Introduction

Public-private partnerships (P3s) are seen as one of the more attractive methods to deliver project financing for public infrastructure projects. The number of P3s in the
United States is growing, particularly as public agencies struggle to construct and maintain infrastructure with limited resources. The recent popularity of P3s in the United States is largely due to government agencies struggling with tight budgets while facing ever-growing needs for infrastructure improvements. The private sector has always benefitted from infrastructure improvement projects; therefore, the public sector has begun to look to the private sector to help ease the burden and share the risk. It is becoming apparent to both the public and private sectors that the future of infrastructure funding lies in this partnership, and consulting engineers need to understand the role they can play in making this a stronger relationship.

Previously, P3s were viewed as a miracle solution to a burdened public sector that was unable to maintain existing facilities, let alone construct new ones necessary to support private investment and economic growth. However, P3s are not quick-fix solutions. Where the public side often failed to understand the value of the private side, the private partner was often impatient with the public process and frustrated that the public entity saw it as a limitless bank account. In the United States, these misunderstandings made P3s at times difficult to pursue.

To begin with, in order to implement a P3 arrangement, states must first adopt P3 legislation and guidelines. Without this, potential P3 relationships are not possible and become lost opportunities. Virginia and Florida have put the necessary framework in place, but many other states have not, which leaves many doors closed to infrastructure opportunities. More detail about appropriate P3 legislation can be found in later chapters of this book. In this chapter, however, we discuss the consulting engineers’ role in tapping into the full P3 potential of a project.

In a P3, the owner, financier, and builder each need the services of a consulting engineer. This chapter describes how consulting engineers can support the roles of the public and private partners, bridge the gap between them, and introduce private financiers into the process to bring a P3 project to a successful completion.

Consulting Engineers for Project Owners and the Public Sector

P3s are typically long-term agreements that distribute responsibilities and risks between public and private parties in order to execute a project more efficiently and cost-effectively. However, P3s should not be thought of as projects with a single-funding source; rather, they should be viewed as one of many delivery methods that can be applied to a project. P3s usually require additional revenue sources, either conventional state and federal funding or alternative resources, such as tolls, fares, rents, user fees, or availability payments. As such, all P3s require careful and comprehensive evaluations of their fiscal, management, and policy implications.1

The success of a P3 project comes from the foundation it is built on which, in turn, derives its strength from proper due diligence and a comprehensive master plan outlining all the stakeholders, clear lines of responsibilities, and the full process.
necessary to complete the project successfully. The consulting engineer has five primary roles in developing this P3 foundation for the project owner:

1. Formulating and presenting the idea of a P3 to the project owner.
2. Defining the preferred P3 model for the project.
3. Organizing the process understanding.
4. Planning.
5. Serving as program manager.

The following sections define these steps for the consulting engineer in more detail.

**Formulating and Presenting the Idea**

As the capacity of traditional funding sources continues to be more limited, it has become increasingly important for the consulting engineer to identify innovative sources and financing mechanisms for public projects. Thus, the first step in formulating and presenting the idea of a P3 to the project owner is to develop a clear financing plan. With P3s playing a more prominent role in project execution, the expectation that private funding can be a sole source of financing for a project must be dispelled immediately. P3s are not a miracle solution, but they can play an important role in the successful implementation of a project. Funding sources and financing mechanisms come in many different forms, including both traditional and innovative sources, which are summarized in Table 1 (next page).

**Define the Preferred P3 for the Project**

There are many forms of P3s. Not all of them are suitable for every project, and many projects require a fine-tuned, custom-crafted P3, given the project elements. It becomes the consulting engineer’s role to help the owner understand which P3 model best suits the project and to prepare the best model for the job at hand. Some of the more typical examples include design-build (DB), design-build-finance (DBF), design-build-finance-operate (DBFO), design-build-operate-maintain (DBOM), and design-build-finance-operate-maintain (DBFOM).

- **Design-build (DB).** The public agency contracts with a private party to design and build a project to the specifications provided by the public agency, and certain risks for design and construction are allocated to the private contractor. After completion, the public agency operates and maintains the facility.

