

CALTRANS PROJECT MANAGEMENT HANDBOOK



Fifth Edition
October, 2007



Office of Project Management Process Improvement

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Caltrans Project Management Handbook
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Preface

The *Caltrans Project Management Handbook* provides an updated overview of project management at Caltrans.

This version is effective as of October 1, 2007.

The project team thanks all individuals within the districts and headquarters for their support and contributions to the production of this handbook.

Purpose

The *Caltrans Project Management Handbook* provides an overview of the basic concepts that guide project management at Caltrans.

Audience

Caltrans project managers, program managers, stakeholders, and other staff requiring project management knowledge.

Background

This edition is reorganization, clarification, and completion of the information in the Fourth Edition, revision 1, dated September 19, 2002. Only a small amount of policy and subject matter has changed. The goal of this edition is to make the present policy and subject matter more useful and easier to understand.

This document supersedes all previous editions of the *Caltrans Project Management Handbook* and the Project Management Terms and Definitions contained in any Project Management Directive

References are to the Project Management Institute (PMI) Third Edition of the *Guide to Project Management Body of Knowledge (PMBOK)*

Revisions

This is the original version of the fifth edition.

Conventions

Titles of books appear in *italics*.

Web site URLs appear in ***bold italics***.



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BASIC CONCEPTS

This chapter:

- ▶ Defines what “project,” “project management,” “program management,” mean at Caltrans
- ▶ Explains the purpose and goals of project management at Caltrans
- ▶ Provides a “big picture” view of project management as one of the five knowledge and skill sets needed for project success

What Is a Project?

*A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*¹ defines a project as “...a temporary endeavor undertaken to create a unique product, service, or result.” A Caltrans capital outlay project produces a unique physical improvement to the transportation system in California. “Project” refers to the work that is performed to develop a transportation improvement product. Projects produce products. A project is temporary because it has a definite beginning and a definite end. The outcome is unique because it differs in some distinguishing way from all similar products or services. For example, Caltrans may be engaged in many highway maintenance projects, but each project is unique because it involves a unique location and work elements on a specific section of highway.

A Caltrans capital outlay project is initiated during the project initiation document phase (PID) by opening an Expenditure Authorization (EA), assigning a project manager, and deciding to begin the project. A Caltrans capital outlay project ends when all close-out activities have been achieved and the EA is closed.

Caltrans divides each project into “components,” each of which produces a major product required by law. Collectively, these components constitute the “project lifecycle.” For more information on the Caltrans project lifecycle, see “Project Lifecycle” on page 17.

¹Project Management Institute, 2004, Third Edition

What Is Project Management?

The *PMBOK® Guide* defines project management as “...the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements.” Project management balances competing demands (scope, time, cost, quality, requirements, expectation of various stakeholders, etc.) throughout the project lifecycle and involves the interaction of three elements:

- ▶ People — People perform the work and determine the success or failure of a project (see “People” section on page 39).
- ▶ Processes — Processes specify products or deliverables required for the project and identify who will perform the work and when (see “Project Processes” section on page 25).
- ▶ Tools — People use predefined tools and techniques to manage the project (see “Tools” section on page 55).

Why Do We Do It?

Limited available resources (compared to transportation needs) require the efficient use of tax dollars. Project management helps Caltrans maintain efficiency by helping to ensure that the right resources complete the right tasks at the right time.

Project Management Mission

Caltrans delivers transportation improvements that meet customer needs. Caltrans project teams use project management standards to deliver quality projects that are timely and cost-effective. The purpose of project management is to:

- ▶ Improve project delivery performance related to quality, scope, schedule, and cost
- ▶ Reduce the support cost of producing the project
- ▶ Do the right things the first time
- ▶ Anticipate and respond to issues before they become problems
- ▶ Communicate effectively with stakeholders
- ▶ Manage change
- ▶ Manage risk
- ▶ Deliver projects that satisfy customer needs

Program Management

Programs are used to define and identify all activities that together achieve an objective of the Department or result in a specific product. Broken into their elements, components, and task parts, they provide the essential basis for planning, budgeting, accounting, and managing. The major programs in the Department are Aeronautics, Highways, Mass Transportation,

Transportation Planning, Administration and Equipment Services. Laws and regulations establish programs for government projects. These laws and regulations define each program's purpose, funding sources, and funding process. In California State government, resources for programs must be approved by the legislature in the annual budget.

Project Management vs. Program Management

This handbook describes the management of a single project; it does not cover program management. The following table summarizes the differences.

Project Management	Program Management
The direction and supervision of one project	The integration, coordination, communication, and simultaneous control of multiple projects
A discipline	An operating environment
Project-wide (a tactical issue)	Enterprise-wide (a strategic issue)

For the fiscal year 2007-2008, the following programs fund state highway improvement projects:

Program	Authority
State Transportation Improvement (STIP) and Interregional Improvement Program (IIP)	Government code 14529 (a) (1) and (2)
State Highway Operation and Protection Program (SHOPP)	Government code 14526.5
Phase 2 Seismic Retrofit Program	Government code 8879
Toll Bridge Seismic Retrofit Program	Streets & Highway Code 188.5
Toll Bridge Improvements Program	Streets & Highways code 30950
Transportation Enhancement Activities (SHOPP TEA) – Caltrans Share	California Transportation Commission (CTC) Resolution 00-18 (This is a federal program with matching funds from the SHOPP)
Transportation Enhancement Activities (STIP TEA) – Caltrans Share	California Transportation Commission (CTC) STIP Guidelines (This is a federal program with matching funds from the STIP)
Special Retrofit Soundwalls	Items 2660-302-0042 and 2660-302-0890 of the 2000 Budget Act (Chapter 52, Statutes of 2000)
Safe Routes to School	Streets & Highways code 2333.5

Program	Authority
Regional Measure 1	Streets and Highways code 30913
Regional Measure 2	Streets and Highways code 30914
Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act	Government Code 8879.20
Traffic Congestion Relief Program (TCRP)	Government Code 14556
State Highway Projects Funded from Other Sources	Annual State Budget

Funds for every state highway project come from one or more of these programs. Project managers must know which programs are funding their projects, and understand the particular funding rules of those programs. Some other tips for successful project management with respect to funding:

- ▶ A project manager must also understand and analyze funding cycles for the various fund sources affecting his/her project.
- ▶ A project manager must make sure that a project conforms to the Regional Transportation Plan.
- ▶ A project manager must understand what is meant by “financially constrained” with respect to his/her project.
- ▶ A project manager must determine if his/her project has full funding and understand the importance of it.
- ▶ A project manager must understand the importance or need for local match where necessary.
- ▶ Ensure project is consistent with FTIP, if federal funds are involved.

The “State Highway Projects Funded from Other Sources” program covers any project funded from sources other than the first 10 programs. Other sources include developer fees, local state tax, and federal demonstration funds. Caltrans performs limited work on these projects. The Legislature provides an annual budget for support of this work.

Sub-Programs

Programs may have sub-programs. For instance, SHOPP includes the Minor Program and Roadway Rehabilitation Program sub-programs. Each sub-program has a particular funding process that sets it apart from the rest of its parent program. For more information on Caltrans program funding and approval process refer to:

<http://www.dot.ca.gov/hq/transprog/index.htm>

**Task
Management**

Task Management is defined as the assignment of individuals (Task Managers) to manage the production and completion of a discrete deliverable, or work package, on a project within a defined schedule and budget.

Task Managers on all Capital Projects are assigned, at a minimum, for all Work Breakdown Structure (WBS) Level 4 and WBS Level 5 work packages. Assigning Task Managers for lower level WBS work packages is encouraged.

For more information on Task Management, see Deputy Directive DD-93 dated August, 2007.

The Big Picture

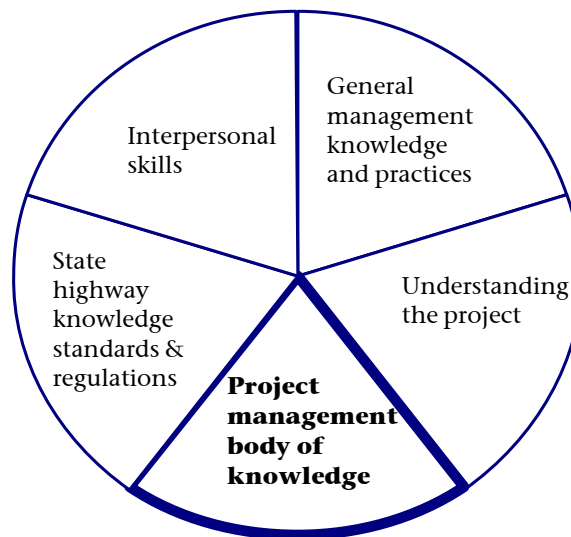


Figure 1. Knowledge and skill sets needed for effective state highway project management

For projects to be successful, the project team must understand and apply generally accepted project management techniques such as work breakdown structures, critical path analysis, and earned value. While they are necessary, these techniques alone are not sufficient for effective project management. Effective management of California state highway projects requires that the project team understand and use the following knowledge and skill sets:

- ▶ Project management knowledge and practices — these consist of project lifecycle definition, five project management process groups, and nine project management knowledge areas. All of these are summarized in the remainder of this handbook and described in the *PMBOK Guide*.
- ▶ State highway knowledge, standards and regulations — the Project Development Procedures Manual is the primary source of these procedures. More detailed information on the standards and procedures is contained in manuals, guides, handbooks, and bulletins issued by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and Caltrans Headquarters Divisions. In some instances, districts may have procedures to address unique situations (such as a district hydraulics manual that addresses the particular hydrology in that geographic area). Many procedures are standard to an employee's profession and are documented in academic textbooks and professional journals.

- ▶ Understanding of the project environment— the project team must understand the project in its social, biological, and physical environment. The team must understand how the project affects people and how people affect the project. This may require an understanding of aspects of the political, economic, demographic, educational, ethical, ethnic, religious, and other characteristics of the people who will be affected by the project or who have an interest in the project. Some team members must be familiar with applicable federal, state, and local laws and with the relevant portions of the budgets of the entities that are funding the project. Other team members must be knowledgeable about the flora, fauna, geology, and physical geography of the region around the project.
- ▶ General management knowledge and practices — these are needed for the management of any enterprise. They include strategic planning, health and safety practices, marketing and sales, financial management and accounting, and personnel administration.
- ▶ Interpersonal skills — these are often called “soft skills,” including the management of relationships with others and the management of oneself. Soft skills include communication, teamwork, leadership, conflict management, negotiation, problem solving, motivation, delegation, personal time management, and stress management. Every person can improve his/her soft skills through training and practice.

