VALUE ENGINEERING AND PARTNERING

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ABSTRACT

The interrelationship between Value Engineering (VE) and the partnering approach to construction projects is described in this paper. A major Los Angeles Metro tunnel project illustrates the mutual benefits of partnering and VE that includes increased opportunity for innovation, improved cost effectiveness, and enhanced performance.

The construction industry within the United St ates will increasingly turn to the concept of partnering to address the economic and techno-logical challenges in the 1990s. Adversarial relationships among the designer, consultants, construction manager, contractor, and owner are being replaced with a cooperative attitude in whichall the participants become "partners" in the successful realization of a project. Partnering is a term used to define an optimum relationship between two or more organizations to achieve specific business objectives by maximizing the effectiveness of each of the participant's resources. The benefits resulting from partnering include improved efficiency and cost effectiveness, an increased opportunity for innovation, and the continuous improvement of quality products and services. [1]

VE plays an important role in the implementation and successful outcome of partnering relationships in the construction industry. A VE workshop involving all project participants can foster trust, dedication to common goals, and understanding of each other's individual expectations and values – all necessary components for a successful partnering relationship. The VE effort will also benefit from the open exchange of ideas and innovative energy released by the partnering approach.

PARTNERING

In 1987, the Construction Industry Institute (CII) established a task force on partnering to evaluate the feasibility of this method of doing business in the construction industry. Its report, "In Search of Partnering Excellence," issued in July 1991, concluded that "Partnering offers many opportunities to participants in the U.S. construction industry to improve the total quality and cost effectiveness of construction projects." [2] Pioneered by private sector programs, partnering is finding increasing favor and usage by public agencies. [3] The Los Angeles Metro program, one of the nation's largest public works efforts, is incorporating partnering principles into its overall construction approach (described later in this paper). The U.S. Army Corps of Engineers is also interested in partnering as evidenced by a recently published paper entitled, "A Guide to Partnering for Construction Projects." [4]

The CII Partnering Task Force identified partnering as a relationship wherein:

> All seek win-win solutions.
> Value is placed on long-term relationships.
> Trust and openness are the norm.
> An environment exists for long-term profitability.
> All are encouraged to address any problem openly.
> All understand that no one benefits from the exploitation of an other.
> Innovation is encouraged.
> Each partner is aware of the other's needs, concerns, and objectives; and all are interested in helping their partners with these achievements.
> Overall performance is improved.

This CII task force also identified synergism as a key element of partnering that:

> Promotes the open exchange and consideration of ideas.
> Avoids the "not invented here" syndrome.
> Combines the resources and knowledge of the partners.

The close relationship of these attributes to those of VE are evident. It was recognized and reported by J. O'Rourke in 1986 in the activities of The Construction Users Anti-Inflation Roundtable, which ultimately led to the establishment of the CII Partnering Task Force. [5] Those early concepts have matured to the point where significant imple-mentation within the construction industry can be expected; however, the role of VE needs to be considered carefully for construction projects using the partnering approach.

Figure 1 illustrates the traditional (i.e., non-partnering) construction project approach. Plans and specifications developed by an architect-engineer are used to hire a construction contractor who is then bound by the provisions in the contract, the plans and specifications, and other contractual documents. Sometimes a VE study is undertaken; frequently, it is not. Claims resulting from real or imagined deficiencies in the contract documents relating to work delays, interferences, and changes lead to owner-contractor confrontations and ultimately to cost growth.