- **Design-build-finance (DBF).** One contract is awarded for the design, construction, and full or partial financing of a facility. Responsibility for the long-term main-
Part 1: P3 Opportunities and Experience

Maintenance and operation of the facility remains with the project sponsor. This approach takes advantage of the efficiencies of the design-build (DB) approach and also allows the project sponsor to completely or partially defer financing during the construction phase of the project.

• **Design-build-finance-operate (DBFO).** The responsibilities for designing, building, financing and operating are bundled together and transferred to private sector partners. Direct user fees (such as tolls) are the most common revenue source.

• **Design-build-operate-maintain (DBOM).** The public agency contracts with a private partner to design, build, operate, and maintain the facility for a specific period of time. At the end of that period, operation and maintenance transfers back to the public agency in a prescribed state of good repair.

• **Design-build-finance-operate-maintain (DBFOM).** The public agency contracts with a private partner to design, build, finance, operate, and maintain a facility under a long-term agreement. At the end of that time frame, full responsibility for the facility is transferred to the public agency in a state of good repair.

Each of these models comes with its benefits and disadvantages, so it falls to the consulting engineer to outline the appropriate P3 model for the project owner. In terms of relative risk transfer, Figure 1 plots the common P3 approaches and the degree of risk transfer of each. Table 2 (page 42) summarizes the benefits and drawbacks of each.

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Table 1. **Revenues, Funding Sources, and Financing Mechanisms**

<table>
<thead>
<tr>
<th>Direct System Revenues</th>
<th>Other Funding Sources</th>
<th>Financing Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional</strong></td>
<td></td>
<td></td>
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<tr>
<td>Passenger fares</td>
<td>Local taxes</td>
<td>Revenue bonds</td>
</tr>
<tr>
<td>Highway tolls</td>
<td>State general obligation bonds</td>
<td>Bank loans</td>
</tr>
<tr>
<td>Parking fees</td>
<td>State sales tax</td>
<td></td>
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<tr>
<td></td>
<td>Federal grants</td>
<td></td>
</tr>
<tr>
<td><strong>Innovative</strong></td>
<td>Transit-oriented development/joint development</td>
<td>State infrastructure bank loans</td>
</tr>
<tr>
<td>Concessions</td>
<td>Benefit assessment district</td>
<td>Transportation Infrastructure Finance and Innovation Act (TIFIA)</td>
</tr>
<tr>
<td>Advertising</td>
<td>Tax increment financing</td>
<td>Registered Retirement Income Fund (RRIF)</td>
</tr>
<tr>
<td>Air rights</td>
<td>Asset monetization</td>
<td>P3s</td>
</tr>
<tr>
<td>Naming rights</td>
<td>In-kind contribution</td>
<td>Availability payment</td>
</tr>
<tr>
<td></td>
<td>Parking increment</td>
<td>Private activity bonds</td>
</tr>
</tbody>
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</tbody>
</table>

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Chapter 2: Opportunities and Roles for Consulting Engineers on P3 Projects

Organizing the P3 “Process Understanding”

The next step in supporting the project owner in the P3 process is for the consulting engineer to organize the “process understanding.” Part of the difficulty in the implementation of P3s is the misunderstanding by the owner of P3 roles, the process, and the time it takes to carry a project to completion. The owner’s consulting engineer can help minimize this by presenting a description of the project that outlines the steps and milestones of the detailed process. The description would include important aspects of planning, design, environmental permitting, and full and upfront coordination with project stakeholders. Developing such an overall process master plan can clarify the process for the owner and establish appropriate expectations early.

Planning

To ensure that the proper approach is taken, the consulting engineer should know the funding partners who will be involved in the project. For example, if the federal government is a potential partner, the planning documents will need to be developed in a manner that is consistent with the specific federal program involved. Submitting a planning document that is not consistent with those requirements may
Part 1: P3 Opportunities and Experience

