MEASURING WHAT MATTERS: SUSTAINABILITY AND ENVIRONMENTAL COMPLIANCE FOR CALIFORNIA’S HIGH-SPEED RAIL PROGRAM

Karl A. Fielding (916-324-1541, fieldingk@pbworld.com), Environmental Planner, Parsons Brinckerhoff, 770 L Street Suite 800, Sacramento CA, 95814

Margaret L. Cederoth, AICP (916-324-1541, cederoth@pbworld.com), Sustainability Manager, Parsons Brinckerhoff, 770 L Street Suite 800, Sacramento CA, 95814

Bryan K. Porter, AICP (916-324-1541, porter@pbworld.com), Environmental Planning Manager, Parsons Brinckerhoff, 770 L Street Suite 800, Sacramento CA, 95814

May 2013
ABSTRACT

The California High-Speed Rail Authority (Authority), in conjunction with the Federal Railroad Administration (FRA), is responsible for planning, designing, building and operation of the first high-speed rail (HSR) system in the nation. California high-speed rail will connect the mega-regions of the state, contribute to economic development and a cleaner environment, create jobs and preserve agricultural and protected lands. By 2029, the system will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of over 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations. Some of the project challenges include its size, engineering complexity and cost; the need to obtain environmental permits assuming the use of design/build contractors; and an ambitious construction schedule. The project is also an expression of the forward-thinking environmental sustainability for which California is legendary.

The HSR project is one of the first times FRA has implemented Council on Environmental Quality (CEQ) guidance on environmental mitigation and monitoring. Published in January 2011, the guidance requires that federal agencies issuing National Environmental Policy Act (NEPA) documents monitor how mitigation commitments are implemented and their effectiveness. These requirements are similar to California requirements under the California Environmental Quality Act (CEQA). With completion of their first joint EIR/EIS for the Merced to Fresno High-Speed Rail Project, the Authority and FRA were presented with the challenge of developing a system to manage its compliance data in a way that would ensure compliance was effectively documented and reported to permitting agencies. To address this challenge, the Authority and FRA are creating an environmental compliance system that coordinates, tracks, and reports on Authority and contractor permitting and environmental compliance activities prior to, during, and following project construction. The Environmental Mitigation Management and Assessment system, referred to as EMMA, will track and report on the Authority’s progress in fulfilling its sustainability commitments. Extensive research was done to assess how other projects and agencies have handled similar compliance management challenges. This paper documents the scope of the challenge, how other entities have addressed similar challenges, what best practices are, what recommendation was ultimately adopted by the Authority, and how effective the recommendation has been in managing the HSR system’s compliance data.

In addition to compliance data, the Authority has committed to integrate environmental sustainability in project design, construction and operation. Significant effort has been required to translate a range of sustainability features into quantifiable performance standards. This paper also demonstrates how EMMA will be utilized to track and report on sustainability metrics for the HSR system.
INTRODUCTION

In 2005, the California High-Speed Rail Authority (Authority) and Federal Railroad Administration (FRA) completed a Tier 1, program-level environmental document, which approved the high-speed rail (HSR) system for intercity travel in California, and selected corridors for project-level environmental analysis. This was followed in 2008 by adoption of the Bay Area to Central Valley High-Speed Train Final Program EIR/EIS, which identified a preferred alignment between the San Francisco Bay Area and the Central Valley via the Pacheco Pass. The Bay Area to Central Valley document was subsequently revised in 2010 and again in 2012. Mitigation measures and environmental commitments the Authority and FRA made in these Tier 1 documents are summarized in the Corrected Mitigation, Monitoring, and Reporting Plan for the California High-Speed Rail Program EIR/EIS dated November 7, 2005, and the Bay Area to Central Valley High-Speed Train Mitigation, Monitoring, and Reporting Plan dated April 12, 2012.