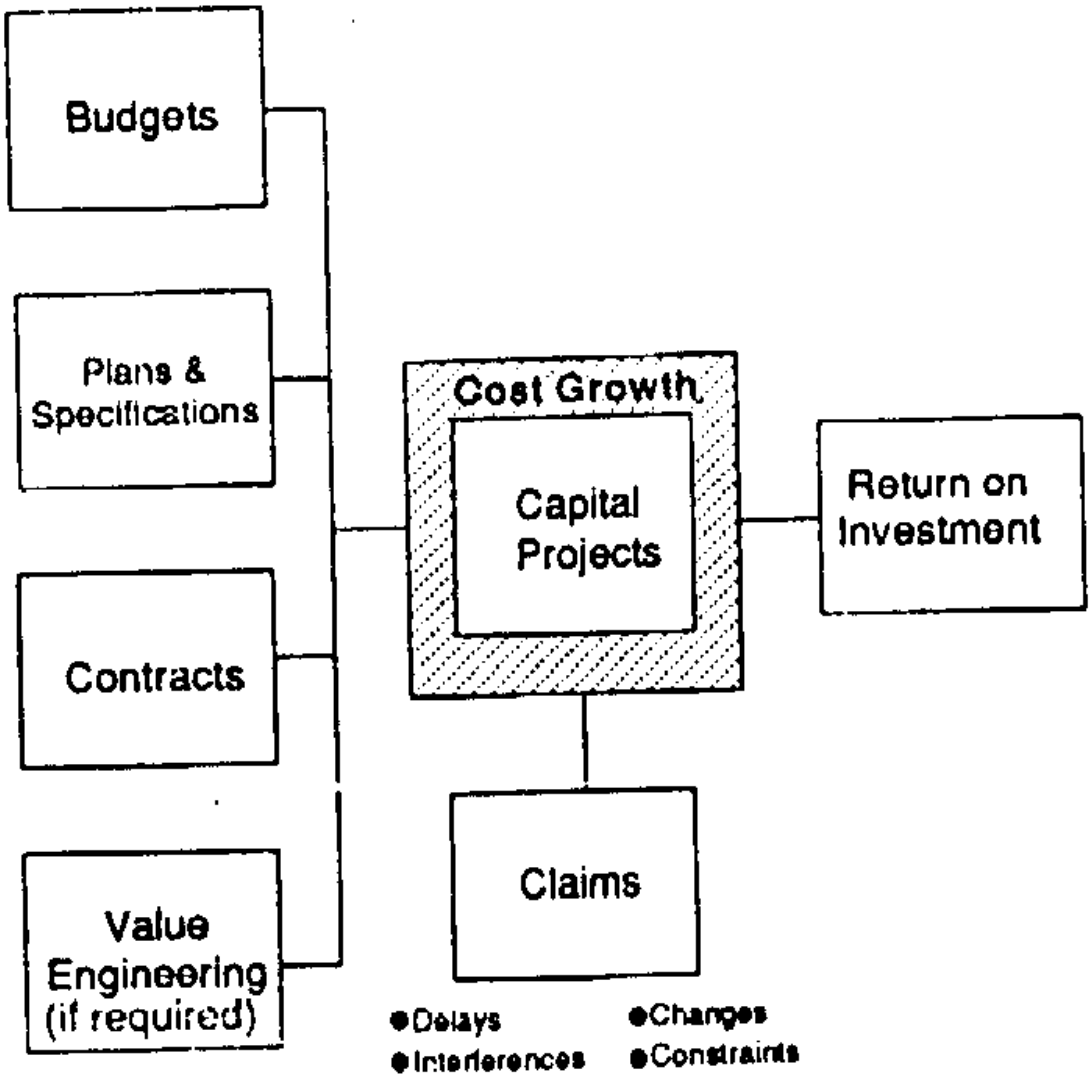

Figure 1 Typical Construction Project Approach

The strength of partnering (Figure 2) is derived from the synergy of the participating organizations. A relationship is developed based on equity and parity rather than adversarial confrontation. The parties become mutually motivated to seek win-win solutions rather than the win-lose solutions of traditional relationships. VE efforts involving all project participants promote this win-win relationship that carries over into project execution. The net results are controlled costs, improved quality, and enhanced performance.