It is not necessary for every team member to possess all these knowledge and skill sets. In fact, it is unlikely that any one person will have all of the knowledge and skill necessary for project success. Some aspects of these knowledge and skill sets might not be needed on a particular project, but they should be available “on call” within Caltrans or through consultants. *For more information on training see Chapter 4, “Training & Skills” on page 53*

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PROJECT LIFECYCLE

This chapter describes each component in the project lifecycle

Lifecycle Overview

Caltrans divides each project into project components, each with its own outcomes, or “deliverables.” The Caltrans *Guide to Capital Project Delivery Work Plan Standards*, formerly known as Work Breakdown Structure (WBS), described on page 58, defines the deliverables for each component. Together, the project components make up the project lifecycle.

For information on phase numbers and WBS elements associated with each process, see Chapter 3 Project Processes.

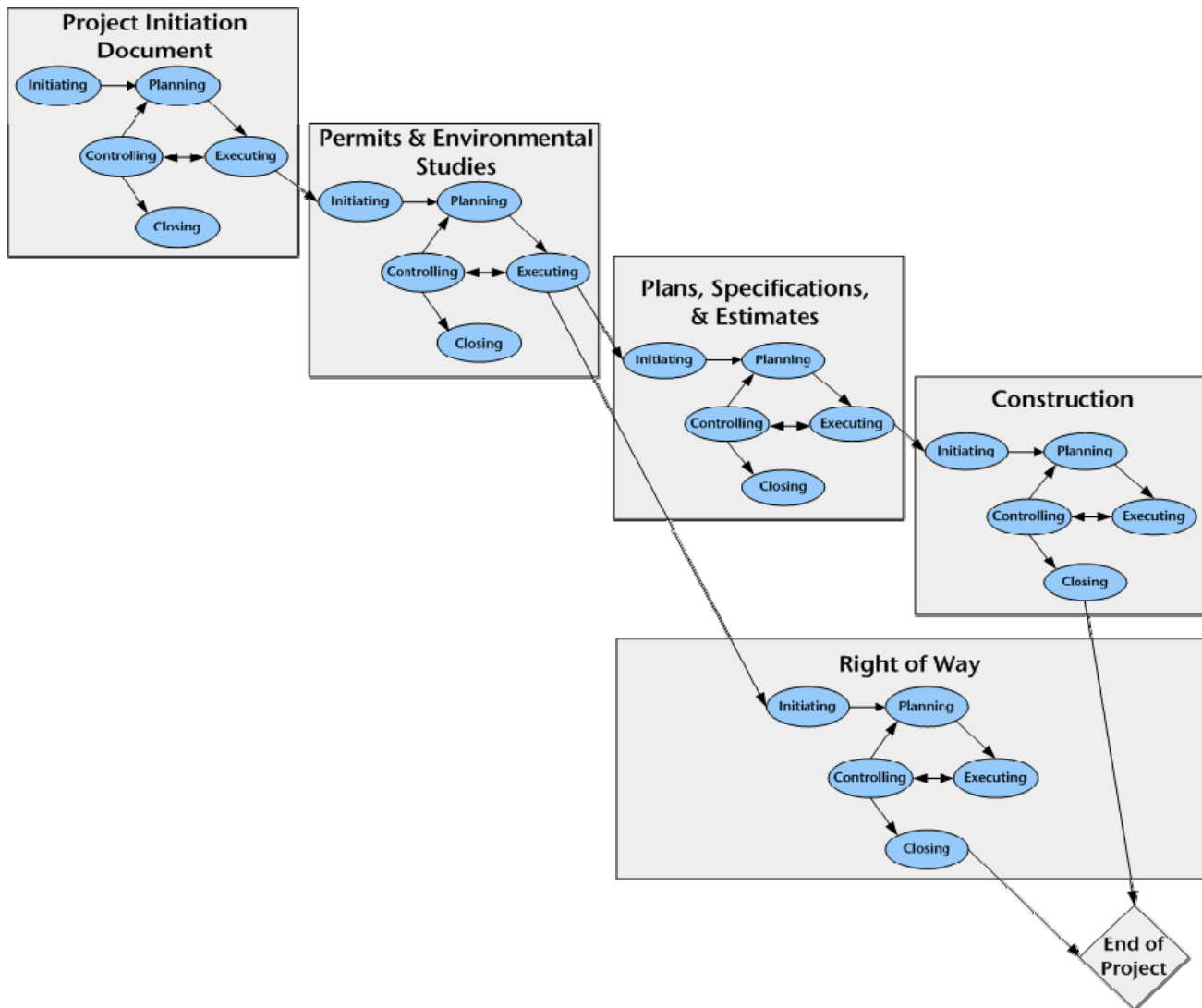


Figure 2. Components in the project lifecycle

Project Initiation Document Component (PID)

Caltrans capital projects start with a transportation problem that needs to be solved. Before a project starts, the Planning Division or the Maintenance and Operations Division or the local agency generates a list of potential projects, each with a “purpose and need” statement. Any work on the project, throughout the project’s lifecycle, must relate back to the original purpose and need statement.

PID Deliverables

The main deliverables for the Project Initiation Document (PID) component are:

- ▶ The PID — contains a defined project scope, a reliable capital and support cost estimate for each alternative solution, and a project workplan for the alternative recommended for programming the project.
- ▶ For some projects the PID is combined with the PA&ED, and the Environmental Document/Determination is completed at the PID phase rather than during the PA&ED phase.
- ▶ Project Charter for the PID phase.
- ▶ The Project Management Plan: This is a group of files used to define how the project is to be executed, monitored, and controlled. Included are the Project Charter, the Project WorkPlan, the Project Communication Plan and the Risk Management Plan.
- ▶ The Financial Management Plan: Required by the Federal Highway Administration (FHWA) for certain federally funded projects.

Permits and Environmental Studies Component

For a capital project to proceed, it must receive official federal, state, and environmental approvals as well as consensus from all the stakeholders and the public. This component is also known as the Project Approval and Environmental Document (PA&ED) phase of the project.

Permits and Environmental Studies Deliverables

The main deliverables for the Permits and Environmental Studies component are:

- ▶ Notice of Intent (NOI). Under NEPA, for EIS projects, the NOI is published in the Federal Register FHQA.
- ▶ Notice of Preparation (NOP). Under CEQA, for EIR projects, the NOP is filed with the State Clearinghouse.
- ▶ Draft Environmental Document (DED)/or Environmental Determination (categorical exemption/categorical exclusion. CE/CE). This includes either the approval to circulate the DED or the CE/CE determinations.
- ▶ Final Environmental Document — contains all required environmental approvals. Many environmental compliance, permit, and agreement requirements are obtained during the PS&E phase. *For more information, see the Caltrans Standard Environmental Reference.*
- ▶ Draft Project Report. The Draft Project Report (DPR) is a decision document. It is only used when there is a Draft Environmental Document (DED). The purpose of the DPR is to document the need for a transportation project, to summarize key points from the Draft Environmental Document, and to summarize the studies of the scope, cost, and overall impact of alternatives so that the decision maker can make an informed decision on whether or not to proceed to the public hearing phase of project development.
- ▶ Project Report — further refines the purpose and need, identifies the alternative selected, describes how that alternative was decided upon, and describes how consensus was reached between Caltrans and stakeholders. *For more information, see the Caltrans Project Development Procedures Manual.*

During this phase, expanded engineering studies are completed to support the environmental evaluation and stakeholder input to the project and its alternatives.

Plans, Specifications, and Estimate (PS&E) Component

This component includes all work to develop contract plans, specifications, engineer's estimate, contract bid documents, allocation of funds, contract award, and contract approval. In addition, environmental commitments must be resolved.

PS&E Deliverables

The Plans, Specifications, and Estimate (PS&E) deliverables include the followings:

- ▶ Prepare base maps, plan sheets.
- ▶ Obtain permits, agreements, and route adoptions.
- ▶ Prepare draft PS&E.
- ▶ Mitigate environmental impacts and clean-up hazardous waste.
- ▶ Prepare draft structures PS&E package.
- ▶ Circulate, review, and prepare final District PS&E package.
- ▶ Prepare contract bid documents “Ready to List”.
- ▶ Award and approve construction contract.

If any environmental permits are required for the project they must be obtained from the appropriate resource and/or regulatory agencies prior to the completion of PS&E. Any environmental commitments from the environmental document, environmental permit(s), or any other applicable environmental requirements must be fully incorporated into the PS&E package.

When the PS&E package is complete, the project should be biddable and buildable.

Right of Way Component

Caltrans is required to obtain property rights for the construction of many of its transportation projects. The Right of Way Component involves preparing maps and legal documents, preparing appraisals, obtaining legal and physical possession of property, relocating occupants, clearing all physical obstructions, and relocating utilities. Other required activities include managing properties, selling excess properties, monumentation of the Right of Way, relinquishments and vacations, and preparing right of way record maps.

Right of Way Deliverables

The main deliverables for the Right of Way Component are:

- ▶ The Right of Way Certification — summarizes the status of all right of way matters pertaining to a proposed construction project. The Right of Way Certification is included in the PS&E package.
- ▶ Legal Right of Way — secures all real property rights that are required for the project, and relocates occupants according to federal and state laws, regulations, and procedures.
- ▶ Clearance of physical obstructions from the right of way — removes improvements, relocates utilities, and executes all railroad agreements.

Construction Component

After the construction contract for a Caltrans capital project has been awarded, construction can begin.

Construction Deliverables

The main deliverables for the Construction Component are:

- ▶ The constructed physical improvement — follows the guidelines in the current edition of the *Construction Manual*.
- ▶ The Final Estimate — includes the final quantity and cost of the work for which the contractor has been paid.
- ▶ The As-Built Plans — reflects what was actually built, including any plan changes made during construction.
- ▶ The Project History File — follows the guidelines in Section 3 of Chapter 15 of the *Project Development Procedures Manual*.
- ▶ Certificate of Environmental Compliance.