Beginning in 2007, the Authority and FRA initiated preparation of engineering and Tier 2, project-level environmental documents for the statewide system, dividing the system into nine geographic sections. These nine project sections, shown in Figure 1, include:

- San Francisco to San Jose
- San Jose to Merced
- Sacramento to Merced
- Merced to Fresno
- Fresno to Bakersfield
- Bakersfield to Palmdale
- Palmdale to Los Angeles
- Los Angeles to Anaheim
- Los Angeles to San Diego
FIGURE 1 California High-Speed Rail Project Sections.
In 2012, the Authority completed its first Tier 2 project-level EIR/EIS for the Merced to Fresno project section. The Final EIR/EIS was certified by the Authority in May 2012 and FRA issued its Record of Decision (ROD) in September 2012. When the Authority certified the Merced to Fresno Final EIR/EIS and approved the project, they also adopted a Mitigation Monitoring and Reporting Program (MMRP) containing all the environmental commitments from the Merced to Fresno Final EIR/EIS that will be executed as part of the approved project in compliance with CEQA. FRA adopted a Mitigation Monitoring and Enforcement Plan (MMEP) as part of its ROD for the Merced to Fresno Final EIR/EIS, specifying which mitigation commitments would be executed in compliance with NEPA.

The mitigation measures committed to by the Authority and FRA in the Statewide Program EIR/EIS, Bay Area to Central Valley Program EIR/EIS, and Merced to Fresno Project EIR/EIS represent a substantial range of environmental requirements necessitating implementation, tracking, and reporting. The MMRP for the Statewide Program EIR/EIS contains approximately 250 mitigation measures, the MMRP for the Bay Area to Central Valley Program EIR/EIS contains approximately 290 mitigation measures, and the MMRP/MMEP for the Merced to Fresno Project EIR/EIS contains approximately 610 mitigation measures. Additional mitigation commitments will come from the project-level EIR/EIS documents yet to be completed for the remaining eight sections of the HSR system. Each project section of the HSR system will be implemented through the use of construction packages, and each project section will have many permits associated with its construction packages. Most of the permits obtained by the Authority will be issued based on conditions that need to be implemented in order to demonstrate compliance with the permit. These permit conditions, in addition to the Tier 1 and 2 mitigation measures, require implementation, tracking, and reporting to various stakeholders and regulatory agencies.

In addition to environmental compliance commitments, the Authority is a forward-thinking organization focused on the success of California and the ability of future generations to enjoy the benefits of such success. These outcomes coalesce under the concept of sustainability: ensuring that decisions made today do not deny future generations the capacity to meet their needs. Inherent in sustainability are two concepts that point to the need for an accurate, organized measurement of activities: transparency and continuous improvement.

To organize policies, regulatory requirements, goals and priorities, the Authority has a draft rail-system specific sustainability policy it created in October 2012. Sustainability actions for high-speed rail are organized around five areas:

- Sustainable infrastructure
- Natural resources
- Business and management
- Communities and ridership
- Energy

These five areas reflect a rail system and organization that will evolve over the next decade, from a project planning and delivery-oriented organization to one that operates or oversees the operation and maintenance of a system. These areas expand upon the environmental sustainability commitments expressed in a Memorandum of Understanding signed among federal agencies and the Authority in June.
2011, by attaching specific actions and objectives to each area. Proposition 1A, the bond act approved by voters in 2008 that provides state funding for HSR, also includes requirements related to sustainability:

- In order to reduce impacts on communities and the environment, the alignment for the high-speed train system shall follow existing transportation or utility corridors to the extent feasible and shall be financially viable, as determined by the Authority.
- Stations shall be located in areas with good access to local mass transit or other modes of transportation.
- The high-speed train system shall be planned and constructed in a manner that minimizes urban sprawl and impacts on the natural environment.
- Preserving wildlife corridors and mitigating impacts to wildlife movement, where feasible as determined by the Authority, in order to limit the extent.

Measuring how well those actions are carried out is important for organizational integrity and regulatory compliance. Tracking performance enables transparent reporting to California citizens and the legislature. For example, as part of the funding legislation for the project, the Authority is required to provide a report on the net impact of the program on the state’s greenhouse gas profile. In addition, all state agencies are subject to waste diversion goals.