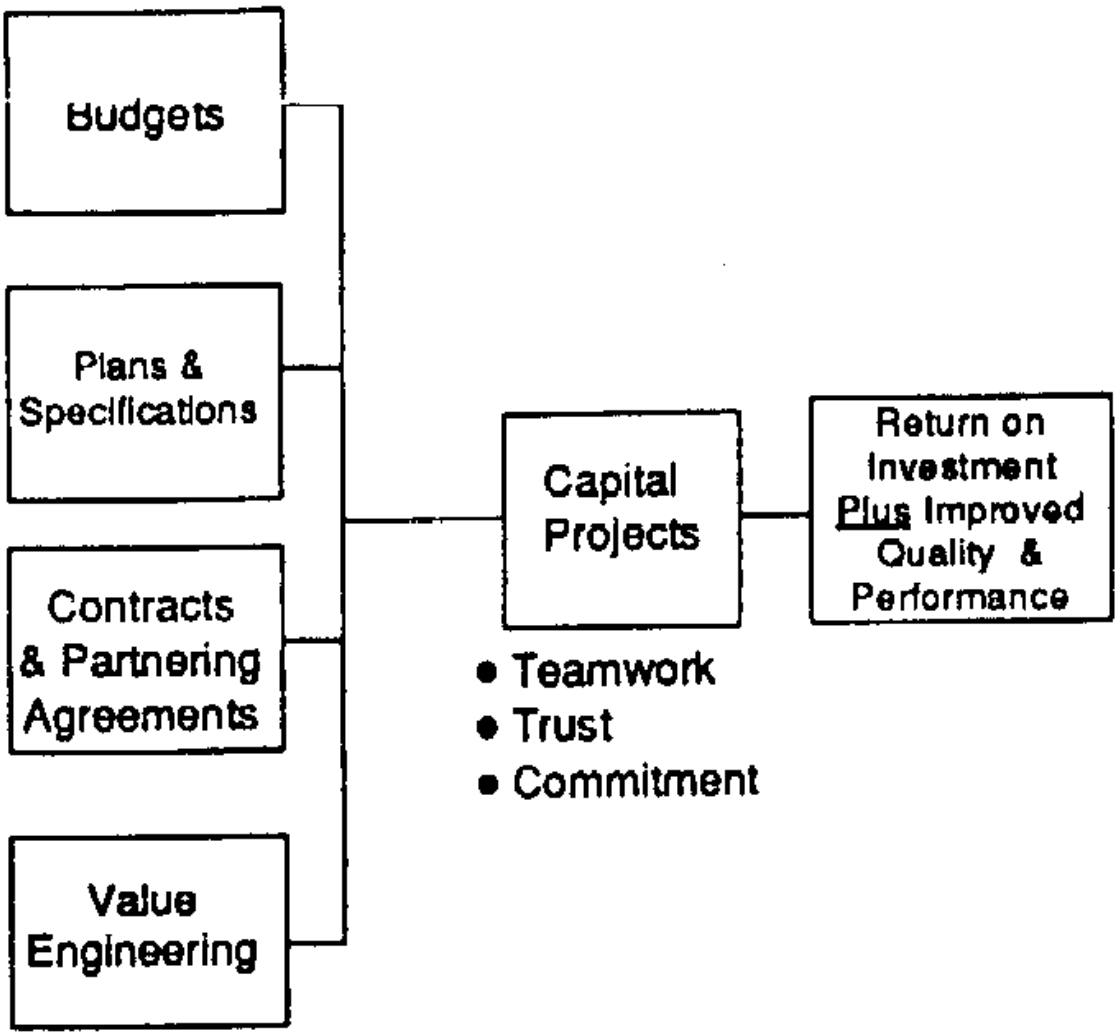

Figure 2 Idealized Partnering Approach

LOS ANGELES METRO

The Metro Red Line, the city's first heavy rail sub-way, will make traveling in the Los Angeles region faster, easier, and cleaner. It is the backbone of an integrated transportation network called the Metro System, being developed by the Los Angeles County Transportation Commission (LACTC). The components of the integrated Metro System includes different types of rail (subways, light rail, and commuter rail), buses and highway manage-ment. The LACTC is designing and constructing the rail portion of the Metro System through its subsidiary, the Rail Construction Corporation (RCC). The completed Metro Rail network is expected to transport 500,000 people daily by the year 2010. It will provide Los Angeles County with 300 miles of rail transit, more than any other metropolis in the country other than New York. By the time the 17.4 mile Metro Red Line portion of the system is completed around 2001, trains will run underground at speeds up to 70 miles per hour from Union Station downtown through the heart of Hollywood to the San Fernando Valley.

Construction of a subway beneath the city streets of Los Angeles presented many challenges to the planners, designers, and construction contractors. Among these were traffic congestion and environmental quality issues, as well as a tangle of buried utilities. Some of the more atypical conditions included the area's high seismic risk, methane gas resulting from abandoned wells and from decomposed organic matter near the surface, contaminated soils from leaking underground storage tanks, and the need to tunnel through abandoned and largely unmapped oil and gas well fields that had been developed in the early part of this century and were now largely forgotten under the homes and businesses of the city. [6]

Figure 3 illustrates the tunneling operations currently under way beneath the city's streets and buildings. Tunnnel shield machines and precast concrete tunnel support liners are used by the Red Line contractors. The final tunnel lining consists of a high-density polyethylene (HDPE) gas protection membrane and cast in place concrete within the initial precast liner.

