LESSONS LEARNED
ON THE
PORTLAND AIRPORT MAX EXTENSION PROJECT

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ABSTRACT

Portland Airport MAX Extension

Portland's Metropolitan Area Express (MAX) light rail transit system is expanding to serve the Portland International Airport (PDX). The 5.5-mile Airport MAX Extension is the result of an innovative public-private partnership involving Tri-County Metropolitan Transportation District of Oregon (Tri-Met), the Port of Portland, the City of Portland, and Bechtel. Revenue service on the Airport MAX Extension will begin in September 2001.

This paper will present the current status of the design-build project and lessons learned during both the design and construction phases, including the partnership agreements required, cost saving measures utilized, use of existing infrastructure, and approaches used to manage civil/systems integration.

Key elements of the project include:

• An at-grade alignment with 4 stations, 3 LRT bridges crossing interstate freeways, and a pedestrian bridge.
• A terminal station located at the airport immediately adjacent to the baggage claim area.
• The all-local financing plan for the $125M light rail design-build project, which consists of passenger facility charges (PFCs), Tri-Met general funds, urban renewal funds, and private funds.
• Use of Oregon Department of Transportation (ODOT) and Port of Portland rights-of-way to connect to PDX.
• Prior regional planning and private funding enabled the project to be implemented on an accelerated schedule.
• An integral 120-acre transit-oriented development located near PDX featuring hotel, retail, entertainment, and office space served by two of the new LRT stations.
• Design-build on a fast-track schedule.
• Use of local and national design subconsultants and construction subcontractors and continuity of key personnel from preliminary engineering through start-up.
BACKGROUND

The Portland metropolitan area is regarded nationally for its visionary use of transportation planning for growth management. The Airport MAX Extension project has demonstrated how to successfully integrate light rail and planned development while promoting transit use to a new base of potential new riders, airline passengers.

The Portland metro area currently has 33 miles of light rail service with 50 stations. The Airport MAX Extension adds 5.5 miles to the system with four new stations, including one at the airport terminal, adjacent to the south baggage claim area. When the line opens September 10th, 2001, the trip from downtown Portland into the Airport is expected to take 38 minutes and cost around $1.55.

The Airport MAX Extension project is a unique public/private venture. Three local government agencies—the Port of Portland, Tri-Met (the regional transit agency), and the City of Portland through the Portland Development Commission (PDC)—capitalized on the unique private investment prospect brought forward by Bechtel that afforded the region the opportunity to extend light rail to the airport earlier than originally anticipated.

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Air passenger traffic at PDX has more than doubled from 6 million trips in 1990 to 14 million in 2000. By 2020, that number is projected to reach 29 million trips. Airport MAX will provide
additional access to the airport and offer an alternative to traffic congestion at the terminal, along Airport Way and on I-205. Simply increasing the number of trains in service allows Airport MAX to grow with airport demand. The decision to interline this extension with Tri-Met’s existing bus and rail service provides numerous commuting opportunities for both the local and out of town transit riders.

THE ALIGNMENT

The Airport MAX Extension ties into Tri-Met’s existing Eastside MAX line at Gateway Transit Center, one of Tri-Met’s busiest Transit Centers. The connection allows a seamless transition from the main eastbound rail line from downtown directly onto the Airport Extension. The first segment is a 3,000-foot single-track section that immediately negotiates a 180-degree curve on an elevated track section, over a multiuse path and two vehicle connector ramps between I-205 and I-84. This segment touches down briefly along the eastside of I-205 and then transitions onto a second elevated section over I-84 and the UPRR. Back on grade the single-track segment transitions to double track through a high-speed turn out. The double track segment stays on grade, sweeping away and descending with the grade to align with an existing underpass. The underpass provides the corridor into the median of I-205. For the next two miles the double track section is generally centered within the median and remains at grade with just one station located directly adjacent to an existing Park and Ride. This Park and Ride is being upgraded into a full service transit center with a focus towards new airport passengers. The double track segment leaves the median by crossing over the southbound lanes of I-205, on a 1200-foot long elevated structure, just south of the Columbia Slough and touching down at the southeast corner of the Port of Portland’s development property. The double track alignment winds its way
through the 120-acre development area. The planned development will be oriented towards two
light rail stations located to serve this area. Next, the double track section leaves the
development at the west end and parallels the Port’s N.E. Airport Way heading towards the
Portland Airport’s terminal, skirting the south side of a complex intersection and transitioning
into a single track section through a second high-speed turnout. The remaining 4000-foot single-
track section then follows the outbound lanes of N.E. Airport Way and snuggly terminates at a
center style station just 150 feet from the Airport’s baggage claim area.

