail corridors, create timetables for different train technologies, and produce speed profile and operating diagrams. **LOCOMOTION™** interfaces with **TRACKMAN™**, producing a complete graph profile for a given route.

**MISS-IT™** (Major Interlocking Signaling System-Interactive Train Planner) is an event-based conflict resolution model designed to increase rail system efficiency. The system draws together track infrastructure data stored in **TRACKMAN™** and the timetables generated with **LOCOMOTION™** to determine the interaction of trains on a specified corridor. **MISS-IT™** uses data on existing infrastructure, such as sidings and double-track, and makes decisions regarding delays and procedures based on given priorities. **MISS-IT™** tests the effects of additional infrastructure on a given route and determines whether these changes create or alleviate bottlenecks within the system. The system is capable of displaying outputs in an animated graphics mode.

**COMPASS™** (Demand Forecasting System) is a comprehensive strategic policy planning tool that assists rail, highway, air, and transit management in planning their systems. **COMPASS™** generates ridership forecasts; revenue estimates; and rail, highway, air, and transit market shares over a given timeframe for a variety of conditions. Forecasts are made over a 25 year time frame and fares can be optimized using revenue yield analysis. **COMPASS™** provides both sensitivity and risk analysis.

**GOODS™** (General Optimization of Distribution Systems) is a modeling framework designed to support the analysis of freight traffic flows at the regional or urban level. The model uses data on current traffic flows, regional economic growth potentials, and specific industrial development proposals to develop total freight traffic flows and forecasts. The evaluation processes of the **GOODS™** model include both financial and economic analyses that identify the commercial potential of new transportation infrastructure, as well as the economic benefits to users and surrounding communities.

**RENTS™** (Financial and Economic Analysis Model) uses output from **COMPASS™** to estimate the financial and economic benefits of a project. This includes financial return (operating ratio, NPV and IRR), economic return (gross and net consumer surplus, NPV, and cost benefit ratio), and community benefits (changes in household income, employment by sector, property values, and population) that result from infrastructure and technology improvements or train and fare modifications.
APPENDIX B: RESUMES OF KEY STAFF
Alexander E. Metcalf, Ph.D.

President

EDUCATION
B.S., Economics (Honors), London University, 1968

Dr. Metcalf, as President of TEMS assumes overall responsibility for the firm’s high speed rail, policy, forecasting, economics, planning and system studies. He is an internationally recognized authority in the areas of high speed rail economics, business planning, demand forecasting, economic and financial analysis and transportation models and systems. Dr. Metcalf developed the COMPASS™ demand forecasting model.

Dr. Metcalf began his career in research at the Royal Institute of Public Administration in London, England, became an economic advisor for transportation with the European Community and transportation policy and planning studies. He was Chairman of the European Freight Study and a member of the Technical Advisory Committee for the European Passenger Study. He was appointed Chief Economist at British Rail and London Transport and, upon privatization, Managing Director of Transcon International. Over his career he has carried out major high speed rail policy and planning studies for British Rail, SNCF, the World Bank, the Asian Development Bank and USDOT.

**REPRESENTATIVE RAIL PROJECTS DIRECTED BY DR. METCALF**

**Maglev, High Speed and Passenger Rail Forecasting Studies**

Dr. Metcalf has carried out more than fifty high speed rail studies across North America.

Representative projects include:
- Minneapolis-Duluth/Superior High Speed Restoration of Intercity Passenger Rail Service - Comprehensive Feasibility Study and Business Plan – St. Louis and Lake County Regional Rail Authority
- Ohio and Lake Erie Regional Rail System – Ohio Rail Development Corporation
- Midwest Regional Rail System – Federal Railroad Administration and Nine Midwest States
- Florida High Speed Rail – Report to the Legislature – Florida Department of Transportation
- Alberta High Speed Rail Investment Ridership Study – Alberta Infrastructure and Transportation
- Lansing-Detroit Commuter Rail Study – Michigan Department of Transportation
- Birmingham LRT Study – Jefferson County, Alabama
- Hiawatha Commuter Rail Extension Service Evaluation – Wisconsin Department of Transportation
- Boston-Portland Commuter Rail Study – Maine Department of Transportation
- Baltimore Regional Rail Economic Impact Study – MTA
- Assessment of the Proposed Bergen County Light Rail Line – New Jersey Department of Transportation
- New York Airport Light Rail Access Study for Kennedy and LaGuardia Airports – Port Authority of New York/New Jersey
- 3C Corridor - High Speed Rail Corridor between Cleveland and Cincinnati – Ohio Rail Development Corporation
- Chicago-Twin Cities High Speed Rail Study – Minnesota and Wisconsin DOT’s
- Chicago-Detroit High Speed Rail Study – Michigan Department of Transportation
- Ontario High Speed Rail Study – Transport Canada
- North-South Rail Link Ridership and Revenue Forecasts – Massachusetts Bay Transportation Authority
- FOX/Florida Demand Assessment – Florida Department of Transportation
- VIA Fast Independent Evaluation of Ridership and Revenue – VIA Rail Canada
- Baltimore-Washington Maglev Study – MTA
PUBLICATIONS AND PRESENTATIONS

The wide range of Dr. Metcalf’s experience in freight rail is reflected in his publications:


“Equation for Success,” High Speed Ground Transportation Association, Chicago, 1999

“Modeling High Speed Rail Revenue Yield,” TRF Conference, 2002

“Can Passenger Rail Pay?,” APTA Annual Conference, 2004
Edwin R. “Chip” Kraft, Ph.D.
Director of Operations Planning

EDUCATION
Ph.D., Systems Engineering, University of Pennsylvania, 1998
M.S., Civil Engineering, University of Pennsylvania, 1983
B.S., Civil and Urban Engineering, University of Pennsylvania, 1982, magna cum laude
B.S., Economics, University of Pennsylvania’s Wharton School of Business, 1982, magna cum laude

Dr. Kraft, as Director of Rail Planning for Transportation Economics & Management Systems, Inc., brings more than 25 years of expertise in passenger and freight rail planning systems. Dr. Kraft has led demand, operational, logistics, financial and planning studies, as well as management system development projects. Dr. Kraft’s recent projects include the Minneapolis-Duluth-Superior High Speed Restoration of Intercity Passenger Rail Service-Comprehensive Feasibility Study and Business Plan, Florida Passenger Rail Business Plan, Midwest Regional Rail Initiative, The Ohio and Lake Erie-Cleveland Hub Study, Indianapolis-Louisville Passenger Rail Study, and the Alberta High Speed Rail Market Assessment. These projects required demand forecasting, operations planning, capacity analyses, and development of economic cost-benefit analyses.

RELEVANT PROJECTS

Minneapolis-Duluth/Superior High Speed Restoration of Intercity Passenger Rail Service - Comprehensive Feasibility Study and Business Plan
For this project, Dr. Kraft led the operations planning and financial planning analysis. This included developing train schedules and operating costs, and building the financial and economic analysis plans for the project. Dr. Kraft developed the Implementation Plan and prepared the Business Plan.