The HSR system will be built in phases over many years. Tracking performance will highlight where targets are easily being achieved, or where expectations have not been met so that procurement documents can be improved with each phase.

With implementation of the HSR program, many types of data will be collected to document compliance with environmental and sustainability requirements. These data types include, but are not limited to, field activities conducted to implement requirements for each resource area, location of activity, time of activity, results of activity, monitoring reports, disturbances to sensitive resources, preventative measures, emissions, fuel and water use, equipment mix and use, impacts to jurisdictional features, materials used during construction, and construction and demolition waste generated and recycled. Additional information relevant to sustainability objectives includes supplier information, such as location and delivery path means data, which will assist the Authority in establishing a baseline for the energy embedded in the materials used to build the system. The Authority will use this tremendous range of data on activities to track requirements towards completion to reduce environmental impacts and meet sustainability objectives of the HSR program.

The Authority recognizes the unprecedented scope of the environmental process being executed for the HSR system and the daunting number of compliance requirements needing to be implemented. Additionally, the sustainability objectives of the Authority create metrics with which to track and report on the environmental progress of the HSR program. Without measuring this data, the Authority will be unable to manage its compliance activity. The number of commitments and amount of data to be collected in order to document environmental compliance and sustainability achievements necessitates a sophisticated and robust method with which to manage the Authority’s efforts.
OBJECTIVES

The primary goal of the environmental compliance system is to ensure the Authority’s program-wide compliance with regulatory commitments and permits. This system will also help identify and limit the Authority’s exposure to risk associated with non-compliance. The lack of such a system and associated processes would make the Authority unable to receive compliance data from contractors, store and map such data, as well as quickly and intelligently respond to inquiries from resource agencies, FRA, state legislature, and others about project commitments and mitigation. A robust system will also be transparent, preserve the integrity of the original data, and help inform decision making and risk assessment. Potential costs would be incurred by the Authority from construction delays associated with programmatic non-compliance injunctions from regulatory agencies; construction contractors will be responsible for mitigating against contract-specific non-compliance injunctions. Without a comprehensive system to aggregate contractor data and project section compliance efforts, the Authority’s ability to demonstrate progress on program-wide environmental goals would be limited.

A secondary goal is to build upon the trust that has been developed between the Authority and regulatory agencies. The Authority’s environmental team has worked hard to collaborate effectively with agency partners. By implementing a robust and transparent system to ensure that the Authority’s activities are compliant with mitigation and permit conditions, these agency relationships will be reinforced and strengthened. The additional trust earned from these relationships will help avoid injunctive actions, preserving the flexibility required by the Authority’s contractors to execute their scope of work when designing and constructing the HSR project. Documenting and tracking compliance data will also have the added benefit of ensuring positive objectives are met and demonstrating benefits of the HSR program.

As noted earlier, the Authority is committed to delivering sustainable infrastructure. Generally, sustainable infrastructure refers to the set of principles and actions in project planning, design, construction, and operation to realize infrastructure that reflect a balance of social, environmental, and economic concerns. Because there is no one definition of sustainable infrastructure, having a clear definition of what constitutes sustainable infrastructure in the specific context of this project, the environmental, social, and financial priorities of California, is necessary. The list below was identified by engineering, program management, and Authority staff to define what the Authority means by its commitment to sustainable infrastructure:

- Make energy efficiency a priority in design.
- Use 100 percent renewable energy for operation.
- Minimize greenhouse gas emissions through design and in construction.
- Design and construct high-performance facilities.
- Maximize station access for pedestrians, cyclists, and transit riders.
- Minimize carbon intensity of major materials while maintaining durability and quality.
- Make the use of non-hazardous materials a priority.
- Investigate appropriateness of groundwater recharge along the alignment and make it a priority where appropriate.
- Make groundwater recharge at sites a priority and/or detain water for reuse in irrigation.
- Progressively refine requirements in design and construction contracts to achieve improved outcomes.
- Sequester in-situ hazardous material (where feasible and cost-effective).
- Follow construction-waste practices that divert 75 percent from landfill, unless the local regulation is higher.
- Recycle all steel and concrete.
- Follow construction practices that maintain air quality during construction, both for workers and people living in the air basin.
- Follow operations practices that maintain or improve air quality.
- Make life-cycle performance of components, systems, and materials a priority.
- Adaptively reuse existing structures and facilities whenever feasible.