PRIOR PLANNING

Light rail to the Portland Airport has been part of regional transportation planning and the PDX
master plan since the mid-1980s. The light rail alignment to the terminal utilizes the median of I-
205, which had been reserved for a future transit way, and the existing underpass, which had
been constructed for this purpose as part of I-205.

Even with the extensive planning framework in place, all the approval steps needed to be
followed. It was advantageous, however, that an exceptional level of regional consensus about
the project’s importance allowed these agreements to be signed in record time.

Resolving issues between three local governments that were entering into a ‘first of it’s kind’
agreement with a private partner required many formal procedures to protect public investment.
In all, 85 agreements were signed, with nearly 20 formal approval steps, by various elected and
appointed bodies.
FUNDING

The Project used existing funds from local jurisdictions and agencies. Federal dollars, state general funds, or additional property taxes were not required to accomplish this project. The $125 million (M) funding framework included:

- Port of Portland, $28.3M, the source was the innovative use of the $3 passenger facility charges (PFCs). The Federal Aviation Administration endorsed the use of PFCs with support from key airlines.
- City of Portland, $23 M, the source was Urban Renewal Funds from the formation of a new urban renewal district.
- Tri-Met, $45.5 M, the source was from Tri-Met’s general funds and sale of tax-exempt revenue bonds.
- CascadeStation Development Company (Bechtel Enterprises and Trammell Crow) $28.2 M, in exchange for longterm land lease rights with the Port.

CURRENT STATUS

As of July 2001, the Airport MAX Project is 99% complete and remains on budget. The project team is wrapping up the finishing touches on station platforms and ticket vending equipment. The system has been turned over to Tri-Met. Operator training is well underway. All elements are on schedule for revenue service beginning on September 10, 2001.

DESIGN-BUILD EXECUTION STRATEGY

This section examines the following aspects of the approach utilized in establishing and executing the design-build contract:

- Program Requirements
Program Requirements

The Program Requirements document, which formed the technical basis of the design-build contract, was prepared by Tri-Met with input from Bechtel at the end of the preliminary engineering (PE) phase. Rather than the fully developed technical specifications and design criteria which are inherent in a typical design-bid-build project, the Program Requirements document was very brief and served as the summary-level document which outlined the technical requirements expected of the design-builder by the owner. This document described the operating requirements of the LRT extension as well as the required civil/infrastructure and system wide elements. This document served two primary purposes:

- Identified requirements and project characteristics that were important to Tri-Met.
- Allowed maximum flexibility on the part of the design-builder where it was not considered essential to the operating system by the owner.

The Program Requirements incorporated by reference various other technical documents previously prepared by Tri-Met for other segments of the MAX system, including design criteria and technical specifications. Since Tri-Met had recently prepared specifications for the Westside
Lessons Learned:  Incorporate technical requirements that clearly, yet succinctly, outline all characteristics of the project considered mandatory by the owner while leaving latitude where possible to encourage innovation by the design-builder.

Integrated Design-Build Team

An important opportunity afforded by a design-build contract is that it allows maximum flexibility to the design-builder in staffing the project and integrating the design and construction team from the outset of the project. On this project, Bechtel self-performed portions of both design and construction and optimized the integration of design and construction by involving construction personnel early in the design process and by maintaining continuity of staff between the design and construction phases where possible.