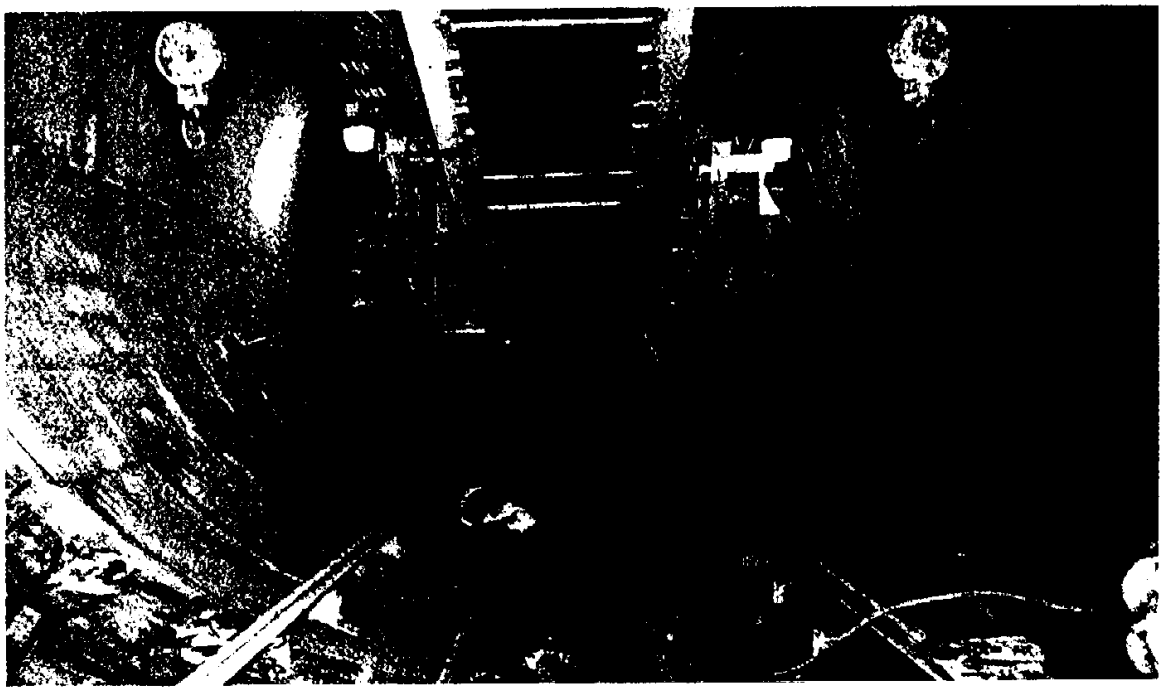

Figure 3 Precast Concrete Liners are used to stabilize the Excavation Tunnel

The RCC in conjunction with the construction Manager, Parsons-Dillingham and the Engineering Manager, Parson-Brinckerhoff/DMJM conducted a comprehensive review of previous and planned subway tunnel and station contracts and decided to separate the tunnels from the stations on Vermont Avenue and Hollywood Boulevard and to combine all of the tunneling along theses corridors into one contract.

The combined tunnel contract is the Vermont/Hollywood Tunnel, awarded to Shea-Kiewit-Kenny (SKK) at a bid of over $163 million. A partnering approach was instituted on this project due to the magnitude and complexity of the work. A VE review held soon after award of the construction contract and before field mobilization proved to be an important element of the project's successful kickoff.

Figure 4 illustrates the route of the subway beginning just west of downtown Los Angeles and ending at the famous intersection of Hollywood and Vine. The contract scope involves constructing nearly 6 miles of twin tunnels, each with a finished inside diameter of 17 feet 10 inches. The contract provided for a single access shaft located in the overflow parking lot of Barnsdall Park from which four tunnels (two west and two south) will be driven. The scope includes crossovers between tunnels, an invert on which the rails will be placed, walkways along the tunnel walls, and utilities. The tracks, five stations, and the mechanical, electrical, and control systems, along the route will be provided through separate contracts.