Table 2. Benefits and Drawbacks of Common P3s

<table>
<thead>
<tr>
<th></th>
<th>Benefits</th>
<th>Drawbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design-Build</strong></td>
<td>Merging of design and construction can shorten project completion time.</td>
<td>Design left incomplete until late in construction process.</td>
</tr>
<tr>
<td></td>
<td>Only one firm is selected, reducing transaction costs.</td>
<td>Costs of construction are estimated and can rise significantly during construction.</td>
</tr>
<tr>
<td></td>
<td>Financing costs can be lowered by bringing revenue-generating facilities</td>
<td>Public agency does not necessarily have guidance of independent design firm.</td>
</tr>
<tr>
<td></td>
<td>into use quickly.</td>
<td>Regulatory compliance may be harder because incomplete designs may frustrate oversight.</td>
</tr>
<tr>
<td></td>
<td>Design can be easily modified to meet unanticipated needs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Putting the private party in charge of all work improves flexibility and communication.</td>
<td></td>
</tr>
<tr>
<td><strong>Design-Build-Operate-Maintain</strong></td>
<td>Public agency incurs fixed costs throughout the length of the agreement; financial risk transfers to private party.</td>
<td>Public agency still bears full probable cost of construction and maintenance.</td>
</tr>
<tr>
<td></td>
<td>This method can produce faster completion times and lower transaction costs.</td>
<td>Public agency pays risk premium in exchange for avoided risk.</td>
</tr>
<tr>
<td></td>
<td>Private party has incentive to design for efficient operating costs.</td>
<td>This method is more common for buildings and non-transportation facilities; there are fewer examples in transportation sector.</td>
</tr>
<tr>
<td><strong>Design-Build-Finance-Operate-Maintain</strong></td>
<td>Private party is responsible for design, construction, financing, and operation for a fixed period.</td>
<td>There are only a few projects in the U.S. that have used this method, so there is little experience with it.</td>
</tr>
<tr>
<td></td>
<td>Private party is responsible for obtaining financing to pay for costs of initial construction and expansions, within concession period.</td>
<td>Requires public agency to monitor compliance with all contract provisions and requires long-term agency oversight to ensure adequate levels of service.</td>
</tr>
<tr>
<td></td>
<td>Public agency regains control and operational responsibilities at end of concessionary period.</td>
<td>Private party’s ability to absorb transferred risks throughout the concession period cannot always be guaranteed.</td>
</tr>
<tr>
<td></td>
<td>Public agency is relieved of financing.</td>
<td></td>
</tr>
</tbody>
</table>

cause delays or jeopardize the funding. The consulting engineer can assist the client with the planning component of the project, which can involve the development of an alternative analysis (AA). The AA is required under the National Environmental Policy Act (NEPA), and all projects contemplating the use of federal funds must comply with NEPA. The consulting engineer advising the owner during the development of early planning documents will be instrumental in ensuring that they are consistent with local, state, and federal requirements.

The consulting engineer contributes to developing the “basis of design” documents, which identify the design criteria to be used by the P3 team. These criteria
typically incorporate the client’s standard criteria as modified to meet the specific needs of the project. The basis of design documents include the conceptual design of the project, which defines each of the components of the project. In this initial phase, early investigative work, such as field surveys, utility research, and geotechnical investigations, is carried out. The consulting engineer uses this data to develop a conceptual design and prepares a report for the funding partners and the P3 teams that will pursue the implementation phase of the project.

Preparations for the environmental approvals start at the outset with the environmental review documents. The engineer can rely on its experience on traditional projects to develop documents that meet the local, state, and federal requirements. All major public projects require a robust approach to engaging the public as part of the early planning. For projects that involve a P3 method, this public process will require a significant educational component. The public, including elected officials, will need to be informed during the planning phases about how this P3 project works and what they can expect to occur. Project information needs to be clear and concise and made available in a timely and convenient manner. Managing the expectations of the public throughout the development phase can have a large impact on whether the project is later considered a success or failure. Again, the consulting engineer can use public information practices developed for traditional projects, augmented with background material, schedules, news contacts, and other facts about the P3.

Serving as Program Manager

Most clients do not have staff with the expertise to provide the services necessary to ensure the success of the P3 project. Therefore, in most instances, they procure the services of a consulting engineer to act as their program manager. Those services can vary, but the general goal of assisting the client achieve success on the project is common to all projects.

After the design concept and basis of design documents have been prepared and the financing arranged, the next step is to issue the request for proposals (RFP). A good RFP includes all the elements that the client usually requires when procuring services, as well as elements unique to the P3 project. As the owner’s program manager, the consulting engineer ensures that those elements are consistent with the state of the industry. To achieve this, the consulting engineer may conduct industry-wide research to ascertain the best practices being implemented on similar projects and then incorporate them into the RFP. Also, the RFP must include a comprehensive scope of services that are expected of the P3 teams. The scope of services will be developed based on the early documents but will need to be specifically crafted for the P3 project. Cutting and pasting from other RFPs is ill-advised because it can lead to confusing and misleading information, which may, in turn, result in unsuitable proposals submitted by prospective P3 teams.