Florida Passenger Rail Business Plan
For Florida Department of Transportation, Dr. Kraft has been leading the Business Planning work designed to bring passenger rail service to Florida by 2010. The work includes evaluating 79 mph, 90 mph, and 110 mph incremental passenger rail service. Specific tasks included demand forecasting, operations planning, implementation planning, and financial analysis. The financial business plan was submitted to Florida DOT and used to develop internal financing and funding programs for high speed rail.

The Ohio and Lake Erie – Ohio Hub Study
This study, similar to the MWRRI, involved revenue and cost analysis for operating feasibility through 40 years of project timeline. Dr. Kraft directed the development of the multimodal demand model used to assess the potential ridership for the Ohio Cleveland Hub. His team carried out an extensive market assessment for four different route options, demand forecasts for eleven different scenarios involving two train technologies, with and without proposed Midwest Regional Rail network connectivity. He also completed the operating financial model and financial plan for a number of integrated alternatives and route choices. The financial plan generated cash flow analysis, a sources and uses of funds statement, NPV analysis, and financial sensitivity to establishing financial feasibility.

Midwest Regional Rail Initiative
Dr. Kraft directed the development of a detailed financial and business model for the entire proposed Midwest Regional Rail Initiative’s (MWRRI) network. The financial analysis included revenue and cost analysis for operating feasibility through 40 years of project timeline. The analysis also generated a statement of operations and key statistics to determine the operational feasibility of the project. The operating financials were then used to prepare a detailed financial plan for the MWRRI. Dr. Kraft’s team estimated demand and revenue forecasts for the MWRRI along with having evaluated system performance sensitivities with regard to feeder bus service and a range of local and express train schedules.
**Indianapolis-Louisville Passenger Rail Study**

The Indianapolis-Louisville corridor was evaluated as an extension to the Midwest Regional Rail Initiative (MWRRI). Financial models previously developed for the MWRRI were extended to incorporate the Louisville extension, so that an incremental revenue and cost analysis could be developed. Dr. Kraft’s team assessed the demand and revenue forecasts for the entire MWRRI network both with, and without, the Louisville extension. Operating costs were compared to revenues to assess the financial feasibility of adding the service. Estimates of capital costs, revenues, consumer surplus, and other mode benefits were developed in order to determine the cost/benefit ratios for the Louisville extension as an increment to the base MWRRI system. In addition, Dr. Kraft preformed an operational assessment including a detailed evaluation of the infrastructure needs and estimated the capital costs for upgrading the line to 110-mph operation using the RightTrack™ system.

**Alberta High Speed Rail Market Assessment**

Dr. Kraft carried out a financial and economic comparison of the four technologies being considered for the Alberta Edmonton-Calgary corridor. This included 125 mph, 150 mph, 185 mph, and maglev options. The analysis identified the operating and capital costs for each technology, the revenue potential, and both the financial and economic returns for each technology. The analysis was presented in both a technical and executive report and as a PowerPoint presentation.
BRIAN T. SCALES, P.E., Ph.D.
Rail Technologist

EDUCATION
Ph.D., Mechanical Engineering, University of Surrey, 1971
B.S., Mechanical Engineering, Kings College, University of London, 1956

Dr. Scales has more than 45 years of experience as a transportation engineering consultant involved in design, testing, research and development, economic and performance evaluation of passenger and freight rail systems and components and related guided ground transportation systems and vehicles. He has several U.S. Patents filed for rail-related inventions.

Dr. Scales has published a number of technical articles in highly respected transportation publications and has held positions as Visiting Lecturer in Railway Mechanical Engineering at Trinity College in Dublin, Ireland and lectured to Master’s Degree students in Railway Engineering, sponsored by British Rail.

PROFESSIONAL EXPERIENCE AND RELEVANT PROJECTS

MIDWEST REGIONAL RAIL SYSTEM
Dr. Scales served as the Technical Expert on this project. His work included the evaluation and comparison of performance of three trainsets suggested for use on this proposed passenger rail service traveling through nine Midwest States with a Chicago Hub. He also prepared and presented other reports and evaluations relating to train technologies on this project.

FLORIDA HIGH SPEED RAIL SYSTEM
As Technical Expert on this project, Dr. Scales defined the trainset configuration to suit the proposed high speed passenger rail service and developed performance requirements of this trainset to meet the projected timetables.

CANADIAN “JET TRAIN” PERFORMANCE
Dr. Scales served as the Technical Expert for the development of the “Jet Train” proposed by Bombardier for high speed service in the Montreal-Quebec-Toronto corridor. Dr. Scales developed the train performance data for the trainset as powered by two gas turbine powered locomotives, one at each end, and data for the trainset powered by only one locomotive.

INNOVATIVE RADIAL TRUCK FOR HIGH SPEED PASSENGER RAILCARS
The first phase of this multiphase project funded by the Federal Railroad Administration has been completed and consisted of the design of the radial truck. This work consisted of engineering design calculations, production of a set of arrangement drawings and detail drawings for manufacturing. Phase II of the project will be the manufacture of prototype trucks for testing when installed under a typical car, proposed as a former Long Island locomotive-hauled commuter car. Funding for Phase II is now being sought.

HI-LO BI-TRACK SYSTEM
The Hi-Lo Bi-Track System provides superelevations for curves in rail track that are appropriate for both high speed passenger trains and low speed freight trains. This objective is achieved by the use of the well-known “gauntlet track” configuration for the curve, with the outer track of the gauntlet pair being superelevated to suit high speed trains, while the inner track is superelevated to accommodate low speed trains. High speed switches at each end of the curve control entry to and exit from the gauntlet section. Adoption of the Hi-Lo Bi-Track System facilitates the introduction of high speed passenger service on existing freight train routes because both types of trains can run through curves at their optimum speed. Preliminary engineering and a feasibility study have been completed under Phase I. Phase II will consist of a detailed engineering study and an economic evaluation of the benefits likely to be achieved in cases where high speed passenger and low speed freight trains share the same track. Funding for Phase II has been requested from the Transportation Research Board under its IDEA Program.
Giovanni Santoboni, Ph.D.
Transportation Analyst

EDUCATION
Ph.D., Nonlinear Dynamics, Centre for Nonlinear Dynamics, University College London, London, 1999
Laurea, Physics, Nonlinear Dynamics, University of Cagliari, Cagliari, Italy, 1996, 110/110 magna cum laude

Giovanni Santoboni is part of TEMS’ demand modeling and forecasting team. He has been involved in the development of the intra-urban COMPASS-U™ model and in a varied selection of projects where he has been responsible for database development, model development, discrete choice modeling, the performance of flow analyses, and for conducting market research and stated preference surveys.