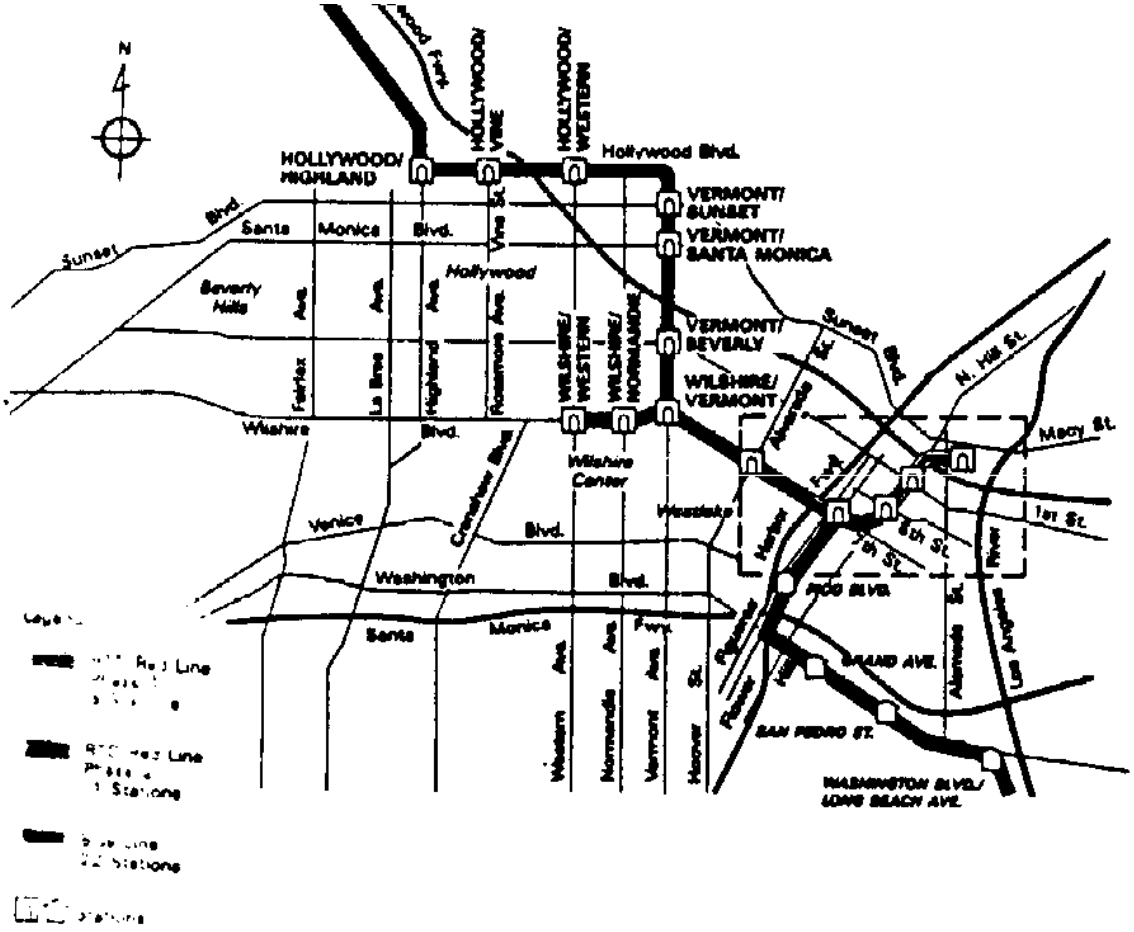

Figure 4 Route of Hollywood Vermont tunnel

VE REVIEW

The RCC requested a VE review at the beginning of the construction phase to identify alternatives that offered potential cost savings. The SKK construction contract incorporated a VE clause that provided for the sharing of savings realized from accepted VE change proposals. In part, the clause stated:

> The Commission encourages the (construction) contractor to submit Value Engineering Change Proposals (VECPs) to avail the Commission of potential cost savings; the contractor and the Commission will share any savings in accordance with the sub-article. The contractor is encouraged to submit VECPs whenever it identifies potential savings or improvements.

Under the partnering concept, the RCC provided a win-win situation by encouraging the construction contractor to participate in the VE review and to develop subsequent potential cost saving alternatives identified during the review into VECPs. The contractor was entitled to recover cost savings from approved VECPs in accordance with the contract, although any potential cost saving alternatives that were outside the scope of the construction contract were to be developed by the construction manager or other project participant.

The VE review was an accelerated and modified adaptation of the 5-phase VE study plan. The construction manager sponsored the review and relied on in-house certified value specialists (the authors). The VE specialists developed an implementation plan that incorporated the partnering approach. The review team consisted of 20 senior representatives from the involved organizations. A systematic review and analysis of the construction contract documents and operational approach was conducted within the VE framework to identify alternatives that could produce savings in the cost of performing and/or managing the work. The RCC's commitment to the partnering approach allowed the team members to put aside the individual interests of their respective organizations and dedicate themselves to the overall objectives of the study.