After the RFP has been issued, the consulting engineer participates in the selec-
Part 1: P3 Opportunities and Experience

tion process. Among other tasks, the consulting engineer responds to questions from teams preparing their proposals. The consulting engineer’s clear, detailed responses should increase the likelihood that the proposals meet the expectations of the project. Thereafter, the consulting engineer reviews the submissions by breaking down the proposals and analyzing their strengths and weaknesses. To be comprehensive, this review will involve many different disciplines.

As a technical advisor to the client’s selection committee, the consulting engineer develops questions to pose to the proposing teams during the interview process. The questions—and answers—should reveal the bidder’s level of understanding of the goals of the project. Before the interviews, the consulting engineer will carefully read each proposal and prepare questions that are fair but that also garner the most information from the proposer. The more information the consulting engineer can elicit from the proposer, the greater the chance that the most qualified team will be selected.

There are three primary roles for the consulting engineer after the P3 team has been selected: conducting the design review, serving as value engineer, and reviewing alternative technical concepts (ATC). The consulting engineer reviews the P3 team’s submittal and tracks comments that are made so that in subsequent submittals the owner can be assured the comments have been properly addressed. During the design development by the P3 team, the consulting engineer provides value engineering services, recommendations to enhance the project made in collaboration with the P3 team. The consulting engineer reviews the P3 team’s ATCs and advises the client whether the alternative concepts will provide benefits that warrant their acceptance.

Consulting Engineer as Member of the P3 Team

Although the consulting engineer’s role is different on a P3 team than on traditional projects, the engineer is familiar with each aspect of the project and can provide tremendous value to the P3 team. The engineer creates innovative designs that meet the client’s goal and yet allow the builder to implement efficient construction techniques. During construction, the engineer makes sure that the commitments made during the early phases of the project are met and informs the public fully about the construction activities.

Serving on Proposal Team

The greatest impact that the consulting engineer can have during procurement is in reviewing the procurement documents, assisting in the development of the team’s proposal, and preparing the team for the presentation or interview. Each of these aspects of project procurement is a part of a consulting engineer’s day-to-day business. The owner can realize the greatest value on a P3 project when the implementation team is procured early enough in the process to allow for maximum flexibility and
innovation, that is, when the designs are in the early phases of development and the
goals of the project and the design criteria and standards are being defined. However,
the design concepts, while sound in general, have not been fully tested. At this early point,
the owner will be looking to the P3 team to refine and optimize the designs to enhance
the project.

The builder’s engineer will have the opportunity to develop alternative technical
concepts, which can encompass most aspects of the project from design criteria
modifications to construction techniques. ATCs are one way that a P3 team can
differentiate itself from the competition, highlighting for the client the team’s creative
approach. In order to devise ATCs with impact, the P3 team must completely under-
derstand the goals of the project and its context, as well as have full knowledge and
understanding of the procurement documents.

It is not uncommon for a P3 project to go through a number of procurements for
professional services during the design development process. The owner will hire one
engineering team to prepare the environmental review documents and preliminary de-
sign and another team to complete the final design. In some cases the owner will hire
yet another firm to the handle the construction engineering and inspection services.

**Gathering Intelligence**

Successful consulting engineers are completely familiar with this procurement
process. They know that it is important to follow a project from the early phases and
not wait for an RFP to put together a proposal. The best intelligence about a project
can be gathered prior to the issuing of the RFP, when the client is more at liberty to
discuss the project. Many times, in fact, an RFP does not fully explain all details that
are unique to the project. Sometimes, those details can only be obtained through
advanced preparation, before the RFP ever hits the street. With this knowledge, the
consulting engineers can dissect an RFP and identify the key issues that will need to
be addressed to make the project a success.