RELEVANT PROJECTS

Minneapolis-Duluth/Superior High Speed Restoration of Intercity Passenger Rail Service - Comprehensive Feasibility Study and Business Plan
Dr. Santoboni led the ridership and revenue analysis for this study. The analysis evaluated corridor demand, and the impact of corridor attractions such as the Grand Casino Hinckley, ski resorts, and sports franchises. The analysis predicted demand for 79 mph, 110 mph, and 125 mph technologies. In completing the study, Dr. Santoboni used the COMPASS™ multimodal demand model, which provided the input to the financial and economic analysis developed in RENTS™

Alberta Investment Grade High Speed Rail Study
Dr. Santoboni led the TEMS study of high speed rail ridership and revenue for the Alberta Department of Infrastructure and Transportation. The study required the completion of data collection, model calibration and the financial and economic evaluation of four different levels of high speed rail (125 mph, 150 mph, 185 mph, and 250 mph).

Ohio Passenger Rail System
Dr. Santoboni supported the development of the long-term plan to bring passenger rail service to Ohio. His work included evaluating the passenger rail forecasts for the plan and developing the financial and economic analysis for the system. In developing the Ohio Hub Plan, Dr. Santoboni calibrated both the COMPASS™ demand model and the RENTS™ financial and economic models.

Midwest Regional Rail Initiative
For this study Dr. Santoboni helped develop the COMPASS™ model, and supported its calibration and use in forecasting ridership and revenue for the 3,000 mile passenger rail system. The analysis included data collection, model calibration, ridership and revenue forecasts.

BC Ferries Routes 17, 18 and 7 Study – Phase I
Dr. Santoboni was responsible for updating the British Columbia regional model to a new base calibration year and undertook several price elasticity sensitivities for the major ferry routes. The analysis evaluated the historical and forecasted price elasticity characteristics of ferry service in the greater Vancouver area and will provide input to an updated BC Ferry financial business plan proposal.

As part of the evaluation of BC Ferries major routes, Dr. Santoboni is providing an analysis of data collected for the previous three years to assess ferry fare elasticities in the greater Vancouver area. The results of the analyses are being used to fund new bonds and capitalize new infrastructure projects.
**PROFESSIONAL RESEARCH EXPERIENCE**

*Richmar & Associates, Research Scientist, Washington, DC*

While with Richmar & Associates, Dr. Santoboni was involved in the preparation of dynamic models, analysis and simulation of systems of interest in the field of Business Process Reengineering. His particular interest and contribution was in the possible application of analytical and numerical methods from control theory. His projects included modeling the effect of the current shortage of Air Traffic Controllers on the capability to process flights at a facility level. Dr. Santoboni also collaborated with team members to prepare proposals for government contracts.

*Research Collaboration with Prof. Franco Meloni, of the Physics Department of the University of Cagliari, Italy*

Along with Professor Franco Meloni, Dr. Santoboni developed numerical algorithms for the simulation of coupled reaction-diffusion systems with very different diffusion rates. This collaboration was intended to provide a numerical support to the modeling of reaction-diffusion systems. The investigation used classical diffusion theory, while the numerical counterpart was accomplished using grid-algorithms programmed in C/C++. 
Lyudmila Bzhilyanskaya, Ph.D.
Economist

EDUCATION
Ph.D., Economics, Moscow State University, Moscow, Russia, 1990
M.A., Economics, Moscow State University, Moscow, Russia, 1987
B.A., Economics, Moscow State University, Moscow, Russia, 1986
Diploma in Accounting, Stratford Career Institute, New York, 2003

FELLOWSHIPS AND SCHOLARSHIPS
John D and Catherine T. McArthur Foundation – individual research
Carnegie Foundation – study and research at Georgetown University, Washington, DC
British Academy – research at Sussex University, UK
British Council – study and research at the University of Birmingham, UK
Program Diderot – research in Higher Polytechnic School (Ecole Polytechnic), France
Eurasia Foundation – participation in American-Russian Summer Economic School, RF

Dr. Bzhilyanskaya will serve as the project economist responsible for socioeconomic projections and financial and economic analysis. She is a mathematical economist highly experienced in quantitative socioeconomic research and in the development of socioeconomic projections of population, income, and employment. Her research includes new quantitative methods for economic and financial analysis and she has written more than forty papers on critical aspects of lifecycle cost analysis, financial evaluation procedures and cost benefit analysis. Dr. Bzhilyanskaya’s work includes both long wave economic linear and non-linear analysis and classic input-output modeling. Her projects include the development of non-linear and combinational models of economic growth and intersector transportation relationships. Since joining TEMS, Dr. Bzhilyanskaya has worked on a wide range of transportation projects including both business and vision plans for intercity rail.

RELEVANT PROJECTS

Minneapolis-Duluth/Superior High Speed Restoration of Intercity Passenger Rail Service - Comprehensive Feasibility Study and Business Plan
Dr. Bzhilyanskaya provided the socioeconomic analysis for the long-term ridership and revenue analysis, and developed the Economic Rent Analysis. Using the TEMS RENTSTM model, she forecast the economic impact of the proposed rail system on the community providing estimates of the increased jobs, property values, and income increases in the corridor. She also provided a tax assessment.

Midwest Passenger Rail Economic Impact Study
In this study, Ms. Bzhilyanskaya developed models to measure the employment, income and wealth impacts of developing the Midwest Regional Rail System. The analysis used the TEMS Economic Rent Model RENTSTM, which identified the benefits on a station, route, state, and system basis.

Ohio Intermediate Passenger Rail Economic Impact Study
Ms. Bzhilyanskaya the lead analyst in developing effective economic impact models using the RENTSTM program for the Ohio Hub study. The analysis will measure economic impacts, income, and property values on a local, community, corridor and statewide basis.

Great Lakes and St. Lawrence Seaway New Cargoes New Vessels Study
Dr. Bzhilyanskaya developed the Market Analysis System and socioeconomic database for the project. This included coordinating Transport Canada and USDOT statistics and developing an integrated database. Long-term trade analysis provided the range of economic and trade futures to be used in the forecasting process. Dr. Bzhilyanskaya also undertook the cost benefit and financial analysis required for the project.
Florida Intercity Passenger Rail Business Plan, Florida Department of Transportation

For this study, Dr. Bzhilyanskaya developed the socioeconomic database for the statewide transportation model that was used to develop the Intercity Passenger Rail Plan. This included long-term projections of economic growth, as well as income, population, and employment. Economic scenarios were developed for central, upper, and lower economic growth, and consistent disaggregate economic projections developed. The intercity rail project options were assessed using Federal Railroad Administration financial and economic criteria. These include operating and cost benefit ratios. These analyses use appropriate discounted cash flow assessment of project lifecycle costs and both revenue and consumer surplus benefits.

VIA Fast Track Intercity Rail Program, VIA Rail

Dr. Bzhilyanskaya developed the transportation and socioeconomic database for the Windsor-Quebec corridor model. The analysis included the development of the zone system for the study, the development of origin-destination traffic and the financial and economic assessment of various rail investment plans. Specific analysis included the development of population, income, and employment forecasts, long-term projections of economic growth, a review of the stated preference survey methods, estimation of time values, and the development of appropriate financial and economic criteria.