The design team, which had been assembled for the PE phase and was maintained for the final design phase, was managed by Bechtel and included design self-performed in Portland and San Francisco. The majority of the design was performed by local design sub consultants and other specialty designers; including David Evans and Associates, Inc.; Finley McNary Engineers, Inc.; Zimmer Gunsul Frasca Partnership; STV Incorporated; LTK Engineering Services; and KPFF Consulting Engineers. This approach allowed close coordination with Tri-Met and other
participating agencies throughout the design phase and enabled the design to be completed on schedule and under budget.

Since the lump sum design-build contract was in place at the end of the PE phase, the responsibility for determining the staffing for the project lay solely with the design-builder. In order to take maximum advantage of the fast-track schedule afforded by design-build, Bechtel ensured that construction input began early and continued throughout the design process. Construction personnel were integrated into the team from the beginning of the design phase and were responsible for providing constructibility input to the design team and for participating in value engineering reviews.

The early presence of construction staffing also provided effective, early input to the development of the construction work packages. This ensured that the development and sequencing of the design documents supported the construction schedule. This approach encouraged a focus during design on the objective of designing something that would be built. This input also ensured that key documents were developed in order to support procurement schedules for long-lead items and major construction subcontracts. This allowed best use of the fast-track schedule by issuing drawings for construction of early work packages, such as bridge foundations and utility relocations, prior to completion of bridge superstructure design.

It was also advantageous to assign construction personnel to the project earlier than they would be for a design-bid-build project. In some cases, key construction field engineering personnel were brought to the site well in advance of construction to perform other tasks that integrated
design and construction, such as permitting activities and preparation of construction phasing and traffic control drawings.

Staff optimization was also used to extend design personnel into field engineering roles during construction. This helped the knowledge transfer process between the design and construction phases of the project. Various design team members also remained with the project team beyond the completion of design to address issues that arose during construction. This group was primarily tasked with responding to requests for information (RFIs), reviewing submittals, making modifications to design documents as required during the construction phase, and preparing as-built record drawings. In addition to Bechtel personnel, the design sub consultants were also retained during the construction phase to assist in this effort.

The project also afforded continuity of staff on the part of the owner; the Tri-Met team that was assembled during the design phase was maintained throughout the project to also oversee construction.

**Lessons Learned:** Maximize integration of design and construction staffing. Take advantage of the constructibility and construction phasing opportunities afforded by the design-build approach and introduce this expertise into the design phase from the very beginning of the contract.

**Design Quality Control (QC) and Quality Assurance (QA)**
A series of internal design coordination and review procedures were utilized throughout the design process to ensure that the design was properly coordinated and that quality was incorporated into the project by design:

- Inter-disciplinary coordination – This occurred throughout the design process and utilized bi-weekly design coordination meetings with all members of the design and construction team.
- Internal checking and QC procedures by each designer – Each designer was responsible for complying with Bechtel procedures and Tri-Met practices for drawing review and checking prior to sealing the respective design drawings.
- Bechtel review of design by sub consultants – Throughout the design process, Bechtel periodically reviewed the design performed by the design sub consultants to ensure that all technical requirements, interface requirements, and constructibility input were addressed.
- Off-project design reviews – In conjunction with the formal design reviews by the owner and other agencies, all design drawings were independently reviewed.
- Independent review of structural drawings – In addition to the above review procedures, an additional technical review was undertaken of all structural drawings and calculations.

This internal design coordination process coincided with and supported the formal 30%, 60%, and 90% design reviews by Tri-Met and other participating agencies. These agency representatives worked together with the design-build team during design. This group met on a bi-weekly basis during the design process to provide input to the design and to coordinate design and permitting issues as they arose. This, in turn, facilitated the formal 30%, 60%, and 90%
design reviews, as the design coordination team members were up-to-speed with the status of the design effort and aware of any open issues and challenges. This process was used successfully for a series of design reviews involving the design team and many agencies to support the fast-track schedule and the intricate permitting process.