The consulting engineer offers the P3 team tremendous value at this point of the
process. With prior experience with the client, the consulting engineer will have
knowledge of the design criteria and the standards the client requires. The consult-
ing engineer will also know which criteria are fixed and which can be modified
to fit the needs of the project. This experience, when combined with knowledge
of what is state of the art in the industry, can offer an opportunity to review the
procurement documents with a critical eye. The consulting engineer can review the
procurement documents and break them down into the key components that focus
on the key issues that will make the difference in selecting a P3 team.

Of the many members of a P3 team, the consulting engineer is best suited to lead
the development of the technical proposal document. As a matter of course, the con-
sulting engineer is required to prepare and submit detailed proposals on all projects
it pursues. Therefore, a consulting engineer will have the experience, knowledge,
staff, and support structure already in place to prepare quality documents and to coordinate the efforts of all other team members. The development of the proposal is a project in and of itself. The proposal manager, like the project manager, must know what the end product should be in order to properly plan the steps to get there. The consulting engineer as project manager will prepare the outline of the proposal and a work breakdown structure so that each member of the P3 team knows what is expected. The engineer may translate technical ideas into more general language so they are easily understood. A quality proposal weaves the team’s experience, qualifications, and ideas into a unique story that is clear and addresses the key points.

The remaining piece of the procurement process is the interview, another task that the consulting engineer is well suited to lead. As in the development of the proposal, the consulting engineer routinely prepares for and manages the interviews on most of its projects. Each client will have different processes and different ways of grading a team’s interview. Thus, each presentation needs to be developed specifically for the project, and the medium used to make the presentation should be tailored to the client. To prepare, the consulting engineer may prepare the team via a story-board process that shows how the interview will be conducted. Getting the speakers ready for their roles in the interview is very important. The consulting engineer can put each team member in the best possible light, where his or her skills, strengths, and value can be clearly seen by the client, and the engineer’s marketing staff will prepare the graphic materials used to present the proposal.

Most P3 projects are procured through a “best value” process, in which both cost and qualifications are considered when selecting a team. The construction partner is best suited to prepare the cost component, inasmuch as it is what it does on its typical projects. The consulting engineer is best suited to prepare the qualifications part of the project.

P3s can come in the form of both solicited projects and unsolicited ideas. Some states only permit solicited P3s, in which case the government agency issues an RPQ or RFP for a project identified in its capital programming plans. As in the traditional government procurement process, the project parameters are defined up front. Some states also permit what is known as an unsolicited P3, in which concessionaires and developers propose a P3 to solve an infrastructure constraint. Allowing unsolicited proposals gives private firms a chance to use an innovative approach to solve public infrastructure needs, but it can impose resource and scheduling burdens on the public agency tasked with reviewing and evaluating the proposal. Moreover, an unsolicited proposal triggers a requirement to allow other competitors to submit competitive proposals.

Leading the Design Phase

After the P3 team has been selected by client, the execution phase can commence. Setting up a well-thought-out plan of execution is a critical first step for a successful
The project scope, schedule, and budget, as well as the roles and responsibilities of each key team member, need to be clearly defined. The consulting engineer will be responsible for finalizing the designs and obtaining permits, and thus should take the lead in developing the scope, schedule, and budget for the early phase of the project.

The consulting engineer’s project manager and the construction project manager together will schedule the development of the designs. One difference between a traditional project and a P3 project is the input of the construction partner. Elements of the design may follow a different flow on a P3 than on a traditional project. For example, the construction partner may want to move forward with a specific part of the project that requires early design in order to obtain the appropriate permits expeditiously, or the construction partner may want to order items with long lead items early to avoid delays later in the project.

Most public-sector clients have a specific procedure in place for project development. Their staff is completely familiar with the process and has clear expectations on what to expect and when to expect it. But a P3 project will probably not follow the client’s typical process. The consulting engineer, having experience with the typical process and knowledge of the P3 team’s plans, can keep the client’s staff informed of the approach and clearly articulate the differences so that expectations are properly aligned with the project delivery.

**Preparing an Operating and Maintenance Plan**

The P3 project will require the team to maintain the system for a period of time. The project will need a detailed operating and maintenance plan that clearly delineates the roles and responsibilities of the parties involved. The consulting engineer can assist in the development of the plan.