In a separate analysis, Dr. Bzhilyanskaya assessed a wide range of potential rail corridors and completed a benchmarking of the levels of potential traffic that could be developed for specific intercity urban areas. This analysis identified the typical level of intercity ridership and revenue associated with different levels of rail service. The analysis was used to create a vision plan and a business case for each potential city-pair corridor.

PUBLICATIONS


Development of Input-Output Tables and Their Use as the Information Source of Inter-branch Complexes Formation”. Vestnik of Moscow State University, Moscow: Moscow State University, Series #6 (Economics), 1988, #3.


Celia M. Pew
Senior Editor

EDUCATION
B.A., Economics, Washington University
Certificate in Urban Studies, University of Illinois
Urban Economics, University of Chicago, Urban Affairs Institute

Celia Pew is a highly experienced transportation and land use economist, who is an expert in planning economics. Ms. Pew also has many years of experience managing contracts, meeting deadlines and performing the project management functions of a lead contractor on large projects. She has also been responsible for the project management and coordination of a number of major investment grade studies throughout North America. These include studies for both the private and public sector, including central and local government, development agencies and the air and transit industries. Ms. Pew has the overall responsibility for report preparation and for assuring the quality of all TEMS’ study products. As Chief Executive Officer of TEMS, Ms. Pew will also be responsible for contract administration and project costing.

REPRESENTATIVE PROJECTS
▪ Minneapolis-Duluth/Superior High Speed Restoration of Intercity Passenger Rail Service - Comprehensive Feasibility Study and Business Plan - St. Louis and Lake County Regional Rail Authority
▪ Boston-Portland Passenger Restoration Study – Maine Department of Transportation
▪ Ohio Hub Regional Rail Study
▪ Midwest Regional Rail Initiative (MWRRI) – Wisconsin Department of Transportation
▪ Toronto Go Transit Fare Integration Study – Go Transit
▪ Washington (DC) Metro Station Study – Washington Metropolitan Transit Authority
▪ Florida High Speed Rail Study – Report to the Legislature
▪ Southern California Rapid Transit Rail System Study – Southern California Association of Governments
▪ Baltimore-Washington Maglev Study – MTA
▪ Cross Dallas Rail Link Study – City of Dallas
▪ DART Planning and Implementation Study – City of Dallas
▪ Detroit-Lansing Commuter Rail Study – Michigan Department of Transportation
▪ Cork (Ireland) Land Use Transportation Study – Irish Ministry of Transport
▪ Dublin (Ireland) DART Commuter Rail Station Study – Irish Ministry of Transport

PREVIOUS EXPERIENCE
1986-1989    PMC Associates – Sole Proprietorship
1985-1986    Reynolds, Smith & Hills, Jacksonville, Florida – Director of Planning and Development Services for the Architectural Design Group
1983-1985    Center Development Incorporated, Chicago – Executive Vice President, Planning and Development
1974-1980    Skidmore, Owings & Merrill, Chicago – Project Planner and Zoning Coordinator for Chicago Office
1969-1973    City of Chicago, Department of Development and Planning – Staff Planner
CHARLES H. QUANDEL, P.E.

Education
MSCE, Lehigh University, 1972
BS, United States Naval Academy, 1969

Registration
Professional Engineer: Pennsylvania, Wisconsin, Maryland, Delaware, Illinois, New York, Kentucky, Florida, Ohio, Michigan, Colorado, Mississippi, Arizona, and Maine
Licensed Land Surveyor – Pennsylvania

Affiliations
Transportation Research Board- Intercity Rail Passenger Systems Committee
High Speed Ground Transportation Association – Chairperson, 2003 to 2006
American Public Transportation Association-High Speed/Intercity Rail Committee
American Public Transportation Association – Rail Conference Planning Subcommittee
American Association of Railroad Superintendents-Member
American Railway Engineering and Maintenance of Way Association-Member
American Society of Civil Engineers
American Society of Mechanical Engineers

Project Experience – High Speed & Intercity Rail – 1998 to 2007

Madison to Milwaukee High Speed Rail Connection for the Wisconsin Department of Transportation and Amtrak: Served as project manager for the preliminary engineering and environmental study of the 85-mile rail corridor needed to accommodate the integration of 20 high speed passenger trains.

Chicago to Milwaukee to Madison Rail Capacity, Conceptual Engineering, and Environmental Assessment for the Wisconsin Department of Transportation: Served as project manager for engineering services for operations simulation, line capacity analysis, and signal block layout of the Chicago to Milwaukee route.

Detroit-Chicago High Speed Rail Corridor Program Study: Served as project manager for a high speed rail study conducted for AMTRAK, Michigan Department of Transportation and the Indiana Department of Transportation.

Midwest Regional Rail Initiative for the Nine States of the Midwest Regional Rail System: Served as project manager and project engineer during the course of the development of the MWRRS, and in 2005, as project manager, recommended adoption of an implementation plan for Phase 1 to incrementally increase Amtrak service.

Tampa to Orlando High Speed Rail: Served as project manager and project technical lead for General Engineering Consultant services provided to the Florida High Speed Rail Authority for the Design, Build, Operate, Maintain, and Finance (DBOM&F) of the initial segment of the proposed High Speed Ground Transportation System (HSGTS).

Orlando to Miami High Speed Rail: Served as the project manager and project technical lead for this study that examined high speed rail technologies and corridors alignment options from Orlando to Miami.

Ohio & Lake Erie Regional Rail – Cleveland Hub Study: Served as project manager for engineering services required to assess the current condition of the railroad infrastructure and rights-of-way.

Northern Indiana/Northwestern Ohio Routing Study: Served as project manager for the engineering services required to assess the current conditions of the railroad infrastructure and rights-of-way.

Gary Alternative Rail Study, Indiana: Served as deputy project manager and project engineer for the evaluation of several alternative routes for passenger rail service in Indiana within the Cincinnati to Chicago corridor.

Wisconsin Rail Plan: Served as the project manager for the engineering assessment of the Chicago to Minneapolis/St. Paul corridor via the Janesville and Eau Claire routes.

Milwaukee to Green Pay Passenger Rail Alternatives Analysis: Served as project manager for the engineering assessment of the Milwaukee to Green route.

Kansas City to St Louis Inspection and Infrastructure Analysis of Union Pacific Railroad Right-of-Way: Served as project manager for engineering services needed to conduct an inspection with Amtrak.
Tri-State II High Speed Rail Feasibility Study, Wisconsin and Minnesota Department of Transportation: Served as project manager for engineering services to undertake a conceptual engineering analysis.

Rochester Rail Link Feasibility Study for the Minnesota Department of Transportation: Served as project manager for the engineering assessment of two routes along the Highway 52 corridor

Minnesota High Speed Rail Study: Served as deputy project director for the Minnesota High Speed Rail Study, requested by the Minnesota Department of Transportation to evaluate the feasibility of high speed rail service.