Implementation of these aspirations has been embedded in the provisions of the Authority’s construction procurement documents as specific actions for the contractor to carry out. Some of these areas align precisely with environmental permitting compliance requirements, while others, such as waste and recycling tracking, materials tracking, and water use are specific to the sustainability objectives of the Authority.

**RESEARCH**

As required by CEQA and NEPA, public agencies and project proponents must track and demonstrate compliance with commitments made in environmental documentation related to project approval. Being a relatively new state agency, the Authority is preparing to embark on its first major construction effort and has been establishing the proper protocols, procedures, and systems for tracking compliance during project implementation. Additionally, the Authority has set ambitious sustainability goals for itself, requiring additional data tracking and management capabilities. Environmental staff engaged in a ten month research effort to identify and understand the compliance tracking needs of the HSR program and explore how other large, complex projects and agencies have handled similar data management requirements. This effort was undertaken to ensure the Authority draws on industry best practice for its compliance tracking system. Each regulatory agency responsible for holding projects accountable through permitting or approval authority often have different expectations for how they want to see compliance data reported and how often they need reports submitted. Various degrees of detail and consistency were encountered in the ways proponents demonstrate compliance on their projects. Some agencies and projects use spreadsheets with cover letters to track and report on mitigation progress, while others utilize sophisticated database systems similar to what is envisioned for EMMA. Table 1 summarizes the recommendations received from agencies and project staff during the ten month research period.
TABLE 1 Recommendations for EMMA

<table>
<thead>
<tr>
<th>#</th>
<th>Feedback from Agencies and Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jump directly into database development and avoid the feasibility assessment process</td>
</tr>
<tr>
<td>2</td>
<td>Emulate an existing database system</td>
</tr>
<tr>
<td>3</td>
<td>Pursue something that is available off the shelf and customizable</td>
</tr>
<tr>
<td>4</td>
<td>Implement a sophisticated environmental compliance solution based on the complexity of the HSR project and the amount of requirements needed to be tracked</td>
</tr>
<tr>
<td>5</td>
<td>Implement a phased permitting approach</td>
</tr>
<tr>
<td>6</td>
<td>Build the database so it can communicate and import/export data with other databases</td>
</tr>
<tr>
<td>7</td>
<td>Link mitigation measures and permit conditions in the database so entering data for one registers progress with the other</td>
</tr>
<tr>
<td>8</td>
<td>The database should clearly and easily collect, manage, and access the mitigation data</td>
</tr>
<tr>
<td>9</td>
<td>Substantial staff resources should be devoted to the system</td>
</tr>
<tr>
<td>10</td>
<td>Beneficial to have compliance data centrally available for review and reporting</td>
</tr>
<tr>
<td>11</td>
<td>Undertake a planning and project management exercise to break down environmental requirements into traceable deliverables and determine what level of detail is appropriate for tracking</td>
</tr>
<tr>
<td>12</td>
<td>Don’t use Excel spreadsheets</td>
</tr>
</tbody>
</table>

Tracking project level carbon footprint information is somewhat unique. Industry guidance includes the Climate Registry’s General Reporting Protocol, ISO 14064 Section 2, the World Resources Institute, and the American Public Transportation Association’s guidance on carbon footprinting for transit agencies. These ‘accounting’ principles provide direction and guidance on what information should be collected; however, the collection method is not stipulated. Emerging assessment methodologies for sustainable infrastructure, again, stipulate what data should be collected, but not the specific means.

Practical experience indicates that use of Excel data sheets result in uneven or possibly inaccurate data collection. Consistent monitoring and oversight is necessary to ensure correct data. A database form, such as the portal that EMMA will provide, mitigates this by limiting the type of information that can be inputted.