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PROJECT PROCESSES

This chapter explains how the *PMBOK® Guide* process groups and knowledge areas apply to project management at Caltrans

Processes Overview

Each component involves a series of processes from five “process groups.” The *PMBOK® Guide* defines a process as “a set of interrelated actions and activities performed to achieve a specified set of products, results, or services.” Project processes fall into one of two categories:

- ▶ Project management processes — describe and organize the work of a project. For example, during the PID component (page 18), the project manager distributes information to and from stakeholders, defines the scope of the project, and facilitates decision-making.
- ▶ Product-oriented processes — specify and create the product. These processes are summarized in the “executing processes” section of this chapter (on page 29). More detailed descriptions are provided in the *Guide to Project Delivery Workplan Standards* and in the manuals, guides, and handbooks that are referenced in the *Guide to Project Delivery Workplan Standards*.

Process Groups

Caltrans divides project management activities into five generally accepted process groups, matching those in the *PMBOK® Guide*:

- ▶ Initiating Processes (page 28)
- ▶ Planning Processes (page 28)
- ▶ Executing Processes (page 29)
- ▶ Monitoring and Controlling Processes (page 32)
- ▶ Closing Processes (page 32)

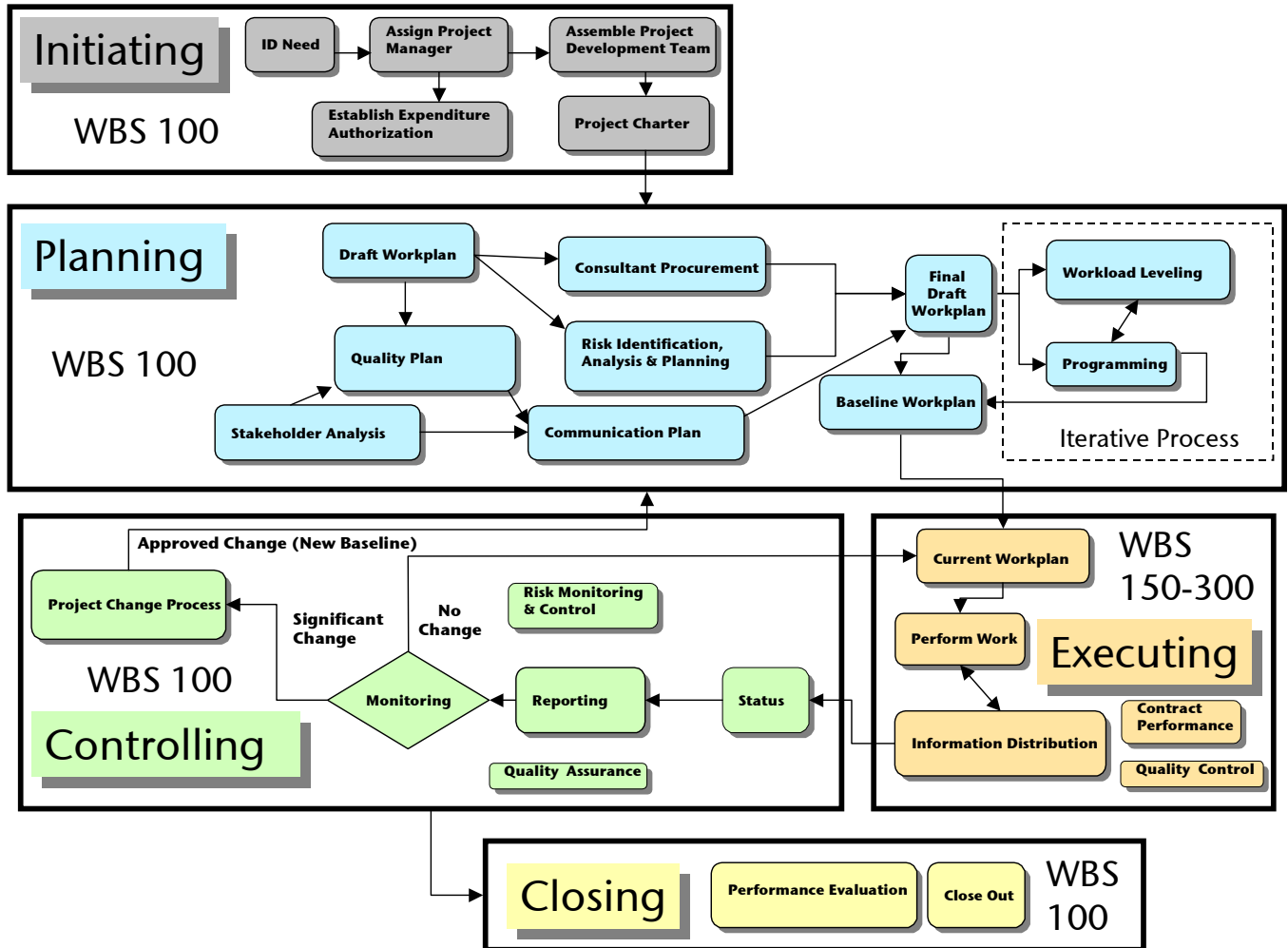


Figure 3. Process group interaction

These process groups:

- ▶ Link to each other by the results they produce — the outcome of one process group usually becomes an input to another.
For example, planning processes produce plans that the project team will execute, so the project manager engages in executing processes to coordinate the team's efforts.
- ▶ Overlap at varying levels of intensity throughout each component of the project.
For example, the project manager performs executing processes to guide the team's efforts at the same time that he/she performs controlling processes to monitor those efforts.
- ▶ Cross project lifecycle components such that the execution of one component leads to the initiation of the next component.

For example, the plan for the Permits and Environmental Studies phase component is a product of the PID component.

For more information on lifecycle components, see “Project Lifecycle” on page 17.

Initiating Processes

Initiating processes involve recognizing that a component should begin and authorizing the project manager to proceed. All initiating processes are project management processes. At Caltrans, this process group involves the following processes:

- ▶ Initiating processes for the PID component:
 - Identify a need
 - Assign a project manager
 - Establish an expenditure authorization (EA)
 - Assemble a project development team (PDT)
 - Develop a project charter
- ▶ Initiate Cooperative Agreements
- ▶ Initiating processes for all other components:
 - Establish EAs — Open next phase EA - a support phase EA for each component and separate capital EAs for the Right of Way and Construction components. *See PDPM Chapter 8.*
 - Update the project charter

Planning Processes

Planning processes involve devising and maintaining a workable plan to achieve the desired result of the component. All planning processes are project management processes. At Caltrans, this process group involves the following processes:

Planning processes for the PID component:

Core processes	Create a PID workplan (PID WBS, Resource Breakdown Structure (RBS) assignments, cost, and schedule) Perform stakeholder analysis Develop scope of work for a Cooperative Agreement Financial Management Plan as required by FHWA for certain projects
Facilitating processes	Create a PID Quality Management Plan Create a PID Communication Plan Create a PID Risk Management Plan

Planning processes for all other components:

Core processes	<p>Draft a workplan for all items that are to be programmed (WBS, RBS assignments, and initial schedule)</p> <p>Update the stakeholder analysis</p> <p>Finalize the draft workplan for programming (WBS, RBS assignments, cost, and schedule)</p> <p>Complete project programming</p> <p>Create a baseline workplan (adjust final draft workplan to match the outcome of programming)</p> <p>Develop scope of work for a Cooperative Agreement</p>
Facilitating processes	<p>Create a Project Quality Management Plan</p> <p>Create a Project Communication Plan</p> <p>Create a Project Risk Management Plan</p> <p>Manage consultant procurement</p> <p>Perform workload leveling</p>

Executing Processes

Executing processes involve coordinating people and other resources to carry out the project plan. Executing includes both project management processes and product-oriented processes. At Caltrans, this process group involves the following processes:

Project management executing processes for all components:

- ▶ Collect project information for use by the project team
- ▶ Distribute project information to the project team
- ▶ Maintain project files
- ▶ Ensure proper hand-off of project deliverables from one team member to another
- ▶ Time Charging
- ▶ Administer consultant contracts (This does not include environmentally related investigations)
- ▶ Execute and administer Cooperative Agreement(s)

Product-oriented executing processes and their corresponding WBS elements:

Phase	Component	WBS	Process
K	PID	100.05	Project Management- PID Component
		150	Develop Project Initiation Document (PID)
0	Permits and Environmental Studies	100.10	Project Management- PA&ED Component
		160	Perform the Preliminary Engineering Studies and Prepare Draft Project Report
		165	Perform the Environmental Studies and Prepare Draft Environmental Document (DED)
		175	Circulate the Draft Environmental Document and Select Preferred Project Alternative Identification
		180	Prepare and Approve Project Report and Final Environmental Document
		205	Obtain Permits, Agreements, and Route Adoptions
1	PS&E	100.15	Project Management- PS&E Component
		185	Prepare Base Maps and Plan Sheets
		230	Prepare Draft PS&E
		235	Mitigate Environmental Impacts and Clean-up Hazardous Waste
		240	Prepare Draft Structures PS&E
		250	Prepare Final Structures PS&E Package
		255	Circulate, Review, and Prepare Final District PS&E Package
		260	Contract Bid Documents “Ready to List”
		265	Awarded and Approved Construction Contract

Phase	Component	WBS	Process
2&9	Right of Way	100.25	Project Management- Right of Way Component
		195	Right of Way Property Management and Excess Land
		200	Utility Relocation
		220	Perform Right of Way Engineering
		225	Obtain Right of Way Interests for Project Right of Way Certification
		245	Post Right of Way Certification Work
		300	Perform Final Right of Way Engineering Activities
3&4	Construction	100.20	Project Management- Construction Component
		270	Perform Construction Engineering and General Contract Administration
		285	Contract Change Order Administration
		290	Resolve Contract Claims
		295	Accept Contract, Prepare Final Construction Estimate, and Prepare Final Report

Monitoring and Controlling Processes

Monitoring and Controlling processes measure progress to ensure that project objectives are being met. If necessary, the project manager may have to take corrective actions to get the project back on track. All controlling processes are project management processes. At Caltrans, this process group involves the following processes:

For all components:

- ▶ Assure quality
- ▶ Report milestone status
- ▶ Monitor project performance (percent complete and earned value).
Visit: <http://pd.dot.ca.gov/pm/pmweb/overview.asp> slide 21 for information on performance report and earned value.
- ▶ Report performance to management and project sponsors (District Status meetings, RTPA Quarterly Reports, HQ Delivery Plan meetings)
- ▶ Prepare Programming Change Requests
- ▶ Monitor and control risk

Closing Processes

Closing processes formalize the conclusion of the project or component, bringing it to an orderly end. This process group involves the core processes of contract closeout and administrative closure. All closing processes are project management processes. At Caltrans, this process group involves the following processes:

For all components:

- ▶ Close out cooperative agreements
- ▶ Close out consultant contracts
- ▶ Record lessons learned
- ▶ Archive project records
- ▶ Suspend EAs
- ▶ Complete final accounting for the component
- ▶ Excess lands
- ▶ For the complete list of close out processes, see the *HQ/PM/Closeout Tool* website:
<http://pd.dot.ca.gov/pm/PMPI/CloseOut/CloseOut.htm>

Knowledge Areas

Caltrans project managers use various tools (reference documents, templates, computer applications, etc.) and techniques (skills, defined methods, procedures, etc.) to perform the tasks in each process group. The *PMBOK® Guide* divides these tools and techniques into nine knowledge areas:

- ▶ Project Integration Management (page 35)
- ▶ Project Scope Management (page 34)
- ▶ Project Time Management (page 35)
- ▶ Project Cost Management (page 35)
- ▶ Project Quality Management (page 36)
- ▶ Project Human Resource Management (page 36)
- ▶ Project Communications Management (page 37)
- ▶ Project Risk Management (page 37)
- ▶ Project Procurement Management (page 38)

For example, the project manager uses project scope management knowledge to complete processes within the following process groups: initiating, planning, executing, and controlling. For more information on process groups, see “Process Groups” on page 28.