Chicago Transit Authority- Design and Construction Phase Services to Replace/Upgrade Signals: Served as principal-in-charge responsible for project management oversight of engineering services

Transport 2020, Madison, Wisconsin: Served as project engineer and conducted project management oversight for the preliminary engineering required to support a draft environmental impact and a new starts application

METRA Rock Island District, Chicago, IL: Served as project manager for the “recovery effort” associated with the final design of the signal and communications network, track realignment, and rehabilitation of three railroad bridges.

Ann Arbor-Downtown Detroit AA/DEIS Transit Study: Served as project manager and project engineer for engineering services required to support the initial Lansing-Detroit alternative analysis

Lansing-Detroit Commuter Rail Study, Michigan: Served as principal-in-charge responsible for project management oversight of the engineering services required to assess the current conditions of the railroad

Kenosha-Racine-Milwaukee Commuter Link: Provided project management oversight of the engineering services required to support the alternative analysis and environmental studies for this project.

New Bedford/Fall River Rail Project, MA: Provided project management and engineering planning services to Vanasse Hangen Brustlin, Inc for planning and environmental study of the New Bedford/Fall River Rail project for the Massachusetts Bay Transportation Authority.

East-West Gateway Council of Governments, Northside/Southside Study, St. Louis, MO: Provided project management oversight of a study to re-examine the preferred alternatives in each area and undertake conceptual engineering and environmental analysis of the preferred alternative.

Project Experience – Special Rail Projects – 1998 to 2007

Chicago Regional Environmental and Transportation Efficiency (CREATE) Program: Served as principal –in-charge responsible for project management oversight for the development of accurate engineering base mapping

Advanced Train Control System, Lockheed Martin for the Australian Railroad Track Corporation: Served as project manager for engineering services required to support Lockheed Martin Federal Railroad Administration Track Maintenance Study Served as project manager for engineering services needed to support Zeta Tech in a joint evaluation of track maintenance costs for high speed rail systems and to prepare a maintenance cost matrix

North American Joint Positive Train Control (PTC) to Canadian Pacific Railway Computer Aided Dispatching Interface Project for the Wisconsin Department of Transportation: Served as project manager for engineering services needed to evaluate dispatching (CAD) system details and dispatch operation requirements

Dane County Regional Airport Runway Safety Area Railroad Relocation, Madison, WI: Served as project manager for the initial planning and provided project management.

Project Experience – Magnetic Levitation Technology

SANDAG Maglev Study: Served as project manager for the preliminary engineering and design analysis for a dedicated Intermodal right of way link between San Diego and the proposed Regional International Airport

Tampa to Orlando: Served as project manager and project technical lead for General Engineering Consultant

Tri-State I Feasibility Study: Served as deputy project director and project engineer for a study to evaluate the potential for high-speed rail service, including magnetic levitation technology between Chicago and Minneapolis

Argonne National Laboratory Design: Served as project director for the conceptual analysis of the Argonne National Laboratory Maglev experimental facility

ROBERT J. MARROS, GISP

Planning Analyst

Education

2000 Master of Science, Resource Analysis (GIS) – Business Administration
St. Mary’s University of Minnesota, Winona, MN
Graduate Thesis (December 2005): “Using a Geographic Information System (GIS) to Visualize and Analyze Spatial Location in a Retail Environment”
www.gis.smumn.edu/GradProjects/MarrosR.pdf

2000 Graduate Certificate, Geographic Information Systems
St. Mary’s University of Minnesota, Winona, MN

1999 Bachelor of Arts, International Business
St. Mary’s University of Minnesota, Winona, MN

1999 Bachelor of Arts, Marketing
St. Mary’s University of Minnesota, Winona, MN

Project Experience

Rail Corridor Assessment Tool Development (RCAT), Chicago, IL
Lead GIS Analyst for data architecture and data development on the conceptual version of RCAT for the Association of American Railroads and the Federal Railroad Administration. This application utilizes context sensitive spatial information, such as demographic and environmental datasets, to assess criticality and security of rail infrastructure. Listed on a pending patent application related to the process and methodology of assessing security of railroad assets along a linear corridor in urbanized areas.

Northside/Southside MTIA Transportation Study, St. Louis, MO
Lead GIS Analyst responsible for GIS task management, extensive demographic analysis and methodology building, reporting, and graphic map development for reports. Deployed an ArcPad application for field collection and management of data. Set up and maintained an ArcSDE database for use across the corporate network.

ITS/GIS Strategic Plan, Ohio Turnpike Commission (OTC), Cleveland, OH
Served as GIS Analyst in the development of a comprehensive strategic plan for technology. Provided needs analysis report. Implemented a blueprint for technology innovation in management, operations and customer service. Project tasks included user interviews, documentation, research and report writing.

Chicago Regional Environmental and Transportation Efficiency (CREATE) Project, Chicago, IL
Lead GIS Analyst for this GIS/base mapping project to modernize the freight and passenger rail infrastructure throughout the Chicagoland area. Managed effort to develop customized software applications for data management, metadata management, and development of rail right-of-way and property mapping using light detection and ranging (LiDAR) and GPS surveying techniques.

I-69 Tier 2 Environmental Impact Statement, Indianapolis to Martinsville, Indiana
Served as lead GIS Analyst responsible for deploying an ArcSDE database as well as an ArcIMS website serving over 300 data layers for use by internal project managers. Managed three GIS technician/analysts in the development of a county-wide parcel base mapping using a versioned ArcSDE database.
Land Use/Transportation Study, Kankakee County, IL
Led the GIS mapping and analysis effort for this county-wide study. Tasks involved data conversion, database design and data analysis to support planners for current and future planning. Co-developed a themed ArcIMS website for use by the general public. Created numerous maps for comprehensive report and for discussion of conceptual plans in public meetings.

Publications

November 2005  Presenter, Developing A GIS From Light Detection and Ranging (LIDAR) Data to Improve Rail Congestion in Chicago, Illinois GIS Association Fall Conference (ILGISA), Oak Brook, IL

September 2005  Co-author, Lidar Data Acquisition and Mapping for the CREATE Program, AREMA Conference, Chicago, IL

April 2005  Presenter, Joint Session: Rail Panel - Spotlight on Chicago’s CREATE Rail Improvement Project, American Association of Port Authorities Conference, Chicago, IL
BRENDA MYERS BOHLKE, PH.D., P.G.

Senior Consultant

Education
Ph.D., M.S., University of California, Berkeley; Geological Engineering (Tunnel design in Washington DC transitional materials)
M.S., University of Miami, Marine Geology and Geophysics; Rosenstiel School of Marine and Atmospheric Sciences;
B.S., University of Maryland; Geology

Professional Background:

Dr. Bohlke is a nationally recognized project manager and leader in infrastructure development with a focus on transportation and underground facilities that has culminated in her recent election to Chair of the Underground Construction Association, dedicated to promoting excellence in underground planning, design and construction. Her diverse background and experience working for federal agencies as a design consultant, and time spent on Capitol Hill, has provided a unique, big-picture perspective to solving project issues. Whether she’s managing a billion-dollar project or serving as an advisor for a high-profile local needs assessment, Dr. Bohlke has the leadership capability to bring widely varied stakeholders together, resulting in creative solutions.