**Key Role in Construction Phase**

Design compliance during the construction phase of the P3 project is an important and ongoing concern. In the early phases of the project, during the development of the environmental review documents, the client makes commitments to the regulatory agencies and to the public in general regarding the project. The consulting engineer reviews the construction phasing and sequencing for the constructor to insure that the construction plans properly adhere to the design and fulfill the commitments.

Often, the consulting engineer is the “face” of the project with the public. Being completely knowledgeable about the commitments, permits, design, and construction sequencing, the consulting engineer keeps the public informed of current and future activities.
Consulting Engineer as Guidance to Financier

A consulting engineer could be the best guidance to a financier, particularly the consultant that has project history and was the lead in developing the project, and can perform due diligence for the financier. The financier wants to invest in a project that is sound from a design perspective and that has accurate capital investment and operating costs. The consulting engineer identifies risks, defines the project and its all-inclusive costs, and offers information about the key stakeholders for the financier. Further, the consulting engineer may serve as the financier’s quality assurance and quality control monitor, with duties that range from providing a design review to developing value engineering that identifies potential cost savings, which could be shared or retained by the financiers as profit. The consulting engineer could certify the cost estimates, giving the financier a sense of certainty that its investment is sound and will accrue the least amount of unexpected overages. The services the consulting engineer may provide a financier within a P3 relationship are summarized below.

Providing Due Diligence

A consulting engineer, particularly one who has history with the project, can conduct due diligence for the financier. The consulting engineer can identify risks associated with the project and the costs of each risk. While no project comes without its set of risks, the consulting engineer’s proper due diligence will enable the financier to gauge how to make the investment.

First, the consulting engineer draws up an assessment instrument called a risk register, which lists the potential risks and the likelihood of a risk adversely affecting the project’s schedule and total cost. If, for instance, the delay and subsequent added cost caused by a risk is high and the likelihood of it occurring is also high, the financier will get a better sense of how it may be impacted. A better-informed financier can make the go/no-go decisions necessary to protect its investment. Due diligence, as represented by the risk register, is not intended to create anxiety or resistance but to provide a clear understanding of possible risks in order to prepare the financier for the oncoming project. Table 3 shows the degrees of impact to a project caused by risks of differing likelihood and mitigation. The financier can use this tool to make informed decisions about its investment.

The risk register lists action items and assigns tasks that help eliminate the risks. It identifies the risks and their consequences and lists who should mitigate them.

Initial phases of a project usually have defined construction costs consistent with engineer estimates. While they are a good gauge of the investment needed, there are many aspects of a project, namely, the cost and schedule implication identified in the risk register, that are not included in those estimates and that may impact the bottom line of a project. The consulting engineer advises the financier about these costs and the schedule implications the risks may present should many or all them occur.
Providing Project Oversight

The consulting engineering also serves the financier in more traditional ways by providing design reviews and design audits. While design reviews should be regular practice as part of the quality assurance and quality control process of any project, the financier would want to ensure that the project is sound by bringing to the team an independent reviewer who can certify the design. A design audit could also be performed to ensure that the team who developed the design followed an established and monitored quality assurance and quality control process before it ever came to the independent review. The review and audit helps the financier ensure that the project it would be investing in is of sound engineering design and that all the risks that stem from the design are minimized or eliminated. The financier would need to worry only about risks outside the design. The financier could ask the consulting engineer to certify the cost estimate developed by the project engineer (if that was not included in the consulting engineer’s original role).

<table>
<thead>
<tr>
<th>Probability of Risk</th>
<th>Insignificant (minor problem, easily mitigated)</th>
<th>Minor (some disruption possible)</th>
<th>Moderate (significant resources required)</th>
<th>Major (severely damaging)</th>
<th>Catastrophic (business survival at risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain (&gt; 90% chance)</td>
<td>High</td>
<td>High</td>
<td>Severe</td>
<td>Severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Likely (50%–90% chance)</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td>Severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Moderate (10%–50% chance)</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Unlikely (3%–10% chance)</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Severe</td>
</tr>
<tr>
<td>Rare (&lt; 3% chance)</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
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In addition to a design and cost estimate review, the consulting engineer can offer value engineering advice. Value engineering typically evaluates the proposed design and considers an alternative that would be less costly to construct or develop. Value engineering on a P3 project is an opportunity for the financier to decrease its capital or operating investment. The consulting engineer may take the opportunity to share in such savings by proposing a compensation formula to the financier that incentivizes the engineer’s innovative design and use of materials. This is a common practice in the construction industry, and the consulting engineer should look to benefit from its own efforts to save the financier’s capital or operating investment.