Project Integration Management

Project integration management tools and techniques ensure the proper coordination of the various elements of the project.

Caltrans project managers use the following project integration management techniques:

- ▶ PDTs, formed at the beginning of the project lifecycle
- ▶ Each team's level of involvement varies according to the current project component
- ▶ Roles and responsibilities determined by the PDT
- ▶ The basic purpose and need statement in the project charter and PID

At the start of each component, and when introducing new team members, the project team refers back to the purpose and need statement to ensure that they are still working towards the stated goal

- ▶ Multi-year project workplans and work agreements to guide the execution and control of project work and resources
- ▶ Project management directives that define department-wide standards
- ▶ Flexibility in processes to recognize district or project-specific needs

Project Scope Management

Project scope management tools and techniques ensure that the project includes all the work required, and only the work required, to complete the project successfully.

Caltrans project development teams select elements from a standard WBS to produce a project-specific WBS. This project WBS organizes and defines the total scope of the project. Any work not included in the project WBS is outside the scope of the project.²

The scope is defined as, “the sum of the products, services, and results to be provided by a project.”³ Within Caltrans capital outlay delivery, the scope product commonly refers to the capital outlay scope portion of the project. However, in broader terms, the scope also includes the support work required to produce the product.

² PMBOK® Guide – 2004 Third Edition, Section 5.3.3.1, pages 117-118

³ PMBOK® Guide – 2004 Third Edition, Glossary, page 375

Project Time Management

Project time management tools and techniques ensure timely completion of the project.

Caltrans project managers use project time management techniques to produce resource-loaded critical path schedules. Work on the critical path should always be fully resourced, using a combination of Caltrans staff, brokering, overtime, consultants, and contractors. Non-critical work elements with the least float (flexibility of schedule) are completed first and are scheduled in such a way as to minimize workload fluctuations. Caltrans maintains standard templates for use as starting points in developing critical path schedules.

Project Cost Management

Project cost management tools and techniques ensure that the project team completes the project within the approved budget.

Caltrans project managers use project cost management techniques such as the Program Evaluation and Review Technique (PERT) to develop budgets. Using PERT, Caltrans can be assured, within statistical limits that the actual expenditures will be within the amounts allowed by State law.⁴ Effective use of PERT requires that the project manager regularly compare actual expenditures to planned expenditures at the level used in budget development.

⁴ Streets & Highways Code 188.8 (e)

Project Quality Management

Project quality management tools and techniques ensure that the project will satisfy the objectives for which it was undertaken.

Caltrans project managers, project sponsors, and PDTs prepare a project charter at the start of the PID component. They review and amend this charter at the start of each succeeding component. The charter is the starting point for the development of the project-specific WBS.

Caltrans project managers also use earned value analysis to monitor and control project support cost.

The Project Quality Management Plan (QMP) is a component of the project management plan. It describes the team's plan for quality control, quality assurance, and independent quality assurance. It includes plans to ensure that the product will meet the expectations of the external customers and that the deliverables will meet the needs of the internal customers.

Project Managers, Functional Managers, and others who are responsible for Quality Assurance (QA) regularly evaluate project performance, Quality Control (QC) Plans and activities, and specific WBS deliverables to provide confidence that each deliverable and the end-product of the project will meet customer requirements. QA is part of the controlling process group.

Each WBS deliverable is assigned to a Task Manager. Under the direction of his/her Functional Manager, the Task Manager prepares a Quality Control (QC) Plan for that deliverable that documents the customer requirements, the procedures and the review processes that will ensure the deliverable meets customer expectations.

Project Human Resource Management

Project human resource management tools and techniques ensure the most effective use of the project team. They ensure that people with the needed skills are available at the right time to execute the product-oriented processes.

Caltrans project managers use a standard Organizational Breakdown Structure (OBS) and various project resource management techniques to produce a project-specific OBS. Similarly, they use cost center and various project resource management techniques to produce a project-specific cost center.

Project Communications Management

Project communications management tools and techniques ensure the timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information.

Caltrans project managers use project communications management techniques to:

- ▶ Develop a communication plan for the project
- ▶ Distribute information via the methods that reach customers most effectively
- ▶ File data using the Uniform Filing system
- ▶ Archive records in accordance with the Caltrans Records Retention policies

The Caltrans *Project Communication Handbook* contains detailed information on communications management processes.

Project Risk Management

Project risk management tools and techniques are used to identify, analyze, and respond to project risk.

Caltrans project managers use project risk management techniques to produce a risk management plan for the project and to manage the plan as risks and opportunities arise.

The Caltrans *Risk Management Handbook* contains detailed information on project risk management processes.

**Project
Procurement
Management**

Project procurement management tools and techniques are used to acquire goods and services from outside Caltrans.

The principal types of procurement on state highway projects are the:

- ▶ Procurement of architectural, engineering, and other consulting services to supplement Caltrans staff in project delivery
- ▶ Relocation of utilities, through contracts with utility companies
- ▶ Purchase of real property
- ▶ Procurement of construction services through contracts with construction companies

Specific laws and procedures control each of these types of procurement.

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PEOPLE

People perform the work and determine the success or failure of a project. This chapter discusses the organizational structure, roles, and responsibilities of the people involved in Caltrans projects

Roles

The people involved in a Caltrans project fill a variety of roles, each important to the project's success.

Stakeholders

A stakeholder is anyone who has a vested interest in the project. Stakeholders are individuals and organizations who are actively involved in the project, or whose interest may be positively or negatively affected as a result of project execution or successful project completion.

Stakeholders often have conflicting objectives, needs, and expectations. Finding appropriate resolutions can be one of the major challenges of project management. The project team must identify the stakeholders on a project, determine what their needs and expectations are, and then manage and influence those expectations to ensure a successful project. In general, differences between or among stakeholders should be resolved in favor of the customer. Understanding the customer is the key to determining the true requirements of a project.

Stakeholder identification is difficult, but necessary. Naming or grouping stakeholders is primarily an aid to identify which individuals and organizations can facilitate or hinder the delivery of a project. For more information, see the Caltrans *Project Communication Handbook*.

Customers

Customers for any Caltrans capital project are either internal or external to the project.

- ▶ External Project Customers — transportation system users who pay for projects through fuel taxes, vehicle fees, tolls, bonds, sales taxes, fares, and other charges (in other words, the general public or their elected representatives)
- ▶ Internal Project Customers — individuals who will use the deliverables or information produced at various stages of the project (internal to the project, not necessarily to Caltrans)

Sponsors

Project sponsors are individuals or groups that represent external project customers by advocating a project or group of projects. They may be internal or external to Caltrans. Types of sponsors include:

- ▶ Deputy District Directors for Transportation Planning and District Division Chiefs for Transportation Planning — the internal sponsors of interregional improvement projects

- ▶ Deputy District Directors for Maintenance and Operations and District Division Chiefs for Maintenance and Operations — the internal sponsors of SHOPP projects
- ▶ Regional transportation planning agencies, county transportation commissions, cities, and counties — the external sponsors of regional projects

Sponsoring local entities

The external sponsors of locally funded projects such as: Sales tax authorities, counties, cities, etc.)

Regulatory Agencies

Regulatory agencies can facilitate the delivery of a project by providing permits and other documents of approval. Examples include the California Department of Fish and Game, the Environmental Protection Agency (EPA), and other governmental agencies.

For more information, see the current editions of the Caltrans *Standard Environmental Reference* and the Caltrans *Construction Manual*.

Oversight Agencies

The primary role of the Federal Highway Administration (FHWA) is to oversee any proposed highway project on the interstate system. The FHWA plays a specific role in State Highway Projects such as technical input during the planning, environmental, design, and construction phases. The FHWA also provides partnering input and emergency relief.

Opposition Stakeholders

Opposition stakeholders are stakeholders who feel that their interests will be harmed by the project. Examples could include local governments, homeowner associations, environmental advocacy groups, landowners, and others.

Project Team

Every project has a project team. The project team consists of every person who works on a project, including state employees, consultants, contractors, utility companies, and resource agencies. Project team members are responsible for delivering products with the quality promised, in a timely and cost effective manner. Each team member is an internal customer for some deliverables and a supplier of other deliverables.

Caltrans uses interdisciplinary teams that initiate, plan, execute, control, and close the various components of the project lifecycle to ensure the successful delivery of a project. Project success hinges on effectively meeting stakeholder needs or communicating why their needs cannot be met.

The project team may be formally or informally organized, depending on the complexity of the project. Individual team members may be active or inactive as a project progresses through the project lifecycle. The project team typically performs the following activities:

- ▶ Ensure design of a quality project that can be safely and efficiently constructed and maintained within scope and budget and on schedule.
- ▶ Participate in a reevaluation of preliminary engineering data and system planning recommendations to confirm that the study should continue.
- ▶ Determine logical project limits.
- ▶ Determine the need for participation of local, regional, State or Federal agency members, or the need for advisory committees.
- ▶ Recommend studies, timetables, alternatives, type of environmental document, and the feasibility of mitigation measures.
- ▶ Call upon various disciplines as needed to ensure thorough analysis of the social, economic, environmental and engineering aspects of the project.
- ▶ Initiate community involvement to obtain project consent and help plan public meetings and hearings.
- ▶ Ensure that State and Federal requirements are met.
- ▶ Recommend a preferred alternative to district management.
- ▶ Ensure that right of way is acquired and cleared on schedule.
- ▶ Provide advice during construction.
- ▶ Ensure that the project history is preserved.
- ▶ Ensure that post construction mitigation is completed before project close out.
- ▶ Ensure that excess property efforts are completed before project close out.