Transportation Tunnel Projects

Chesapeake Crescent: A public-private bi-partisan consortium of national and regional leaders whose objective is to create a political and regional governance framework to spur economic development and improve quality of life in the Chesapeake Region. Brenda serves as the Principal Transportation Consultant for the Secure and Sustainable Infrastructure Program, collaborating on the transportation needs to provide accessibility and mobility locally and throughout the region using high speed rail and regional rail networks that contribute.

Tysons Tunnel Project: Community Client Rep/Project Manager tasked with the ensuring fast-track preliminary engineering design and environmental assessment for a 3.4 mile large bore tunnel alternative for the 11.4 mile segment of the Dulles Metro Rail Extension. The large bore tunnel is a new configuration for metro system where one tunnel can accommodate up to four tracks or two tracks and two station platforms. This single large bore provides time and cost savings compared to the traditional twin bore-center platform metro systems.

ASCE Tunnel Review Panel for the Washington DC Metro Extension to Dulles Airport: Member of an expert Panel convened at the request of the Governor of Virginia to determine the feasibility of constructing a single, large diameter tunnel through Tysons Corner, Va using state-of-the-art Tunneling technology (the economic center of Virginia). This project is a public private partnership contract between Dulles Transit Partners and the Commonwealth of Virginia which had been designed as an elevated rail system.

Panama Canal Master Plan, Program Management Advisory Services: 2003-2004 As Project Manager, worked closely with staff from all areas of the Panama Canal Authority, including Administration, Environmental, Operations, Marketing, Engineering and Procurement. Dr. Bohlke was responsible for managing various studies for and the development of the Master Plan for the Expansion of the Panama Canal with emphasis on risk identification; market and engineering feasibility; construction estimating and program scheduling. This Master Plan was the basis for determining the viability, marketability and engineering feasibility of expanding the Panama Canal to handle Post Panamax Ships.
with the design and construction of the world’s largest locks, water saving basins, as well as deepening of the approach channels and deepening and widening entire canal system to accommodate deeper draft vessels and provide a larger fresh water reservoir.

**Sydney, Australia M5 East-Motorway Tunnel:** Principal Tunnel Design Consultant for this design-build project. The motorway involved six kilometers (km) of twin highway tunnels through the Hawkesbury Sandstone with a guaranteed design life of 100 years on all support and design elements. The tunnel was designed with a relatively flat arch roof in horizontally bedded sandstone using corrosion resistant rockbolts and steel fiber reinforced shotcrete as the final lining.

**Washington Metropolitan Area Transit Authority (WMATA), Three Sections of Metro Rail, Washington DC:** Tunnel Design Manager for design of Section F6 Anacostia to Southern Avenue Station. Dr. Bohlke was responsible for the design of foundations, lateral earth pressures for open cut and cut-and-cover sections and five shafts, excavation methodology, tunnel alignment, and soft ground tunneling through coastal plain sediments. Three segments of this project were constructed using deep open cut, EPBM bored tunnels, and NATM tunnel. Three sections were constructed using a combination of deep open cut stations, earth pressure balance machine (the second time used in the U.S.), NATM in soft ground waterproofing membranes. The at-grade section was changed to avoid environmental hazards and reduce the risks associated with disturbing incinerator ash deposits. Cost savings were realized through liner gasket design and solutions associated with environmental issues. The project was completed under budget.

**Port of Miami Tunnel, Florida:** Member of a three-person Tiger team convened to evaluate the feasibility of tunneling under Biscayne Bay and Government Cut shipping channel using conventional mechanical tunnel methods through karstic limestones. Large diameter pressure face bore to accommodate highway traffic access to the port. This project is a design-build-operate, maintain and finance concession.

**Woodrow Wilson Bridge Improvement Study, Maryland/Virginia:** The Woodrow Wilson Bridge crosses the Potomac River connecting the states of Maryland and Virginia. Age and congestion dictated the need for an evaluation of different alternatives to upgrade the crossing. This study involved the evaluation of bridge, tunnel and a combination of the two types of structures to replace and improve the traffic flow on this important crossing. Dr. Bohlke was involved in the evaluation of tunnel alternatives that included cut-and-cover cofferdam construction, sunken tube tunnels, and bored tunnels.

**Los Angeles Metro Tunnels, California:** In response to a fire during construction of the tunnels for the LA Metro, Dr. Bohlke conducted an evaluation of waterproofing membrane products with respect to flammability, performance during a fire, effective permeability, durability, and installation procedures. She also reviewed metro station excavation techniques, including cut-and-cover and various mining methods.
Steve Coffin’s communications experience has taken several forms over the years, ranging from practicing law at two of Colorado’s most prominent law firms to being a corporate officer at one of Colorado’s oldest energy corporations to being a senior staff member on Capitol Hill in Washington, D.C. for one of Colorado’s leading members of Congress. While seemingly disparate jobs, the common thread running through all these has been the strategic use of words to communicate, persuade, advocate and shape perception, with target audiences ranging from customers to elected officials to the media to the general public. This breadth of experience is one of Steve’s strongest assets that he brings to his clients.

As a Principal at GBSM, Steve has worked closely with some of Colorado’s leading businesses, non-profit organizations and communities. He has developed a reputation as a leader on water issues through his work on the Statewide Water Supply Initiative, an unprecedented study of Colorado’s water future, the Prairie Waters Project, the biggest public works project in the history of Aurora, Colorado, and as a key advisor to Denver Water in its communications efforts. He is also known as a leader on state transportation issues, and for his ability to take complex issues facing the public and translating them into terms and actions that are understandable.

Since joining GBSM in 2000, his practice has included work in the fields of transportation, energy, real estate development, health care, and water, among others. His clients have included Mayors, state cabinet officials, CEO’s, Directors, and Managers. Steve does more than work for his clients. He develops a deep understanding of the needs and culture of his clients, and as a result, is known for the excellent and highly responsive service he provides.
This is just one of the reasons that the majority of Steve’s clients have been with him for several years.

In short, whether it is called community relations, media relations, customer relations, public involvement, public affairs, Steve is an expert at communications, regardless of the audience or the medium.

Steve has served in a number of leadership positions in Colorado. Former Colorado Governor Roy Romer appointed him to the Colorado Air Quality Control Commission and asked him to chair the Blue Ribbon Panel on Transportation, a panel of state leaders developed to identify solutions to Colorado’s unmet transportation needs. Steve has also served on a number of non-profit boards of directors, including the Denver Metro Chamber of Commerce, the Aurora Economic Development Corporation, the Metro Denver Network, the Colorado Association of Commerce and Industry, the Colorado Oil and Gas Association, the Colorado Energy Assistance Foundation, the Petroleum Association of Wyoming, the Rocky Mountain chapter of the Anti-Defamation League, and as an alternate on the Colorado Forum. Steve has a B.A. from the University of Colorado and a J.D., with honors, from the National Law Center at George Washington University.
Andy Mountain thrives on tackling complex business and communications challenges. He’s spent the last decade doing exactly that for large and small corporations, government agencies and non-profit organizations.