Case Studies

The following case studies of P3 projects in the United States exemplify the role an engineering consultant can play and has played.

Denver Union Station Redevelopment

Consulting engineers on the Denver Union Station redevelopment project participated in every step along the way, starting with planning for the station and transit-oriented development (TOD) while the master plan was being developed, through the design phase, during which a more comprehensive understanding of the project’s capital investment and operating costs was formed, and finally to identifying the financing structure necessary to execute the plan. The Denver Union Station project is an example of how disparate stakeholders, funding sources, and project elements can be combined to produce a major regional benefit. The project has elements of a wide variety of innovative funding sources and financing mechanisms, including TOD, tax increment financing (TIF), P3s, and innovative loan programs.

The Denver Union Station (DUS) was built in 1881 and remodeled in 1914. Denver sought to redevelop Union Station to serve the needs of the community, including historic preservation and sustainable development, in addition to improving the area’s transportation services.

The Denver Regional Transportation District (RTD) acquired the 19.5-acre station site in 2001 and created a master plan to redevelop the station into a multi-modal transportation facility that would bring together light rail, commuter rail, intercity rail, bus, parking, taxi, pedestrian traffic, and cycling. The vision was for the station to serve as a mixed-use, transit-oriented development and become a hub for urban activity, including office, retail, and residential uses. The project was expected to cost $518.6 million.

Following master plan approval, an RFQ process was initiated to select a master developer to construct about 1 million square feet of office space, up to 300 residential units, a hotel, and 100,000 square feet of retail/commercial space.
Partial funding for DUS included funds from real estate development around the station. Key elements included a TIF district that would produce revenue as the master developer took down property. The property tax increment will be the largest source of pledged revenues in the later years of the project and will be based on tax levies imposed by the city and Denver Public Schools.4

RTD used subsidized loans and grants for the project, including $145.6 million from the U.S. Department of Transportation TIFIA program and $155.0 million for commuter rail from the Railroad Rehabilitation and Improvement Financing Act (RRIF) program. RTD received an FHWA grant of $45.3 million, an FTA grant of $9.5 million, and an ARRA Stimulus grant of $28.4 million for the project. The remaining funding will come from RTD, state and local sources, land sales, and revenue during construction. The TIFIA and RRIF loans are backed by an annual RTD obligation of $12 million, which will come from a dedicated sales tax, revenues from the TIF, a levy on property tax revenues, and hotel taxes.

Dulles Corridor Metrorail Project

The Dulles Corridor Metrorail Project, or Silver Line, was planned and designed to connect the Washington metropolitan area with Dulles International Airport and Tysons Corner, Virginia. The 23-mile rail line is estimated to cost $6.8 billion and will have 29 stations. One of the purposes of the Silver Line was to encourage economic development in Tysons Corner. Business owners along the rail corridor recognized the value this would have and overwhelmingly approved a Benefit Assessment District (BAD) tax. This BAD itself is innovative in that it covers not just station areas but also land around the corridor in Fairfax County, Virginia. The voluntary tax was approved in 2004 and is expected to fund more than 15 percent of the project’s total costs.5 Private contractors will be responsible for the design and construction of Phase 1 through a design-build delivery mechanism. Further funding for the project would be provided by excess tolls from the Dulles Toll Road, which is owned and operated by the Metropolitan Washington Airports Authority.

Poinciana Parkway Toll Road

When fully developed, the Solivita Retirement Community in Poinciana, south of Orlando, Florida, will be a 4,600-acre residential, mixed-use community, with 36 holes of golf, 250 acres of man-made lakes and recreational waterways, and 30 miles of paved, multi-use trails and bicycle paths. In order for the Solivita community to be convenient and accessible for its residents, it needed an entirely new roadway connecting it to the west. Creating Poinciana Parkway by extending Marigold Avenue to U.S. 17-92 was considered
key to development in Poinciana. The consulting engineer’s role on this project included the following responsibilities:

- Permitting the project through Polk and Osceola Counties and the FDOT District 1 Maintenance Division.
- Developing right-of-way plans and instruments of taking, as well as negotiated right-of-way acquisitions.
- Developing innovative design techniques to cross wetland areas (e.g., geotextiles, mechanically-stabilized earth walls).
- Developing the design of the stormwater conveyance system, attenuation, and water quality, as permitted through South Florida Water Management District (SFWMD).
- Identifying and evaluating existing wetland systems along the corridor and securing permissions from SFWMD and U.S. Army Corps of Engineers (USACE).
- Developing environmentally sensitive designs for construction through an existing wetland complex (Reedy Creek) and an existing mitigation bank.
- Coordinating efforts through the Minority Business Round Table, United States Fish and Wildlife Service, Florida Fish and Wildlife Conservation Commission, USACE, SFWMD, U.S. Environmental Protection Agency, and the Department of Agriculture’s Natural Resources Conservation Service.
- Coordinating testing and evaluation analysis and developing a mitigation plan to protect wildlife, such as the Florida panther, eastern indigo snake, and wood stork, along the corridor.
- Preparing a maintenance of traffic plan that accommodates the safety of the construction workers and allows for minimal impact to traffic flow.

The project itself is intended to develop a 9.66-mile, four-lane road beginning at the existing intersection of County Road 54 and U.S. 17-92 in Polk County and terminating at the intersection of Marigold Avenue and Cypress Parkway in Osceola County, to be known as the Poinciana Parkway. The concessionaire would develop, own, and operate as a private toll road the 4.15-mile central portion of the Parkway, develop and dedicate to Polk County the 1.34-mile westerly portion of the Parkway, and develop and dedicate to Osceola County the 4.17-mile southerly and easterly portion of the Parkway. The consulting engineer’s previous experience and relationships with the Florida Department of Transportation, Osceola and Polk Counties, the South Florida Water Management District, and the U.S. Army Corps of Engineers created an atmosphere of trust and respect among the stakeholders for the development of this privately financed project. When completed, Poinciana Parkway will give the residents of Solivita and Poinciana a new way home and will form an entirely new road network for the area, connecting U.S. 17-92 on the west to the Polk–Osceola County line on the south and east, while cutting travel times in an efficient and environmentally responsible manner.
Warwick, Rhode Island, Intermodal Station

The consulting engineer’s role in this project started in the planning stages when the feasibility of the facility was evaluated. Once the engineer had a clear understanding of the capital investment necessary and the annual cost of operating and maintaining the facility, the engineer carried this project through design and developed a financing plan.

The Warwick Intermodal Station project is a $267 million project at T.F. Green Airport in Warwick, Rhode Island, that connects air passengers, bus riders, cars, and rental cars in one location. The project had five funding sources: $124.6 million in federal funding grants, $42.0 million in TIFIA loans, $39.6 million in special facility revenue bonds, $29.6 million in customer facility charges, and $31.1 million in state grants. The rail platform at the airport was integrated with the rental car operations, which has access to over 1,800 parking spaces, with an additional 800 spaces reserved for rail commuters. The project will become one of the closest rail connections to a major airport terminal in the country and is expected to generate about $127 million a year.

This project used the TIFIA program as a significant source of financing. As required for eligibility for the TIFIA program, this project’s TIFIA loan was less than 33 percent. The project was also supported by user charges. A TIFIA loan agreement accounts for $42.0 million of the total project cost. Both senior and TIFIA debt are supported by the pledge of future facility revenues. These revenues consist primarily of customer facility charges collected by rental car companies but also include commuter parking revenues, earnings on investments, Rent-A-Car (“RAC”) rental fees, and tenant improvement payments. These revenues are also pledged for facility operations and maintenance expenses. Federal grants came to $124.6 million and state grants were $31.1 million. The remainder of the project was financed through $39.6 million in special facility revenue bonds and $29.6 million in customer facility charges.

The consulting engineer served as project advisor, a role that included project management and design.

References


Joint Legislative and Executive Commission on Oversight of Public-Private Partnerships, Final Report to the Governor and General Assembly, January 6, 2012


Federal Highway Administration, Project Profile, TF Green Airport.
Notes


5. Percentage estimate based on earlier total capital cost estimate of approximately $5.3 billion.