Project Development Team

A PDT is an interdisciplinary team composed of key members of the project team and selected external stakeholders. (See figure 4.)

PDT members:

- ▶ Advise and assist the project manager in directing the course of studies
- ▶ Make recommendations to the project manager and district management
- ▶ Responsible to carry out the project workplan
- ▶ Participate in major meetings, public hearings, and community involvement
- ▶ Oversee the execution of the early components of the project activities, culminating in project approval

The PDT continues to address significant project issues that may arise during any component of the project lifecycle. For further discussion of the PDT, see the Caltrans *Project Development Procedures Manual*, Chapter 8, section 4.

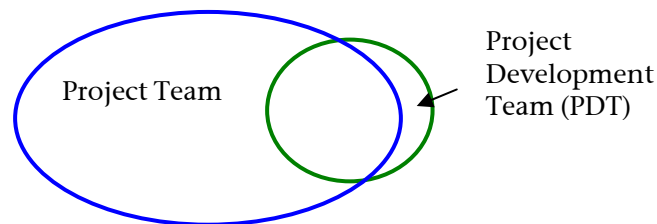


Figure 4. Project Team & PDT Formal Approach to Stakeholders

On large or complex capital projects, the PDT uses a formalized approach to obtaining stakeholder input. These projects usually involve one or more of the following:

- ▶ Significant new right of way
- ▶ Route adoption by the CTC

- ▶ Work on access controlled facilities requiring a new or revised Freeway Agreement
- ▶ Substantial increase in capacity

During the early components of a project, the PDT formally solicits project stakeholder input into the planning, development, and evaluation of the various project alternatives. This is primarily due to the fact that on a PDT, external stakeholders are given an active role in solving their problems.

Informal Approach to Stakeholders

On smaller projects that do not meet the criteria listed above, the PDT uses an informal approach to obtain stakeholder input. Generally this means that the stakeholders are less actively involved, but still consulted.

Responsibilities

Every member of a project team has a different set of responsibilities. This section details these responsibilities.

Concepts

These concepts of responsibility, empowerment, and authority apply to every member of the project team.

Responsibility

Responsibility is the commitment to accomplish the work with the quality promised within an agreed upon schedule and within an agreed upon budget of dollars or hours. Each member of the project team is accountable for meeting his/her commitments.

Empowerment

Project complexity combined with customer demand for responsiveness requires management to empower the project team to meet customer needs. Empowerment does not mean that managers abdicate their leadership role. Rather, it means that managers need to define the boundaries for, or delegate a level of authority to, each project team member in accordance with that individual's capabilities.

Project team members are then free to:

- ▶ Carry out their assignments using their own judgment, skills, and methods
- ▶ Make unilateral decisions affecting how they do work
- ▶ Accept responsibility for the outcome of their efforts

Authority

Authority is the power of individuals to make decisions that others are expected to follow. An individual may derive formal authority from his/her job title or an organizational position. An individual may derive informal or earned authority through his/her knowledge, skills, abilities, and personal effectiveness.

The project manager has formal authority derived from his/her organizational assignment. Project managers can also acquire informal or earned authority on the basis of their knowledge and reputation, which includes the ability to influence others and solve problems.

Overlapping Responsibilities

Any project has the potential for overlapping responsibilities. Prior to the initiation of the project or a particular project component, the project team must agree on who will assume what responsibilities.

Responsibility Matrix

The following table outlines the tasks assigned to each role. See “Stakeholders” on page 40 for role definitions.

Role	Process Group	Action
Project Sponsor	Initiate	Identifies and prioritizes projects for which he/she is the sponsor Sets goals for the project and works toward agreement on the charter Serves as advocate for his/her projects and solicits funding from the various funding programs (STIP, SHOPP, Minor, Congestion Mitigation and Air Quality (CMAQ), Toll, Sales Tax, etc.) Arranges funding for projects — for external sponsors, this includes working with the CTC to arrange funding for STIP projects Establishes performance measures for evaluating the quality of capital improvements
Deputy District Director for Program and Project Management (DDDPPM) <i>Has overall responsibility for the management of the capital program in a district or region</i>	Initiate	Manages delivery of the district’s portfolio of state highway projects Ensures that his/her district meets the programmed project delivery performance measures Identifies delivery trends and takes corrective action to improve delivery Works with RTPAs concerning changes to externally sponsored projects Manages capital outlay support resources Makes decisions on how to apply resources, staff, overtime, and consultants Maintains staff/supervisor/manager ratios Manages his/her district’s project management plan Makes decisions on which projects to implement, tools to use in managing projects, and business processes to implement for effective project management Works with other managers to establish priorities and manage production of project delivery Ensures that business processes and procedures are in place to meet delivery objectives Directs project managers, the project management support unit (PMSU), and the consultant services unit (for more information about these units, see “Project Management Support Unit” on page 50, and “Consultant Services Unit” on page 50) Assigns workload and resources to project managers Provides project managers with training and direction in the use of resources Sets priorities between competing resource demands

Role	Process Group	Action
Project Manager <i>Has full authority, delegated from the DDDPPM, to produce the intended results, on schedule and within budget, and to keep the project sponsors and customers satisfied</i>	Initiate	Identifies the needs and expectations of the project sponsors
	Plan	<p>Leads the project team in the development of a project management plan that defines the project scope, schedule, cost, resource needs, risk, and communication needs</p> <p>Ensures that the project management plan includes all the work required, and only the work required, to produce the product</p> <p>Assigns resources in the following order:</p> <ul style="list-style-type: none"> ▶ First, assigns WBS elements to functional managers in his/her own district or region ▶ Second, brokers WBS elements to functional managers in other districts, regions or divisions, if functional managers in his/her own district or region are unable to meet the delivery requirements ▶ Third, uses consultants to produce work elements, if neither local district or region staff nor brokering will meet the delivery requirements <p>Modifies workplans to account for the use of project-specific consultant contracts</p>
	Monitor & Control	<p>Coordinates and facilitates the work performed throughout the project lifecycle</p> <p>Monitors project performance and takes corrective action if necessary</p> <p>Communicates sensitive issues and project progress to district management, the sponsors, and the project team</p> <p>Provides input into the performance evaluation of project team members, and recommends changes to the project team membership when necessary</p> <p>Serves as the single point of contact on matters involving overall project scope, cost, or schedule</p> <p>Resolves problems that affect project scope, cost, or schedule</p> <p>Controls change to the project scope, cost, or schedule throughout the project lifecycle</p> <p>Coordinates communication between task managers and internal customers of project deliverables to verify and document customer expectations</p> <p>Coordinates the efforts of the overall team, including the Division of Engineering Services</p> <p>Chairs project team meetings</p> <p>Controls the project budget (both support and capital)</p>
Close	<p>Provides timely project completion</p> <p>Ensures that the final product meets the needs of the project customers</p> <p>Discusses the final product with sponsors to gauge their level of satisfaction</p> <p>Prepares a final report on the project, with recommendations for improvement</p> <p>Provides feedback to the team on lessons learned</p>	

Role	Process Group	Action
Functional Manager	Plan	Prepares and reviews project resource estimates Assigns an equitable workload to individual employees Assigns project team members when requested by the project manager or task manager by: <ul style="list-style-type: none"> ▶ Determining his/her functional unit’s ability to meet project delivery schedules using in-house staff ▶ Using “on-call” consultant resources, including oversights, when his/her functional unit is unable to meet its delivery commitments with in-house staff ▶ Using flexible resources such as other Districts, Regions, and State agency staff Modifies workplans to account for the use of “on call” consultant contracts
	Execute	Directs project team members in the delivery of products within the timeframe agreed in the project management plan Supervises a functional unit Acts as the immediate supervisor of the staff who work on the project Provides opportunities for staff members to strengthen their skills Empowers staff to do their jobs with the minimum supervision necessary according to each individual’s capabilities Provides technical and procedural direction to staff performing the work Approves staff and other project expenditures Ensures that there are adequate quality control and quality assurance processes in place for deliverables Provides quality assurance on contract and cooperative agreement work
	Monitor & Control	Monitors and provides feedback to staff
	Close	Ensures that intermediate products (including reports, estimates, environmental documents, etc.) meet the needs of internal customers and have the required features to comply with all applicable standards, regulations, and policies
Task Manager <i>Assumes both project manager and functional manager responsibilities for the production of particular WBS elements; may have a title such as “Project</i>	Plan	Is appointed by the functional manager (if the WBS elements are produced entirely by one functional unit) or by the lowest-level supervisor or manager who manages all the involved functional units (if the WBS elements are shared among several functional units) Participates in the development of the project management plan Provides expert knowledge and analysis for the preparation of the project scope, schedule, and resource estimates Commits to the scope, schedule, and resource estimates of his/her portion of the project management plan Commits to delivery of his/her portion of the project workplan Identifies and verifies customer expectations and prepares a Quality Control Plan for each deliverable in his/her portion of the project scope

Role	Process Group	Action
<i>Engineer, "Project Coordinator", etc.</i>	Execute	<p>Leads project team members in the delivery of products within the timeframe agreed in the project management plan</p> <p>Provides activity status information to the project manager (e.g. start date, remaining duration, finish date, percent complete, and hours at completion)</p> <p>Coordinates with other functional areas on planned products</p> <p>Communicates sensitive project problems, issues, conflicts, or changes to the project manager and the functional manager</p> <p>Resolves technical problems, issues, or conflicts raised by staff so that the overall project scope, cost, schedule, and product quality are not compromised</p> <p>Provides feedback to staff, functional managers, and the project manager on lessons learned</p> <p>Provides early identification to the project manager of issues that might impact the budget or scheduled delivery</p> <p>Provides products on time and within budget</p> <p>Executes the Quality Control Plan to ensure deliverables will meet customer expectations.</p>
Functional Coordinator <i>Appointed by a Functional Deputy District Director or by a Deputy Division Chief in the Division of Engineering Services</i>	Monitor & Control	<p>Coordinates the work of several functional units</p> <p>Performs full-time task management duties</p> <p>Takes responsibility for WBS elements that are shared among several functional units</p> <p>Monitors project performance and cost, and takes corrective action if necessary</p> <p>Provides input into the performance evaluation of project team members and recommend changes to the project team membership when necessary</p> <p>Coordinates the efforts of the members of the project team</p> <p>Assists the project manager to resolve problems that affect project scope, cost, or schedule</p>
	Close	Provides feedback to the project manager on lessons learned
Project Team	Plan	Provides input into the development of the project management plan
	Execute	<p>Delivers products within the timeframe agreed upon in the project management plan</p> <p>Works together in a team environment</p> <p>Monitors production and progress</p>
	Monitor & Control	<p>Communicates sensitive issues and project progress to task managers</p> <p>Monitors and Controls change to activities and products</p>
	Close	Provides feedback to functional managers on how work can be done more effectively and efficiently

Functional Deputy District Directors and Deputy Division Chiefs in the Division of Engineering Services

Functional Deputy District Directors (FDDD) and Deputy Division Chiefs (DDC) in the Division of Engineering Services are responsible for entire functional areas in a district, region, or division.