As a Senior Associate, Andy serves as a strategic advisor and manages communications programs in the areas of natural resources, aging, transportation, public works, technology and others.

Andy has rock-solid expertise in strategic communications planning, public involvement and writing. He also has extensive experience in organizational management, media training, public-opinion research, media relations, investor relations, speechwriting and online marketing.

Andy’s experience prior to joining GBSM is multifaceted. Some of his fondest memories include leading the public-involvement team for RTD’s West Corridor Environmental Impact Statement; developing and running a national media relations campaign for Pumpkin Masters’ grassroots response to the September 11th tragedy; and managing corporate communications for MSN Carpoint – Microsoft’s online auto buying Web site.

Outside of work, Andy is actively involved in the community. He serves as the communications chair for the American Diabetes Association and is a member of the Denver Metro Chamber of Commerce’s 2006 Leadership Denver Class. He also volunteers his time to a number of nonprofit organizations supporting the arts.

Andy earned a BA in Journalism and Public Relations from the Phillip Merrill College of Journalism at the University of Maryland at College Park.
Carl Hanson, Ph.D., P.E.
Senior Vice President

A co-founder of Harris Miller Miller & Hanson Inc. (HMMH), Dr. Carl Hanson specializes in noise and vibration control engineering projects, particularly related to rail transportation.

He is active in a wide range of rail transportation projects including noise control designs of vehicles and facilities, compliance tests, environmental assessment, community measurement programs and expert testimony. In these activities, Dr. Hanson consults for architects, engineers and planners on projects for railroads, rapid transit properties, state agencies and the Federal government. He has been especially active in the area of high speed rail and maglev systems, having conducted research and consulting projects in the United States and Europe.

Dr. Hanson has been active on transit projects since 1972. Throughout his many transit projects, he has been applying and refining criteria, screening methods and prediction methods. He has worked on noise and vibration problems at nearly every major transit system in the country as well as many of the railroads. His transit experience covers the spectrum of projects, from environmental assessments of small facilities to final engineering of large heavy rail projects. Relevant to transit projects is his experience as lead author of FTA’s Transit Noise and Vibration Impact Assessment, and FRA’s High Speed Ground Transportation Noise and Vibration Impact Assessment, the guidance manuals for methods used in rail projects in the USA. In order to make these manuals a part of the planning process, Dr. Hanson conducted rail noise courses throughout the country for FTA under contract to the National Transit Institute. He has continued teaching courses on the subject for many public transit agencies.

Recent projects of note where Dr. Hanson has been the Project Manager and Principal Investigator include: noise and vibration assessments and preliminary engineering for several corridors of the Houston Light Rail Transit system, vibration assessments on microchip research facilities near new LRT systems in Phoenix and Minneapolis, noise and vibration assessments for the new transit system in San Juan, Puerto Rico, and updating of Federal Transit Administration’s guidance manual Transit Noise and Vibration Impact Assessment. His freight rail experience includes noise and vibration assessments of capacity improvements on the Alaska Railroad, noise from coal deliveries to power plants in Minnesota and Texas, several railroad mergers and yard facilities projects. High speed rail projects include Amtrak’s Acela, the California High Speed Train Project, the Florida High Speed Rail Project and the Maglev Deployment Program.

Representative Projects

Rail Projects

- High Speed Ground Transportation Noise and Vibration Guidance Manual, Federal Railroad Administration (2005), Project Manager
- Phoenix LRT Vibration Assessment for Sensitive Research Facilities, Phoenix, AZ (2004), Project Manager
Carl Hanson, Senior Vice President

- People Mover Vibrations - Construction and Operation, Phoenix Sky Harbor International, Phoenix, AZ (2004), Project Manager
- Noise and Vibration Assessment, Alaska Railroad Anchorage Capacity Improvement Project, Anchorage, AK (2002), Project Manager
- Noise and Vibration Assessment, California High Speed Train Project, City, CA (2003), Project Manager
- Noise Assessment of Locomotive Horns at Grade Crossings, Federal Railroad Administration (2000), Project Manager
- Noise and Vibration Characteristics of Northeast Corridor High-Speed Trains, Federal Railroad Administration (2000), Project Manager
- Noise and Vibration Characteristics of the Transrapid TR08 Maglev System Federal Railroad Administration (2002), Project Manager
- Charlotte LRT System Noise and Vibration Assessments (South, Southeast, West and Northeast Corridors), Charlotte, NC (2001,2005), Project Manager
- Tren Urbano Noise and Vibration Assessments, DEIS, FEIS, and proposed extensions to Minillas and Old San Juan, San Juan, PR (1991-1998), Project Manager
- Vibration Assessments at Sensitive Research Facilities, Minneapolis Hiawatha LRT project, Minneapolis,MN (2001), Project Manager

Representative Publications and Presentations

Larry D. Kelterborn  P.Eng., BASc, MASc

Vice President

Telephone: 905-577-1052

profession: Mechanical Engineer

Position in Firm: President

Nationality: Canadian

Languages: English

Professional Summary

1982 – Date: Interfleet Technology, Inc. (Previously LDK Engineering)
President

1976 – 1982: Dofasco Inc
Project Engineer

Key Skills and Experience

• High Speed Rail Technologies
• Passenger rail safety regulatory and governmental affairs
• Project management, marketing, and technical support
• Vehicle structural and suspension design for all rail car types
• Expert Witness/Litigation Support
• Cumulative damage and fatigue life prediction
• Failure investigation and metallurgical studies
• Professional Engineers Ontario (PEO), designated Consulting Engineer
• American Society of Mechanical Engineers (ASME)
• Transportation Research Board (TRB): Past Chairman of the TRB A2MO5 Safety Subcommittee on Guided Inter-City Passenger Transportation
• Hydraulic Systems

www.interfleet-technology.com
EDUCATION AND PROFESSIONAL QUALIFICATIONS

1981 : Masters of Applied Science (Mechanical Engineering), University of Waterloo
1976 : Bachelor of Applied Science (Mechanical Engineering), University of Waterloo
1971 : Diploma (Mechanical/Production Engineering Technology), Sheridan College

CAREER HISTORY

1982 – DATE : INTERFLEET TECHNOLOGY INC. (PREVIOUSLY LDK ENGINEERING)
President

- Lead engineer for numerous rail equipment highly political technical investigations
- Industry representative for the development of passenger rail safety regulations and standards.
- Technical and commercial direction of large rail system projects across North America.
- Design of ride control systems for high-speed and conventional railway vehicles.
- Technical support in North America, Asia and Europe for manufacturers and Train operators.
- Stress and materials analysis
- Expert Witness services in support of a car builder engineering related litigation case
- Fatigue and damage evaluation.