**Lessons Learned:** Implement internal design coordination and review procedures and incorporate the various formal agency reviews required. Perform independent reviews to ensure that all work elements are coordinated and accurately completed. Involve all agencies on a continuous basis during design.

**Construction QC and QA**

In accordance with the design-build contract, Bechtel was responsible for construction QC and QA. The primary field QC was provided by Bechtel field engineers/QC representatives who inspected all work performed by Bechtel and its construction subcontractors. These QC activities were performed in accordance with established Bechtel field engineering procedures. In addition, independent labs were retained to provide soils and concrete sampling and testing and any specialized testing required on the project in accordance with Tri-Met requirements and industry standards.

Bechtel also assigned a full-time QA manager to the project who reported directly to the project manager and to the corporate QA manager. He also interfaced directly with the Tri-Met QA representative for the project. The QA manager provided independent oversight of the field engineering/QC function as well as independent audits of all field inspections and procedures.
He also coordinated factory inspections of all equipment and products being fabricated for the project. The QA manager was responsible for verification of completion of work activities in accordance with project documents. This included closing any non-conformance reports (NCRs) initiated by a field engineer/QC representative to document any unacceptable work.

An additional level of field inspection and QA was provided for certain work activities that, in accordance with City of Portland permit requirements, required an additional level of special inspections by the engineer of record to ensure that construction was performed in accordance with the design documents.

**Lessons Learned:** Construction QA/QC can be achieved in a design-build environment by using a well-established QA/QC program and by requiring the proper level of oversight. Incorporate the use of independent labs for specialized construction testing and inspection.

**Safety**

The construction effort on this project set new safety standards in the State of Oregon. Bechtel was the first construction contractor and the Portland Airport MAX Extension was the first construction project to be awarded Voluntary Protection Program (VPP) status by Oregon OSHA. The project was initially recognized in 1999 with “Merit” status and then was elevated to “Star” status in 2000. This was recognition of a commitment to safety that exceeded Oregon OSHA goals.
Beginning with its “Zero Accidents Policy,” Bechtel core safety processes were implemented on the project and resulted in recognition of a number of “Best Practices” within the construction industry:

- **Partner with OSHA** – The project viewed Oregon OSHA regulations as written to prevent injuries, consistent with the safety goals of Bechtel. Therefore, OSHA was viewed as a partner in achieving the goal, not an adversary. OSHA rules are minimums, and Bechtel strove to exceed them and invited Oregon OSHA to help. This resulted in the VPP recognition.

- **Partner with and actively engage all organizations in the effort** – This included the workers compensation carrier, police and fire departments, traffic control, insurance organizations, medical clinics, subcontractors, and suppliers. This was approached with a preference to prevention, not in claims and reporting. Subcontractors were given all of the core processes for safety and required to have an equivalent or better standard for safety. The subcontractor safety plan was developed and approved before they started work. Bechtel expected its subcontractors to have the same commitment to safety in terms of resources, processes, and tools. Each subcontractor was required to have a safety coordinator, skilled people, and recurring training. Bechtel also provided safety training for subcontractor supervisors and include them in the safety process.

- **Engage construction supervisors in the safety process** – Make supervisors accountable for safety activities, including any post-injury activities, by requiring them to identify and correct safety problems in their areas of responsibility.
• Safety leadership was planned for and developed – Through setting and maintaining standards and training this was accomplished.

• Safety communication was set at the highest level – Communications began at the highest levels within Bechtel’s corporate management and on the project. All possible communications measures were utilized. Accident investigations did not focus just on the primary cause of the accident but on all causes. The results of each investigation were communicated with everyone on the project. There were no secrets or agendas for safety.

• Use of safety committees at all levels – Committees were used for employee involvement and as a communication tool. Area safety committees were comprised of workers and managers, and an oversight “executive safety committee” for the entire project was also utilized.