They:

- ▶ Manage functional managers
- ▶ Report directly to District Directors, Chief Deputy District Directors, or the Chief of the Division of Engineering Services
- ▶ Facilitate interaction between project managers and functional managers
- ▶ Provide functional managers with training and direction in the use of resources

Project Management Support Unit (PMSU)

PMSUs, located in each of the districts or regions, provide administrative support to project managers — collecting data, preparing reports on project status, maintaining project management, databases, etc. While PMSUs support multiple projects at one time, Caltrans recommends a one-on-one relationship with PMSU staff — a project manager should contact the same PMSU staff person throughout the project lifecycle.

Consultant Services Unit

Consultant services units, located in each of the districts or regions, manage the procurement of outside resources necessary to deliver projects. The consultant services unit develops the scope of services or deliverables for each contract using the statement of work and other input provided by the project manager, project workplan, and other functional units that are involved in the project.

One-Hat and Two-Hat Project Managers

Caltrans categorizes its project managers as either “one-hat” or “two-hat.”

One-Hat Project Managers

A one-hat project manager’s duties consist mainly of project management and could in special cases include supervision. One-hat project managers determine what tasks are done, when they are done, and how much each task costs. One-hat project managers are generally assigned to all major capital projects, including the following:

- ▶ STIP, SHOPP, seismic, locally funded, and toll projects
- ▶ Projects with multiple functional unit involvement
- ▶ Projects with a significant amount of local or private entity involvement

Current Caltrans policy guidelines require that most project managers be one-hat.

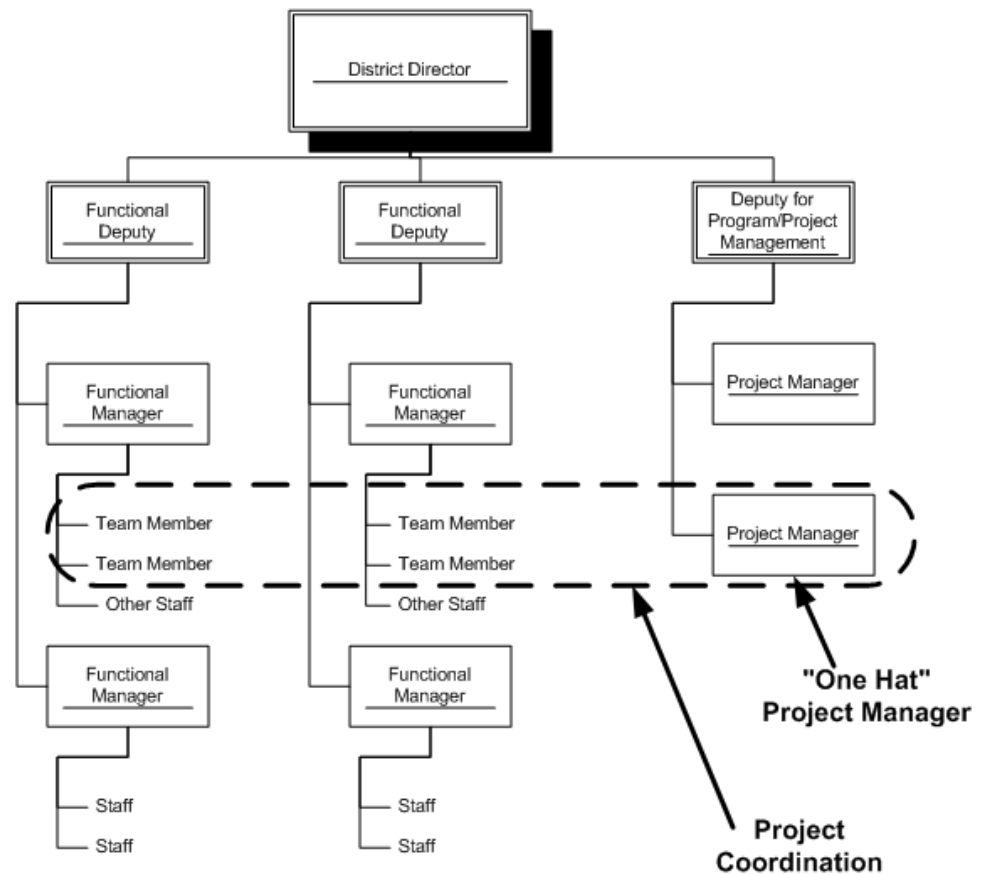


Figure 5. Organizational structure: one-hat project manager

Two-Hat Project Managers

Two-hat project managers are those whose duties consist of both project management and supervision of a functional unit. Two-hat project managers may be assigned to projects where project requirements do not significantly compromise the functional requirements of the two-hat manager, or create a conflict of interest between the two roles of the project manager.

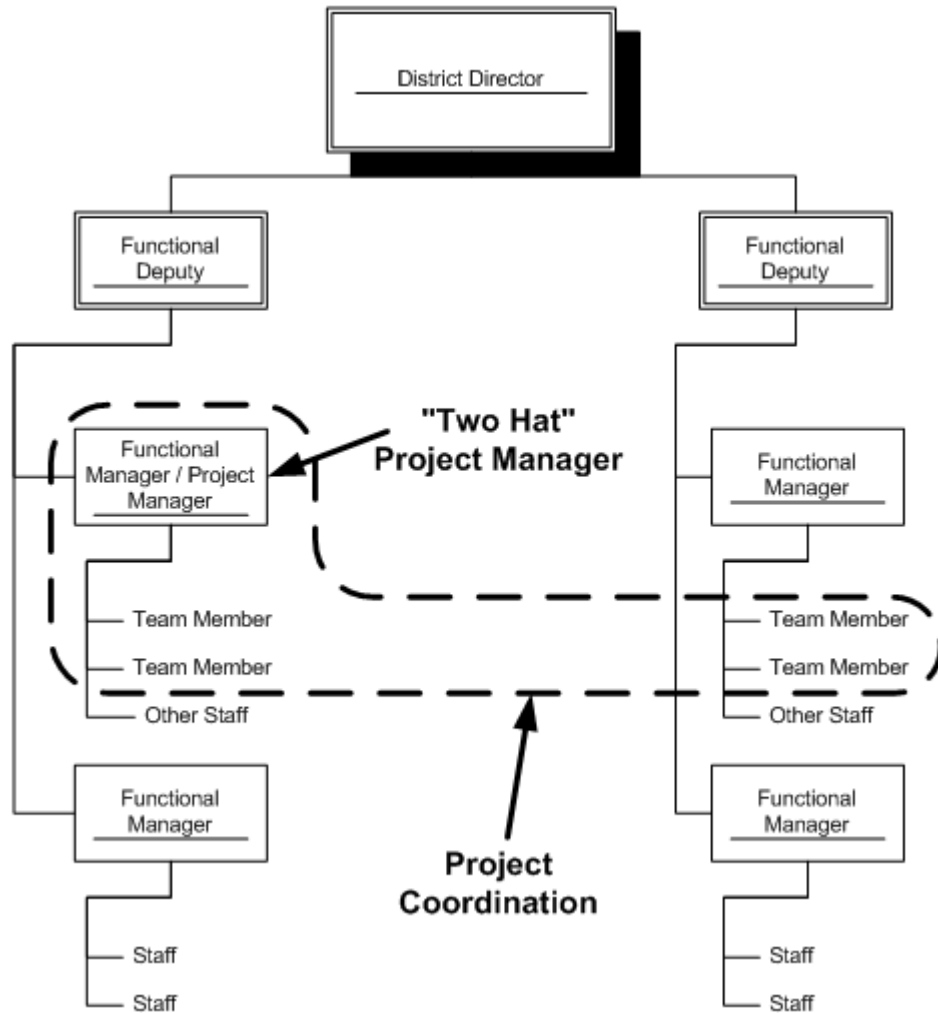


Figure6. Organizational structure: two-hat project manager

Training & Skills

Project Management Professional (PMP)

The Project Management Institute's (PMI) PMP certification is widely recognized and accepted throughout the world as evidence of a proven level of education, knowledge and experience in project management. The Division of Project Management encourages qualified Project Delivery staff to pursue their PMP and provides a course that includes intensive on-line review and the PMP exam.

Those that have been granted the PMP credential must demonstrate ongoing professional commitment to the field of project management by satisfying PMI's Continuing Certification Requirements. PMP's must accrue 60 Professional development units (PDUs) every three years. *For more information see PMI's website www.pmi.org*

Caltrans Project Management Certificate Program

Delivered in partnership with California State University Sacramento, College of Continuing Education (CSUS, CCE) this program connects industry standard (Project Management Institute) project management principles with Caltrans Project Delivery policies and procedures. This program is targeted at Project Delivery staff at the senior level and above. Project Delivery team members gain the necessary skills to enhance their effectiveness. The program includes both a theoretical and practical problem solving approach to project management.