**EMMA OVERVIEW**

Based on best practices collected from industry research and the requirements of the HSR program, a sophisticated database was selected as the method for the Authority to track and report on its environmental compliance and sustainability objectives. The system is called EMMA, which stands for Environmental Mitigation Management and Assessment. EMMA is accessible through a web browser and hosted on a remote server, so no software needs to be downloaded to the user’s computer in order to use the system. EMMA is being implemented as part of the Authority’s larger Project Management Information System (PMIS), which has been developed through Microsoft SharePoint Enterprise 2010. This PMIS allows EMMA to connect and relate to other database systems of the HSR program, including work-breakdown structure (WBS), geographic information systems (GIS) for mapping environmental data, right-of-way, scheduling, cost control and financial management, trending and forecasting, and document and records management. Key features of EMMA are as follows:
• Collect, retain, sort, and report all environmental compliance and sustainability data
• Divide and export data sets in many different ways to satisfy multiple stakeholders
• Possess a diversified structure to manage all project components for the project
• Link different environmental requirements to track progress for multiple objectives
• Geographically display compliance activities on project map – integration with GIS capability
• Provide a user-friendly, web-based interface (no local software required)
• Integrate with SharePoint Enterprise 2010 by Microsoft
• Integrate data with Primavera Contract Manager, an Oracle product

EMMA is being executed in a phased implementation, to allow functionality to become available when required by the HSR program. The database will grow and expand in size and function as the needs of the project increases over time. The compliance requirements will initially be established through approved environmental documents and permits, with data demonstrating compliance provided primarily by the Authority’s contractors, to be used to monitor and assess project-wide environmental compliance. The system will generate various reports on compliance status based on many variables, depending on which entity or permitting agency needs to see the report. Sustainability objectives will also be tracked and managed through EMMA. Processes, procedures, staffing, guidance documentation, and technology parameters are being established to allow for successful system implementation.

The decision to implement EMMA and the PMIS through Microsoft SharePoint Enterprise 2010 has provided many benefits to the HSR program. Microsoft’s SharePoint platform is the most widely adopted web-based application offered. It is ranked as the leading integration portal and Enterprise Content Management System (ECMS) and Social Networking platform. It provides the ability for power users to create custom input forms for capturing information via the Internet, allows for creation of ad hoc and structured workflows, and provides a centralized resting place for all project documents and records.

SharePoint is a platform which houses configuration capabilities, meaning modules are configured using SharePoint’s native tools to meet specific business requirements. The ability to allow power users to create out of the box application input forms with associated workflows while storing data and documents is one of the core reasons why SharePoint is a leading collaboration system. The ability to create and configure SharePoint input forms specific to the requirements of the HSR program can be obtained with no custom programming. In addition, SharePoint also provides the ability to integrate layers to commercial systems expected to be employed by the Authority, such as GIS and Primavera Contract Manager, both of which are integrated with the environment management system.

EMMA’s home page is the starting point for all users, and content is displayed specific to the user’s role in the system and access restrictions. For example, Authority staff will be able to see all commitments for all project sections, while contractor staff will only see commitments and data relating to their construction package. An example of the home page is shown in Figure 2.
Contractors will complete forms to enter data into the system while doing work in the field consistent with environmental requirements and sustainability objectives. An example form is shown in Figure 3.

Once a project section EIR/EIS is approved by the Authority and FRA, such as Merced to Fresno, the mitigation in the MMRP for that section can be uploaded to EMMA, as shown in Figure 4.
These mitigation measures contain details which link them to the project section they come from, their mitigation code, the construction package in which they will be implemented, and the specific requirement of the mitigation, as shown in Figure 5.