• Use of the “Safety Task Analysis and Risk Reduction Talk” (STARRT) program – This program was implemented as a required daily analysis and crew discussion activity to explain the hazards of the day and outline risk reduction measures that must be taken by the crew. This program forced continuous attention to the ongoing and changing hazards of a construction project. This program also incorporated the hazard identification and correction process. Project-wide use of personal protective equipment, including head, eye, and hand protection and reflective vests, was enforced. All employees, manual and non-manual alike, participated in the stretching program at the start of each day.

• Safety incentives – Significant dollar safety incentives that combine safe work practices and safety results with productivity and quality results were used.
The overall commitment to safety on the Airport MAX Extension project was demonstrated by the resources dedicated to safety programs, leadership attention, financial support, training at all levels, excellent tools for safety awareness, incentives, demonstrated support in safety committees, and worker involvement.

**Lessons Learned:** Create partnership with OSHA and all organizations on the project. Extend project safety requirements to all subcontractors on the project. Encourage safety leadership and communication. Use programs to identify hazards before starting any work activity. Incorporate safety incentive programs.

**Civil/Systems Integration**

One of the key areas of concern on this and any rail transit project is the integration of the civil/infrastructure elements with the system wide elements. On the Airport MAX Extension, this integration was the responsibility of the design-builder and was accomplished utilizing a variety of methods.

During the PE phase of the project, design sub consultants STV and LTK were responsible for the preliminary design of the signals and communications systems and the traction power system, respectively. At the start of the final design, these two major systems packages were consolidated, and the responsibility for their completion was turned-over to Siemens Transportation Systems, Inc. As a design-build subcontractor to Bechtel, Siemens was responsible for completing the systems design, furnishing all equipment, and installing all systems components. This consolidated approach to the systems work helped the integration
between the various systems, as Siemens was solely responsible for design and construction of all systems. In addition, this single point of contact for the systems work facilitated the civil/systems integration effort. Siemens participated with Bechtel and Tri-Met as part of the design coordination process to identify and coordinate all civil/systems interface issues. An action items list was maintained to document resolution of these interface issues.

Bechtel retained STV and LTK during the systems design-build phase to assist with review of design submittals prepared by Siemens to ensure that they conformed to the Program Requirements, project criteria, and technical specifications. They also assisted with field inspections and the integrated testing and start-up process.

One of the key civil/systems integration efforts was the collaborative design process used to locate all systems elements with respect to all civil and structural features. A separate set of civil/systems integration drawings was prepared to show all systems elements, which are often designed and shown schematically, to scale on the civil background drawings.

Each transit system has clearance requirements based upon the physical and operational characteristics of their particular rail vehicles. These clearance requirements must be checked at each physical obstruction located along the alignment. Clearances must be checked during the design phase, and clearance envelopes for rail and any road or highway that crosses the alignment must be shown on the drawings. Clearances must be confirmed in the field based upon as-built measurements at all new infrastructure elements as well as at all new systems
elements. Any existing structures adjacent to the right-of-way must also be checked to ensure that adequate clearance is provided.

The design of all systems elements, including power, communications, public address, and telephone, must be integrated into the architectural design of the station facilities.

Consideration must be given to the integration of all stray current, corrosion control, and grounding issues. This is particularly important when the project includes concrete structures with direct fixation track work. A special study was performed to model the anticipated results and then recommended mitigation measures were incorporated into the design of the LRT bridge structures. Protection must also be provided for existing utilities that are near the rail alignment and for existing steel and concrete structures that are close to the LRT power distribution system.

The design of any at-grade rail crossings must be closely coordinated between the civil layout of the intersection with the systems grade crossing equipment. In particular, these efforts must be closely coordinated with the state regulatory agency to ensure that grade crossing orders are received in a timely fashion.

Systems integration extended beyond that discussed above to include the owner in the integrated testing and start-up process. This effort, which is currently underway, is required prior to turning-over the system to Tri-Met. It is expected that the project will be turned-over to Tri-Met on or before July 9, 2001. As part of this process, training and testing, spare parts, QC records, and as-built record drawings will also be provided to the owner.
Lessons Learned: Prepare a consolidated set of civil/systems integration drawings to scale on the civil background. Prepare clearance calculations and show clearance envelopes on the drawings. Begin development of the integrated testing and start-up plan as early as possible in the systems design process.