There are a total of eight courses, with 6 of those on-line and 2 in a traditional classroom setting. In 2006 this program won international recognition by winning the PMI Professional Development Product, and Provider of the Year. Additionally, the program received a Caltrans Innovation Award in 2003 and was the subject of an article published in PM Network magazine in July of 2004. This program is offered internally (Caltrans employees) as the CT PMCP and the website for information is: www.cce.csus.edu/caltrans/pm. To register for courses please go to Caltrans Learning Management System (LMS) within Staff Central. The exact same program is offered to externals through CSUS, CCE. Information for those publicly offered classes is here:

http://www.cce.csus.edu/catalog/course_group_detail.asp?group_number=224&group_version=1

Project Manager Skills Series

This 5-course series was developed specifically for Caltrans Project Delivery Project Managers at the request of the Project Management Board. The series includes traditional classroom courses in communication, negotiation, presentation, facilitation and leadership. These practice based courses will provide the opportunity for improvement to every student, regardless of their current ability level. The Project Manager Skills Series is open to all Project Delivery staff at the senior level and above, Project Management Professionals (PMP) and Assistant Project Managers as identified by their Deputy Director of Program/Project Management

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TOOLS

This chapter describes some of the tools and information systems used by Caltrans project managers

Project Management Plan

A project management plan is a group of documents used to define how the project is to be executed, monitored, and controlled. The plan addresses the project's purpose and need (why), goals and objectives (what), schedule (when), and roles (who). The project management plan includes, but is not limited to, the following:

- ▶ Project charter (page 57)
- ▶ Workplan (page 58)
- ▶ Quality management plan (manual in development at the time of this printing)
- ▶ Communication management plan (see the *Project Communication Handbook*)
- ▶ Risk management plan (see the *Project Risk Management Handbook*)
- ▶ Procurement management plan (manual in development at the time of this printing)

The project manager is the single point of contact for the project management plan, ensuring that only one set of documents is created and maintained.

Project Charter

A charter documents the agreement between the sponsor and project manager on the key elements of a project and component. It helps the project manager guide the project team efficiently and effectively through the project lifecycle. It is also used to identify and meet customer satisfaction requirements.

Many capital projects suffer from rework (due to scope changes), which leads to schedule and cost overruns. The charter process helps to manage project scope and reduce rework by preventing unnecessary scope changes.

The project manager, assisted by the PDT, creates a charter at the beginning of the PID component and revises it at the beginning of each subsequent project lifecycle component.

For more information about project charters please visit:

http://pd.dot.ca.gov/pm/ProjectOffice/ProcessGuidance_Directives/PM_MemosDirectives/PMD007_Rev.pdf

Workplan

A workplan is a resourced project schedule. It identifies the project's tasks (identified by the project's WBS) and defines the cost, timeline, and along with task durations and resources (identified by the project's OBS). For any task in the workplan, the project manager assigns a WBS element, a RBS element, and an OBS element.

Work Breakdown Structure

The WBS is a deliverable-oriented grouping of project elements that organizes and defines the total scope of the project. Each descending level represents an increasingly more detailed definition of the deliverables.

Project managers use the WBS to assign deliverables to functional managers. The WBS defines the deliverables, and not the activities, staff, timelines, dependencies, or other factors needed to produce them.

Resource Breakdown Structure

The RBS is a standardized, hierarchical list of resources that might be needed to produce a project deliverable. Resources are grouped by functions and numerically identified by District and Cost Center (source unit). In addition, the RBS contains a consultant resource category to separate consultant resources from Caltrans staff resources in the workplan.

Project team members use the RBS to determine what roles are needed to produce project-specific WBS elements.

Organizational Breakdown Structure

The OBS describes the Caltrans organization chart. It groups personnel into successively smaller units, each reporting to a single manager or supervisor. Districts and divisions consist of offices, which are subdivided into branches. In large districts and divisions, branches may be further subdivided into sections, and sections sometimes subdivided into squads.

Project managers use the OBS to identify the units or persons within the organization who will perform the WBS activities in the workplan.

Value Analysis & Value Metrics

Value Analysis

A term used by the California Department of Transportation that describes the application of Value Methodology to its projects, products and services (*refer to Deputy Directive DD-92 dated July, 2007 for policy on value analysis*). Value Analysis or Engineering is the systematic application of recognized techniques by an independent multi-disciplined team that identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and reliably provides the needed functions at the lowest overall cost.

Value Analysis (VA) studies are mandated by federal law for all projects on the federal-aid system (Interstate and the National Highway System) with a total project cost (right of way, construction and support) of \$25 million or more and on bridge projects totaling \$20 million or more, regardless of funding source. Value Analysis studies should be appropriately conducted in consideration of the project schedule and complexity. Value Analysis can be utilized independent of the mandated Value Analysis Studies (WBS Task 150.10.10 and 160.10.20, etc.) that are typically proscribed for projects. They can be used at any time during the project's schedule or programmed phase to further "...improve the value of a sub product or sub service (sub means: within the context and intended for furtherance of the project's scope, cost and schedule) by identifying and evaluating its functions, and provide the necessary functions to meet the required performance at the lowest overall cost." Mandated studies must be held prior to start of construction.

Value Analysis Team

Value Analysis team members are Independent subject matter experts, Project Development Team members and project stakeholders that participate in the Value Analysis process.

Value Metrics

Value Metrics is a useful group of techniques that establish a means for the measurement of a project's cost and performance as it relates to value improvement. It augments the traditional Value Methodology Job Plan utilized by the Caltrans Value Analysis program. It was originally developed as a means to measure the effect of value studies on project performance for the State of California's Department of Transportation, where it was first called the "Performance Measure Process."

These techniques range from early definition of the performance requirements and attributes of a product or service, to rating scales, utility curves, performance and value matrices, and other tools. They provide a means for the measurement of a project's cost and performance as it relates to value improvement. The equation for functional value is utilized ($V_f=P/C$), where the value of a function is equivalent to its performance divided by its cost.

Value Metrics is usually applied in conjunction with a traditional Value Analysis studies; however, it can also be used independently as a means to assist in making complex decisions. It provides an ideal way for Project Managers to make decisions amongst many alternatives or proposals that can impact a project's scope, schedule and cost.

Information Systems

Caltrans uses several systems to store and process the information needed to monitor and manage projects.

**California
Transportation
Improvement
Program System
(CTIPS)**

CTIPS shows the project description and authorized funding for STIP and SHOPP projects, and the fiscal year of delivery for each STIP and SHOPP project. This information is essential to the project team because it identifies the scope, budget, and schedule that they are expected to meet.

Project Resource and Schedule Management (PRSM)

PRSM is the first part of a three-part plan to modernize the financial management software of Caltrans. The three parts are:

- 1 PRSM, which will enable Caltrans to effectively manage State employee time in its Capital Outlay Support (COS) program. This \$1.2 billion-per-year program funds environmental studies, design services, construction engineering and right-of-way acquisition services for State Highway projects. Caltrans employs more than 10,000 people in COS. State employee time charges make up most of the costs in this program. PRSM will be Commercial-Off-The-Shelf (COTS) software.
- 2 A Construction Management System to replace the existing outdated system.
- 3 An Integrated Financial Management System to replace the existing Transportation Accounting and Management System (TRAMS).

Most of Caltrans' financial management software was written in the 1960s through 1980s. The focus at that time was on recovering Federal Funds and on correct payment of contractors. Since then, transportation financing has become far more complex. Many new Federal, State and Local funding programs have been added, each with its own rules. There has also been an increased attention to the management of Caltrans' State employee and consultant resources. Caltrans has developed band-aid processes to address the new demands with the old software, but these are less than satisfactory.

PRSM will integrate scheduling and timekeeping. It will:

- ▶ Allow portions of each project to be assigned to individual employees ("Task Managers").
- ▶ Allow Task Managers to update current schedules, labor hour estimates and assignments on their work using a web browser, while preventing them from making any other changes.
- ▶ Allow all employees to see current cost and schedule information using a web browser.
- ▶ Integrate with Staff Central to ensure that employees know what labor charges they are authorized to make on projects.
- ▶ Assist supervisors and managers to prioritize the work of their units.
- ▶ Assist supervisors and managers to estimate their future workload and plan for that workload.
- ▶ Compare project costs with the project budgets.
- ▶ Forecast the final cost of each project phase.

Transportation Accounting and Management System (TRAMS)

The Caltrans mainframe accounting database TRAMS provides financial information, including expenditure information, by project. Staff members use preprogrammed or ad hoc reports to access the data.

Staff Central

Staff Central is the original name that was given to the Caltrans initiative to develop a new time reporting system to replace TRS and PERMIS. The new system will also have online modules for reporting and monitoring Workers' Compensation cases and monitoring of License and Certification requirements. The TOPSS development team has customized commercial software from a company called PeopleSoft. The three modules (time reporting, licenses & certifications, and workers' compensation) can be accessed from a new Caltrans Intranet portal called Staff Central.

Project Management Data Warehouse (PMDW)

PMDW is a database containing general project information, project schedule, capital costs, and operating expense data extracted and integrated from existing databases. Staff and managers use desktop computer query tools to access the data.

PMDW is a database that correlates information in XPM with information in Staff Central. PMDW data is accessible to project delivery staff and managers for query purposes using desktop computer query tools. PMDW will be replaced by PRSM.

Systems Being Replaced

Caltrans intends to replace the following systems:

Project Management Control System (PMCS)

PMCS is a mainframe project database containing:

- ▶ Capital cost, scope, and schedule data
- ▶ Project characteristics (existing conditions, traffic, and accident information, etc.)
- ▶ Projections for person/year needs

PMCS provides online entry and viewing of project data. Preprogrammed batch reports provide multi-project information. The various functions of PMCS will be replaced by several integrated financial systems.

eXpert Project Manager (XPM)

XPM is the current project scheduling and resourcing software. It will be replaced by PRSM.



GLOSSARY

Definitions

Activity	A component of work performed during the course of a project ⁵ .
Baseline Workplan	The original workplan approved by the stakeholders. For programmed state highway projects, the cost estimates in the baseline workplan are within 10 percent of the amounts shown in the programming document and the delivery year matches the programming document.
Capital Project	A temporary endeavor undertaken to create a unique physical improvement to the transportation system in California. The word “project” refers to the work that is performed. Projects produce products.
Communications Management Plan	A plan detailing to whom information will flow, what methods will be used to distribute various types of information, a description of the types of information to be distributed, a schedule for information production and distribution, how information will be updated, and how it can be accessed between scheduled communications.
Critical Path	Generally, but not always, the sequence of activities that determines the duration of the project ⁶ .
Critical Path Method (CPM)	A scheduling method that uses diagrams to graphically display the logical sequence of workplan activities. Caltrans uses this method to determine the length (time) of a project and to identify the activities that are critical to the completion of the project on time.
Current Workplan	The baseline workplan plus changes approved by the project manager and project team. The current workplan guides the day-to-day operations of project execution and project control. It reflects the current reality and can be compared to the baseline workplan to assess progress and performance.
Customer	See “external project customers” and “internal project customers.”
Deliverable	Any unique and verifiable product, result, or capability to perform a service that must be produced to complete a process, phase, or project.
Expenditure Authorization (EA)	The key to the Caltrans accounting system. It identifies an expenditure of funds. Every expenditure of Caltrans funds must be charged to an EA.
External Project Customers	Transportation system users who pay for projects through fuel taxes, vehicle fees, tolls, bonds, sales taxes, fares, and other charges.
Federal Project	An authorization to incur federally reimbursable costs for a specific scope of work within specific geographic limits.