Field staff will be able to use tablet devices to access EMMA and input daily records remotely, without needing to go to the office. Daily records that have been entered into the system can be linked to mitigations, permit conditions, and sustainability objectives to demonstrate how those commitments are
being implemented. These components outline the critical functionality of EMMA, which enables the system to achieve the results necessary for the HSR program:

- Input compliance data from multiple construction packages
- Associate compliance data with environmental commitments from one or many project sections
- Aggregate compliance data to manage the Authority’s programmatic efforts
- Output compliance data in reports sorted by commitment type to demonstrate compliance to agency partners

The reporting functionality of EMMA ensures that agencies and stakeholders can be given accurate, detailed compliance reports on a regular schedule to satisfy their oversight role. This consistent reporting, which can be programmed into the system to meet the specific needs of each agency, helps the Authority avoid injunctive action and maintains effective collaborative relationships with project partners. It also enables the Authority to make informed decisions to alter targets and actions based on accurate information.

**PHASED IMPLEMENTATION**

Developing the first segment of the Initial Operating Section (IOS) from Madera to Bakersfield will cost $6 billion, consisting of $3.3 billion in federal funding and $2.6 billion in Proposition 1A bond proceeds. Five construction packages are planned from approximately Madera to outside Bakersfield, totaling approximately 130 miles of HSR infrastructure. The first four construction packages would build the HSR corridor and structures necessary to support the alignment, while the fifth construction package would build track along the corridor. The first construction package is scheduled for award to a design-build contractor in summer 2013, with additional construction packages entering procurement in the second half of 2013. A map showing the five construction packages can be seen in Figure 6.
FIGURE 6 Central Valley HSR Construction.
The five construction packages span two project sections, Merced to Fresno and Fresno to Bakersfield. As discussed earlier, the Merced to Fresno Final EIR/EIS has been completed by the Authority and FRA, and the Fresno to Bakersfield Final EIR/EIS is scheduled for release in fall 2013. Due to the construction schedule and the use of multiple construction packages, EMMA is currently going through a phased implementation. The system is structured so that EMMA will be able to address environmental compliance and sustainability objectives associated with the first construction package while growing to accommodate the needs of future construction packages and project sections. This flexibility and growth capacity will enable the Authority and FRA to demonstrate environmental and sustainability accomplishments through EMMA to regulatory agencies and project stakeholders throughout the statewide HSR system.
BIOGRAPHIES

**Karl A. Fielding** is an Environmental Planner with Parsons Brinckerhoff and has four years of experience working on environmental planning issues. He currently serves as a member of the program management team (PMT) retained by the California High-Speed Rail Authority (Authority) to oversee preparation of nine EIR/EIS documents for the proposed 800-mile high-speed train project, connecting the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. Mr. Fielding is supporting the Authority during its transition into construction and had led the development of a system for tracking and reporting the Authority’s environmental mitigation commitments and permit requirements.

**Margaret L. Cederoth, AICP**, is a Supervising Urban Planner with more than a decade of experience working in the areas of transportation and sustainability planning, land use and international planning. Her expertise includes sustainability strategies for transportation infrastructure projects, New Starts transit planning and funding submittals, master planning infrastructure programs, LEED evaluation of infrastructure projects, environmental planning and National Environmental Policy Act (NEPA) documentation, as well as international urban development throughout North Africa and the Middle East. Ms. Cederoth currently leads corporate sustainability initiatives for Parsons Brinckerhoff and the sustainability program for California High-Speed Rail.

**Bryan K. Porter, AICP**, is an Environmental Planning Manager with Parsons Brinckerhoff and has nearly 35 years of experience working on a variety of transportation, land use, environmental and water planning projects. His experience includes, for example, managing the preparation of joint EIR/EIS documents, including mitigation plans; developing short- and long-range transit studies, funding plans and implementation documents; and preparing water resource development plans.
BIBLIOGRAPHY


California High-Speed Rail Authority. 2012a. Bay Area to Central Valley High-Speed Train CEQA Mitigation, Monitoring, and Reporting Plan. Sacramento, CA: California High-Speed Rail Authority, April 2012.


California High-Speed Rail Authority. 2012c. Mitigation Monitoring and Reporting Program Merced to Fresno Section Revision 1. December 2012.