RESULTS AND BENEFITS

Development of costs for the design-build required a lump sum estimate. The team went through a preliminary design effort, and different portions of the design were developed to differing levels of completeness as needed to commit to a lump sum price. For example, track plan and profile was developed to an 80-90% level of completeness since these were used as the basis of all subsequent work, whereas systems electrical design was only developed at a schematic level.

A cost ceiling of $125M was established by Tri-Met, through negotiating the scope with the design-build contractor. Only by executing the project on a design-build basis and utilizing a fast-track schedule, was it possible to achieve these cost and schedule milestones that would not otherwise have been met.

Costs savings were attributed to two primary areas: schedule (permitting, design, and construction) and design innovations.

Cost Savings Schedule
The old adage remains true - time is money. If the duration of the project could be shortened, the project could save money. The schedule for permitting, design, and construction was accelerated. Due to the absence of federal funding of the project, the design schedule could be expedited. The federal oversight by a Project Management Oversight group was not needed. Permits however were still required for federal, state, and local agencies. To expedite permit review by state and local agencies, senior level staff from the City of Portland, Port of Portland, and Oregon Department of Transportation (ODOT) were included in the bi-weekly design team meetings. These agency representatives had the authority to make commitments to the design team. This allowed for quicker review and approval when plans were formally submitted. Design reviews then consisted of verifying if the design elements were on the plans. Different design options and requirements had previously been discussed. The use of a local engineering firm expedited design and review, because the engineering firm knew the local design requirements and the people in the local and state agencies. Early coordination occurred with ODOT and the City during the Type, Size, and Location (TS&L) study for all of the bridges.

Design occurred in three segments. Conceptual design to verify the feasibility of the project was completed in August of 1997. A go/no go decision was made at the conclusion of this work. Design proceeded with preliminary engineering from December 1997 through August of 1998. A lump sum price was agreed upon at $125 million. Final design began in October of 1998. The team issued the first construction plans for civil work on March 15, 1999. The team moved from conceptual engineering to issued for construction plans in less than two years. Construction began immediately after the drawings were issued. Design proceeded and plans were issued for roadway and architecture on June 14, 1999. Because of the design-build nature of the project,
overlapping of the design and construction phases of the project afforded fast tracking advantages. Design-build also eliminated the agency time typically incurred for bidding activities and mobilization within a standard design-bid-build contract.

The construction schedule was accelerated due to the ability to begin construction before design was 100% complete. Elements of the design were sequenced to follow the sequence of the construction activities. Utilities and civil elements were designed before the buildings and systems.

**Cost Savings-Design Innovations**

Another benefit of the design-build approach that was realized is the flexibility to change construction methods for certain project elements and to be innovative with the approach to design and construction. Innovative design elements of the project were:

- The use of pre-cast traffic barriers instead of cast-in-place ballast wall. On previous Tri-Met projects, cast-in-place ballast walls were used to separate the ballast from the edge of the sub grade in areas where limited right-of-way width excluded the use of a ditch. The benefits of using pre-cast barriers were: lower cost, quicker installation, and the barriers served double duty for traffic control. In the I-205 median, the barriers were used to separate the work zone from highway traffic. As the grading work was completed, the barriers were incorporated into the final, constructed project.
The use of cable channel in place of ductbank. Tri-Met had traditionally used ductbanks, a group of 9 to 16 conduits run below the center of the tracks, encased in red concrete that house the power, signal and communications conductors. The benefits of using cable channel were: speed of installation, less excavation, reduced risk of unearthing contaminated soils, reduced number of conflicts with existing utilities, and speed of installation of wiring.