⁵ PMBOK® Guide – 2004 Third Edition, Glossary, page 350

⁶ PMBOK® Guide – 2004 Third Edition, Glossary, page 357

Functional Coordinators	Individuals who coordinate the work of several functional units. Functional coordinators are appointed by a Deputy District Director, Deputy Division Chief in the Division of Engineering Services, or Office Chief in the Southern Right of Way Service Center.
Functional Managers	The immediate supervisors of the staff who work on the project.
Functional Unit	A group of people supervised by a functional manager.
Internal Project Customers	Individuals who will use the deliverables or information produced at various stages of the project. They are internal to the project, not necessarily internal to Caltrans. (See also “external project customers” and “project team.”)
Milestone	A significant point or event in the project. It has zero duration.
Product-oriented Processes	Processes concerned with specifying and creating the project product.
Product Scope	The features and functions to be included in a product. (See also “project scope.”)
Program	A group of related projects managed in a coordinated way to obtain benefits not available from managing them individually. Laws and regulations establish programs for government projects and define each program’s purpose, funding sources, and funding process.
Program Evaluation and Review Technique (PERT)	An event-oriented network analysis technique used to estimate program duration when there is uncertainty in the individual activity duration estimates. PERT applies the CPM using durations that are computed by weighted averages of optimistic, pessimistic, and most likely duration estimates. PERT computes the standard deviation of the completion date from those of the path’s activity durations.
Programmed Project	A proposed transportation improvement in a geographic location that is listed in a programming document or in a report to the CTC. The improvement and location are specified in the programming document or report to the CTC.
Programming Document	A document that lists the projects that are authorized in a program.
Project	A temporary endeavor undertaken to produce a unique outcome. A Caltrans capital project produces a unique physical improvement to the transportation system in California.
Program Change Request	The process used to obtain approval for project scope, cost, and/or schedule changes ⁷ .

⁷ Program Change Requests memo dated September 21, 2000

Project Charter	The charter process defines the key elements of the project. These include the purpose and need, component deliverables, and known constraints, assumptions, and risks. The charter documents the agreement between the sponsor and project manager, who represents the project team.
Project Components	The highest-order deliverables on a project. On government projects, these are normally deliverables required by laws or regulations. On California State Highway projects, the components are defined in Government Code sections 14529 (b) and 14556.13(b).
Project Cost	The sum of all the cost components, including capital (right of way and construction) and support costs. These are determined by estimating the present value of each and escalating out to the point in time that the actual expenditures are estimated to occur.
Project Development Team	An interdisciplinary team composed of key members of the project team and external stakeholders that acts as a steering committee in directing the course of studies required to evaluate the various project alternatives during the early components of the project lifecycle.
Project Initiation Document (PID)	Concept approval document for candidate projects that contains a defined project scope, a reliable capital and support cost estimate for each alternative solution, and a project schedule (workplan) for the alternative recommended for programming the project.
Project Lifecycle	A generally sequential arrangement of the components of a project. Each of the lifecycle components involves the five project management process groups – initiating, planning, executing, controlling, and closing. When all components are complete, the project is complete.
Project Management	The application of knowledge, skills, tools, and techniques to project activities in order to meet sponsors’ and external customers’ needs and expectations from a project.
Project Management Body of Knowledge® (PMBOK) Guide	A standards document published by the Project Management Institute.
Project Management Plan	Defines how the project is to be executed, monitored, and controlled. Included are the Project Charter, the project workplan, the Project Communication Plan, Procurement Management Plan, Quality Management Plan, the Risk Management Plan, and the Financial Management Plan.
Project Manager	The individual responsible for managing a project.
Project Scope	The work that must be done in order to deliver a product with the specified features and functions.
Project Sponsors	Individuals or groups that represent external project customers by advocating a project or group of projects. Project sponsors may be internal or external to Caltrans.

Project Team	Every person who works on a project, including state employees, consultants, and contractors. Each team member is an internal customer for some deliverables and a supplier of other deliverables.
Quality Improvement Project	A temporary endeavor undertaken to improve the way in which capital projects meet customer needs. Quality improvement projects include those designed to produce process improvements, training, and tools.
Quality Assurance	The application of planned systematic quality activities to ensure that the project will employ all processes needed to meet requirements. ⁸ Caltrans definition: The activities performed at the district management (functional management) level, during the project delivery process that provides confidence that the project team is fulfilling established project requirements and expectations.
Quality Control	Performing quality control involves monitoring specific project results to determine whether they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results. ⁹ Caltrans definition: The operational processes, practices and activities performed at the project team level during the project delivery process to ensure that the product meets the project's purpose and need and fulfills established quality requirements.
Regional Transportation Planning Agency	A transportation planning agency designated in Government Code 29532. In this handbook, the term "Regional Transportation Planning Agency" is used loosely to include the councils of governments and local transportation commissions described in Government Code 29532 (b) and (c) as well as the regional transportation planning agencies described in Government Code 29532 (a) and (d).
Right of Way Only Project	An entry in a programming document that has funds programmed only for right of way.
Risk Advertisement	Project advertised for construction prior to having all of the necessary constraints cleared to ready-to-list (RTL) the project for construction.
Risk Vote	Risk Vote is a California Transportation Commission (CTC) action requested by the District Director or Local Agency to risk vote project funds (allocation) prior to the project being RTL or amended in the approved Federal State Transportation Improvement Program (FSTIP) 17 working days prior to the CTC meeting.
Scope	The sum of products, services, and results to be provided as a project. In Caltrans, this is both the scope of work (support) and the physical features (capital outlay) of the project. ¹⁰

⁸ PMBOK® Guide – 2004 Third Edition, section 8.2, page 187

⁹ PMBOK® Guide – 2004 Third Edition, section 8.3, page 190

Scope Document	Project Initiation Document (PID) or Project Report (PR).
Sponsor	The person or group that provides financial resources, in cash or in kind, for the project. ¹¹
Stakeholder	Individuals or organizations who are actively involved in the project or whose interests may be positively or negatively affected as a result of project execution or successful project completion.
Task	A term for work whose meaning and placement within a structured plan for project work varies by the application area, industry, and brand of project management software. ¹²
Task Managers	Individuals who are delegated the responsibilities of both the project manager and the functional manager for the production of particular elements in the project WBS.
UnPAR or Drop Project	<p>UnPAR is to un-program (free the funds of) a project. This happens in the following scenarios:</p> <ul style="list-style-type: none"> ▶ Projects that are no longer required or needed ▶ Funding is needed for higher priority projects ▶ The project is delayed further than the Programming Document (SHOPP / STIP)
Value Analysis Team	Project Team members and project stakeholders that participate in the Value Analysis process.
Value Analysis or Engineering	The systematic application of recognized techniques by a multi-disciplined team that identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and reliably provides the needed functions at the lowest overall cost.
Work Breakdown Structure	A deliverable-oriented grouping of project elements that organizes and defines the total scope of the project. Any work not included in the WBS is outside the scope of the project.
Work Package	A deliverable or project work component defined by the lowest level of the project's work breakdown structure.
Workplan	A resourced schedule. The workplan identifies the project-specific WBS elements and defines the cost, timeline, resources, deliverable, and requirements for each.

¹⁰ PMBOK® Guide – 2004 Third Edition, Glossary, page 375

¹¹ PMBOK® Guide – 2004 Third Edition, Glossary, page 376

¹² PMBOK® Guide – 2004 Third Edition, Glossary, page 377

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
CEQA	California Environmental Quality Act
CMAQ	Congestion Mitigation and Air Quality
CPM	Critical Path Method
CTC	California Transportation Commission
CTIPS	California Transportation Improvement Program System
DDC	Deputy Division Chiefs
DDPPM (SFP)	Deputy District Director for Program and Project Management (Also Single Focal Point)
DED	Draft Environmental Document
EA	Expenditure Authorization
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FDD	Functional Deputy District Directors
FHWA	Federal Highway Administration
IIP	Interregional Improvement Program
NEPA	National Environmental Policy Act
OBS	Organizational Breakdown Structure
PA&ED	Project Approval and Environmental Document
PDT	Project Development Team
PERT	Program Evaluation and Review Technique
PID	Project Initiation Document
PMBOK	Project Management Body of Knowledge
PMCS	Project Management Control System
PMDW	Project Management Data Warehouse

PMI	Project Management Institute
PMP	Project Management Professional
PMSU	Project Management Support Unit
PRSM	Project Resource and Schedule Management
PS&E	Plans, Specifications & Estimate
QA	Quality Assurance
QC	Quality Control
RBS	Resource Breakdown Structure
RIP	Regional Improvement Program
RTPA	Regional Transportation Planning Agency
SHOPP	State Highway Operation & Protection Program
SPMIT	Statewide Project Management Improvement Team.
STIP	State Transportation Improvement Program
TEA	Transportation Enhancement Activities
TCRP	Traffic Congestion Relief Program
TRAMS	Transportation Accounting and Management System
TRS	Time Reporting System
TSM	Traffic Systems Management
WBS	Work Breakdown Structure
XPM	eXpert Project Management

Note: For more detailed list of acronyms, visit: <http://pd.dot.ca.gov/pubs/ProjectDeliveryAcronyms.pdf>

References:

- 1) Project Management Body of Knowledge (PMBOK) Guide, Third Edition.
- 2) Project Management Site Map: [**http://pd.dot.ca.gov/pm/pmweb/site_map.asp**](http://pd.dot.ca.gov/pm/pmweb/site_map.asp)
- 3) PM Overview Slide Show: [**http://pd.dot.ca.gov/pm/pmweb/overview.asp**](http://pd.dot.ca.gov/pm/pmweb/overview.asp)
- 4) Work plan Standards:
[**http://pd.dot.ca.gov/pm/ProjectOffice/WorkplanStandards/StandardsHome.asp**](http://pd.dot.ca.gov/pm/ProjectOffice/WorkplanStandards/StandardsHome.asp)
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[**http://onramp.dot.ca.gov/hq/cpsd/workplan_development_best_practices/Workplan_development_best_practices.pdf**](http://onramp.dot.ca.gov/hq/cpsd/workplan_development_best_practices/Workplan_development_best_practices.pdf)



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