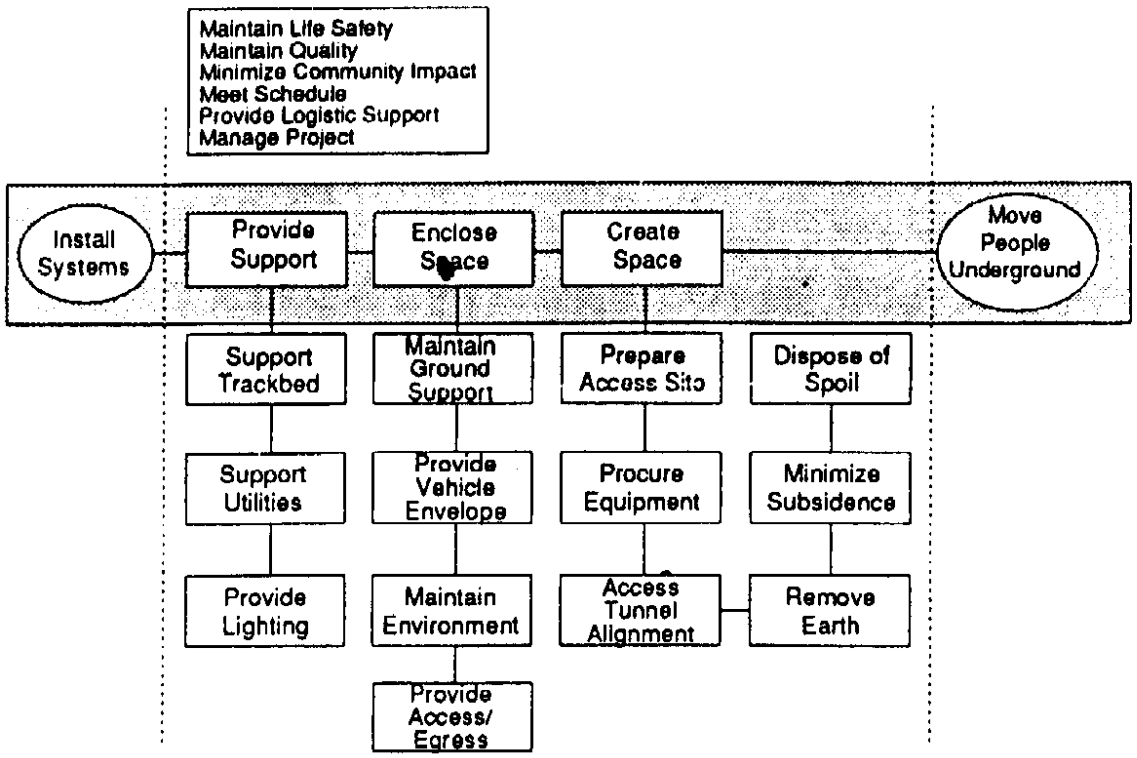

Figure 5 Hollywood/Vermont Tunnel FAST Diagram

All of the review team members participated i n the development of the tunnel project FAST diagram (Figure 5). The process of developing a tunnel project function analysis proved to be a challenging one, and it resulted in the participants viewing the project from a new perspective, that seemed to bring the team together and reinforce partnering reelation-ship. Three primary functions required to "move people underground" were identified:

- Create space - tunnel excavation
- Enclose space - t unnel lining
- Provide support - invert and track tie-ins

These three primary functions served to organize the review team into subgroups, each focused on one function.

Forty-two initial alternatives were identified by the team. Further analysis resulted in the presentation of 20 VE candidates that will be developed into VECPs by the responsible organizations.

The review team presented its findings to the senior managers of the RCC, the Construction Manager, and the Engineering Manager. The Hollywood/ Vermont Tunnel-specific VECPs identified during the review will result in the savings of millions of dollars, and the candidate VECPs that addressed the long-term design and management of the Metro program may result in several millions of dollars in savings.

Equally as important as the potential savings was the partnering team-building accomplished during the review. According to the CII Partnering Task Force:

> The concept of partnering is based on the premise that important but complementary opportunities may exist between two (or more) companies . . . but barriers exist that prevent them from working together. However, if the right people are brought together with an effective organizational process, these barriers can be eliminated and mutually beneficial relationships can be established.

The VE study of the Metro Red Line was demonstrated to be an effective organizational approach to eliminate barriers and build relationships that will have a lasting and beneficial effect.

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