1976 – 1982 : Dofasco Inc
Project Engineer

- Structural design, analysis and testing of cast and fabricated structures.
- Materials, Weld and QA Specifications, Reliability and Maintainability studies.
- Manufacturing/production support
- After sales technical support
APPENDIX C: RAIL FEASIBILITY REPORT OUTLINE
The following schema provides an outline of the structure and content of the proposed Rocky Mountain High Speed Rail Business Plan Report.

### Feasibility Study Business Plan Report Layout

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>Executive Summary</td>
<td>Summary of the Business Plan for reference by senior decision-makers</td>
</tr>
<tr>
<td>Chapter 1</td>
<td>Rocky Mountain Corridor Intercity Rail Services</td>
<td>Summary of the overall systems to be developed</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Target Markets and Proposed Service Offerings</td>
<td>Detailed description of target markets, market segments, associated rail service offerings, fare structures, and proposed ancillary services</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Projected Equipment and Capital Investment Needs</td>
<td>Summary of equipment and capital investment needs for both the rail service itself and ancillary services</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Operating Arrangements and Responsibilities</td>
<td>Proposed operating arrangement and responsibilities including cooperative agreements, with freight railroads, private sector participation and public/private partnerships</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Project Market Penetration, Patronage and Annual Revenues</td>
<td>Estimated market penetration by city pair and target market segment, estimated annual patronage and annual revenues for the rail system and associated services</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Estimated Operating Costs</td>
<td>Projected annual costs including rail service and ancillary operating, equipment, capital and debt service costs</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Financing Plan and Innovative Financing Options</td>
<td>Proposed financing plan including projected private sector contributions. Proforma Financial Statements</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Legal, Regulatory and Institutional Requirements</td>
<td>Assessment of critical legal, regulatory and institutional issues, including recommendations for potential action</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Potential for Added Revenue and Cost Reduction</td>
<td>Identification of potential innovative service arrangements, ancillary service offerings and potential operating procedures designed to either enhance revenue or reduce costs</td>
</tr>
<tr>
<td>Chapter 10</td>
<td>Service Implementation Plan</td>
<td>Description of the proposed rail service implementation program, by year and region together with the marketing program, institutional arrangements, and legal and financial agreements</td>
</tr>
<tr>
<td>Chapter 11</td>
<td>Business Plan</td>
<td>Comprehensive Business Plan assessment of the proposed rail system, and assessment of the risk associated with its implementation</td>
</tr>
</tbody>
</table>

--- | Appendices | Detailed data tabulations supporting individual chapters |

--- | Presentation Materials | PowerPoint™ Presentation to be given to executives and senior decision-makers |
APPENDIX D: EVIDENCE OF INSURANCE
ACORD™ CERTIFICATE OF LIABILITY INSURANCE

PRODUCER
BB&T Frederick Underwriters
7200 Bank Court
P.O. Box 235
Frederick, MD 21705-0235

INSURED
Transportation Economics & Mgmt. Service
116 RECORD STREET
FREDERICK, MD 21701

INSURERS AFFORDING COVERAGE
INSURER A: Hartford Fire Insurance Company 19682
INSURER B: Twin City Fire Insurance Company 29459
INSURER C: Chubb Indemnity Insurance Company 12777

COVERAGE

The policies of insurance listed below have been issued to the insured named above for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies. Aggregate limits shown may have been reduced by paid claims.

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<tr>
<th>INSERT ADDR LTR</th>
<th>INSERT INSRD</th>
<th>TYPE OF INSURANCE</th>
<th>POLICY NUMBER</th>
<th>POLICY EFFECTIVE DATE (MM/DD/YYYY)</th>
<th>POLICY EXPIRATION DATE (MM/DD/YYYY)</th>
<th>LIMITS</th>
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<td>12/01/08</td>
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<td></td>
<td>COMMERCIAL GENERAL LIABILITY</td>
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<td>DAMAGE TO RENTED PREMISES (EA occurrence) $300,000</td>
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<td>MED EXP (Any one person) $10,000</td>
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<td>PERSONAL &amp; ADV INJURY $2,000,000</td>
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<td>GENERAL AGGREGATE $4,000,000</td>
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<td>ANY AUTO</td>
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<td>BODILY INJURY $(Per person) $</td>
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<td>ALL OWNED AUTOS</td>
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<td>BODILY INJURY $(Per accident) $</td>
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<td>SCHEDULED AUTOS</td>
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<td>PROPERTY DAMAGE $(Per accident) $</td>
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<td>HIRED AUTOS</td>
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<td>AUTO ONLY - EA ACCIDENT $</td>
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<td>NON-OWNED AUTOS</td>
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<td>OTHER THAN AUTO ONLY: $</td>
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<td>AGG $</td>
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<tr>
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<td>EXCESS/UMBRELLA LIABILITY</td>
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<td>12/01/07</td>
<td>12/01/08</td>
<td>EACH OCCURRENCE $1,000,000</td>
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<td>12/01/08</td>
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<td>ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?</td>
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<td>E.L. DISEASE - EA EMPLOYER $1,000,000</td>
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<td>E.L. DISEASE - POLICY LIMIT $1,000,000</td>
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<td>$2,000,000 aggregate</td>
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DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

RE: Proposal for Rocky Mountain Railroad Authority High Speed Rail Feasibility Study

CERTIFICATE HOLDER

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENSURE TO MAIL 10 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

Mary J. Manzmaker

Date: 03/19/2008

© ACORD CORPORATION 1984
IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.
## ACORD CERTIFICATE OF LIABILITY INSURANCE

**Producer:** (570) 622-7775  **FAX:** (570) 622-6327  
Higgins Insurance  
The Landmark Building  
115 South Centre Street  
Pottsville PA 17901

**Insured:**  
Quandel Consultants LLC  
4755 Linglestown Road  
Ste 200  
Harrisburg PA 17112

**Coverages:**

- **General Liability**
  - Commercial General Liability
  - Claims Made
    - Each Occurrence: $1,000,000
    - Medical Expenses: $5,000
    - Personal Injury: $1,000,000
    - General Aggregate: $2,000,000
    - Products-Commodity Aggregate: $2,000,000

- **Automobile Liability**
  - Combined Single Limit
    - Bodily Injury (Per Person): $
    - Bodily Injury (Per Accident): $
    - Property Damage (Per Accident): $

- **Garage Liability**
  - Auto Only - EA Accident
  - Other Than Auto Only - EA Accident

- **Excess/Umbrella Liability**
  - Each Occurrence: $1,000,000
  - Aggregate: $1,000,000

- **Workers Compensation and Employers' Liability**
  - Employer's Liability
    - Each Accident: $500,000
    - Disease - EA Employee: $500,000
    - Disease - Policy Limit: $500,000

**Certificate Holder:**

Transportation Economics & Management Systems Inc  
16 Record Street  
Frederick, MD 21701

**Cancellation:**

Should any of the above described policies be cancelled before the expiration date thereof, the issuing insurer will endeavor to mail 30 days written notice to the certificate holder named to the left, but failure to do so shall impose no obligation or liability of any kind upon the insurer, its agents or representatives.

**Authorized Representative:**

Margaret Smith
IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

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