The use of fiber optics for the communication cable in lieu of copper wire. At the ends of the project, fiber optic cable was used. At the south end of the project a connection was made to the existing system ½ mile from Gateway Transit Center. The existing ductbank did not contain enough spare conduits to contain the wiring. The options were to build a new ductbank for the ½ mile in the existing roadway, or use fiber optic cable that would fit in the existing ductbank. The benefits to fiber optic cable were: less space required, avoided construction of ½ mile of ductbank and its associated disruptions, speed of installation, and lower cost.

The use of pre-cast, pre-engineered substation buildings instead of custom designed and field constructed buildings. The benefits to the use of pre-cast buildings were: reduction in design time, less cost, less construction time, quick to permit, and vandal resistance.

The use of segmental cast-in-place bridge at the crossing of I-205. This method allowed the bridge to be constructed over live traffic on I-205, one of the busiest highways in the State of Oregon, without lane closures during construction. This was decided as part of a
TS&L study, which involved reviewing numerous options with the design team and ODOT. The initial concept was to construct a cut and cover under crossing of the southbound lanes of I-205. The under crossing was ruled out as being too disruptive to the traffic flow on the interstate because it would have required lane closures. The lengths of the spans ruled out pre-cast concrete girders. The cost of steel ruled out a steel structure. The benefits of using the segmental cast-in-place bridge were: construction without lane closures, constructibility and facilitated permit approval by ODOT.

- The choice of either cast-in-place retaining walls or mechanically stabilized earth (MSE) walls. The Program Requirements did not specify the type of retaining walls required. Based on evaluation at each wall, Bechtel chose the best-suited retaining wall type for the location. The benefits to site-specific wall types were: reduction in time and money expended, and constructibility as the site-specific areas and construction phasing dictated.

- As a mitigation for the small area of wetlands that was disturbed on the project site, rather than mitigating this on site, the governing local and state agencies preferred that the project help mitigate another, more environmentally sensitive site nearby. The agencies had been accumulating smaller contributions to help restore this larger wetland area. This was done at a 2:1 area ratio, which is typical for this type of situation. The benefits were realized beyond the limits of the project: a better functioning water quality wetland facility that requires less maintenance than numerous small facilities.
Comparing Tri-Met projects of the past with the Airport MAX Extension, with dollars adjusted to 1999, and excluding costs of right-of-way and vehicles, shows the results of these efforts:

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<th>Cost per Mile</th>
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The design-builder as well as the owner strictly monitored project costs. The design-builder had committed to a not-to-exceed price and was committed to meeting that price while earning a reasonable profit. The owner also had no additional revenue sources and so was also very committed to maintaining the agreed to project budget. Proposed changes to the project were strongly reviewed and evaluated by both sides. When changes were required, both the design-builder and the owner worked closely together to minimize any time or cost impacts. Because of this joint commitment and continued focus, the project is being completed on time and on budget.

A cost savings realized by the owner is in direct staff salaries. The owner is able to oversee a design-build project with a much smaller staff than would be required on a more traditional project. However, it must be recognized that the design-build approach usually requires the owner to relinquish a certain degree of control in the overall management of the project.

**WRAP UP**
The speed of the project is a testament to its unique intergovernmental cooperation, which translated into efficient permit approvals by city, state and federal regulators, and to the use of design/build and fast-track construction techniques. All told, the project will take less than three years from the start of final design to the opening of Airport MAX.

**RECREATING THE MODEL**

Airport MAX development has given local governments an exceptional model for public/private ventures. This project offered Bechtel strong business incentives, an essential element in attracting private involvement to public works. All negotiations and agreements were well documented and can serve to guide other projects. Increased openness to such projects by both businesses and governments makes them more likely in the future.

The existence of good regional plans, which is also encouraged by federal transportation procedures, makes this type of quick response viable in other communities. Urban renewal districts and the use of tax increment financing can be valuable funding sources because their flexibility allows dollars to be spent to pursue regional employment and density goals.

Obstacles that may arise include mismatched public and private objectives, the difficulty for a business to participate in a lengthy public process, and public bidding regulations, which can challenge government’s ability to pursue the type of sole-source contracting that may be needed.

Ultimately cooperation, trust, good planning, and a shared vision are key to any successful project.