# PROJECT MANAGEMENT GUIDELINE

## For the SFC Project Management Program (PMPro)

A Guide for Planning, Designing, and Constructing SFC Projects

December 2019

Indian Health Service
Office of Environmental Health and Engineering
*Division of Sanitation Facilities Construction*

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## About the SFC Project Management Guideline

Completing and delivering sanitation facilities construction projects is the primary activity by which the Indian Health Service (IHS), Division of Sanitation Facilities Construction (DSFC) accomplishes its mission. Because of this, excellence in project management is directly linked to SFC Program success. The purpose of the Project Management Guideline is to provide a framework for the development and execution of projects that incorporates formal project management concepts and practices, with the goal of improving project outcomes and, consequently, mission success.

This guideline has been developed as a reference for all IHS and tribal personnel involved in DSFC projects, from entry-level field staff to upper-level management. While it is recognized that many DSFC personnel develop their own approaches to project management based on their particular work environment, the establishment of consistent standards and practices will lead to more effective project delivery across the organization. This guideline is written primarily to support DSFC staff in the management of projects delivered through Direct Service. Projects delivered under Title I or Title V of Public Law 93-638, the Indian Self-Determination and Education Assistance Act, have differing requirements, but many of the concepts and principles outlined herein can still be applied. This guideline is established with the intention that it will be updated and clarified when necessary to reflect the current state of the art in professional project management.

Continuous learning, innovation, and sharing of best practices are the hallmarks of a successful organization. To underscore the importance of these values as they relate to project management, the SFC Program has adopted the following position statement:

> *The primary vehicle for the delivery of the Public Law 86-121 Sanitation Facilities Construction Program is the project, which is used to both define and address sanitation needs in American Indian and Alaska Native communities. Sustaining and continually improving a culture of professional project management is essential for the SFC Program to uphold its programmatic and fiduciary responsibilities and ensure that the commitments made to Tribes through our government-to-government agreements are upheld. The SFC Program will uphold these commitments and ensure the delivery of quality projects by becoming and remaining an exemplary project management organization.*

This position statement will serve as a guidepost for the SFC Project Management Program and its various elements.

## Acknowledgements

This guideline is the work product of an extensive and collaborative effort by several working groups of dedicated SFC project managers over the years. Thank you to all that have contributed to the development of this guideline and to all that continue to identify best practices in the management of SFC projects.

This most recent edition of the Project Management Guideline was authored by the IHS DSFC Headquarters Office, with significant review and input from the IHS Area, district, and field staff that are primarily responsible for the delivery of the Sanitation Facilities Construction Program. Any questions or suggestions regarding its content can be routed through the Director of the Area SFC Program at the appropriate Area Office.

## Foreword

This guideline is a result of the implementation of the IHS DSFC Strategic Plan. The Strategic Plan was developed through a facilitated process beginning in 2005, in which Area SFC Directors and mid-level managers proposed and prioritized several vision elements and goals for SFC Program improvement. One of the identified vision elements was to make formal project management part of the SFC culture. In response, vision element teams developed the IHS DSFC Project Management Program (PMPro) described in this guideline.

Throughout their work, the vision element teams were aware of the fundamental tie between effective project management and the success of the SFC Program. The SFC Program is a project-driven organization that supports the IHS mission through the delivery of water, wastewater, and solid waste infrastructure projects. The identity of practitioners in the SFC Program has typically been proudly and justifiably tied to their technical engineering expertise. However, while sound technical skills are critical to the SFC Program, they are only one skill set required of a well-rounded SFC project manager. The PMPro and this guideline document describe that wider skill set and are intended to evolve as the SFC Program improves its understanding and implementation of professional project management.

This guideline was written to be consistent with other current guidance for the Program, including the *Criteria for the Sanitation Facilities Construction Program*; Part 5, Chapter 2 of the Indian Health Manual; the Sanitation Deficiency System Guide; and other policies and guidelines that shape the delivery of the SFC Program. In the event that a recommendation in this document conflicts with an SFC authorizing statute or official policy, the statute or policy document takes precedent.

This version (12/31/2019) of the PM Guideline incorporates the following changes:

- Consolidation of the PMPro structure from six components to three;
- Inclusion of industry-current project management concepts in SFC project delivery, based on the most recent ($6^{th}$) edition of the Project Management Body of Knowledge (PMBOK);
- Incorporation of the "Ready to Fund" certification from the Sanitation Deficiency System (SDS);
- Clarification on funding project planning and design activities;
- Emphasis on the pro-active management of project objectives (scope, schedule, budget, and quality) in the context of the government-to-government project funding agreements that establish commitments;
- Emphasis on risk, communications, and stakeholder management throughout the project life cycle;

- Emphasis on the comprehensive inclusion of O&M considerations, based on the *Operation and Maintenance Guideline for the SFC Program*, throughout the life cycle of the project;

- Inclusion of design life and life cycle cost considerations during project planning;

- Replacement of the IHS Engineering Project Report template with the interagency Preliminary Engineering Report (PER) format, which IHS agreed to accept through an interagency Memorandum of Understanding (MOU) on January 16, 2013;

- Removal of the Community Master Plan (CMP) as a typical outcome of the Planning and Design Phase;

- Elimination of the example documents and templates previously included in the appendices to this guideline and moving them to the Project Management Office (PMO) SharePoint site; and

- Removal of material primarily referenced in other DSFC documents (e.g. the MOA Guideline).

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## Abbreviations and Terminology

| | |
|---|---|
| AC | Actual Cost |
| AI/AN | American Indian and Alaska Native |
| CO | Contracting Officer |
| COR | Contracting Officer's Representative |
| CPA | Construction Project Agreement |
| CPI | Cost Performance Index |
| CSI | Construction Specifications Institute |
| CV | Cost Variance |
| DSFC | Division of Sanitation Facilities Construction, IHS |
| EHSC | Environmental Health Support Center, IHS |
| EJCDC | Engineering Joint Contract Documents Committee |
| EPA | U.S. Environmental Protection Agency |
| EV | Earned Value |
| EVA | Earned Value Analysis |
| FAR | Federal Acquisition Regulation |
| GIS | Geographic Information System |
| HPS | Housing Priority System |
| HQ SFC Program | Headquarters Sanitation Facilities Construction Program |
| HUD | U.S. Department of Housing and Urban Development |
| IA | Interagency Agreement |
| IHS | Indian Health Service |
| MOA | Memorandum of Agreement |
| NEPA | National Environmental Policy Act |
| O&M | Operation and Maintenance |
| OEHE | Office of Environmental Health and Engineering, IHS |
| P.L. | Public Law |
| PDP | Project Development Plan |
| PER | Preliminary Engineering Report |
| PDS | Project Delivery System |
| PMBOK | Project Management Body of Knowledge |
| PMO | Project Management Office |
| PMPro | Project Management Program |
| PS | Project Summary/Project Scope document |
| PV | Planned Value |
| SDS | Sanitation Deficiency System |
| SPI | Schedule Performance Index |
| STARS | Sanitation Tracking and Reporting System |
| SV | Scheduled Value |
| TERO | Tribal Employment Rights Ordinance |
| TP | Technical Provision |
| U.S.C. | United States Code |
| USDA | U.S. Department of Agriculture |
| WBS | Work Breakdown Structure |

# 1.0 THE SFC PROJECT MANAGEMENT PROGRAM (PMPro)

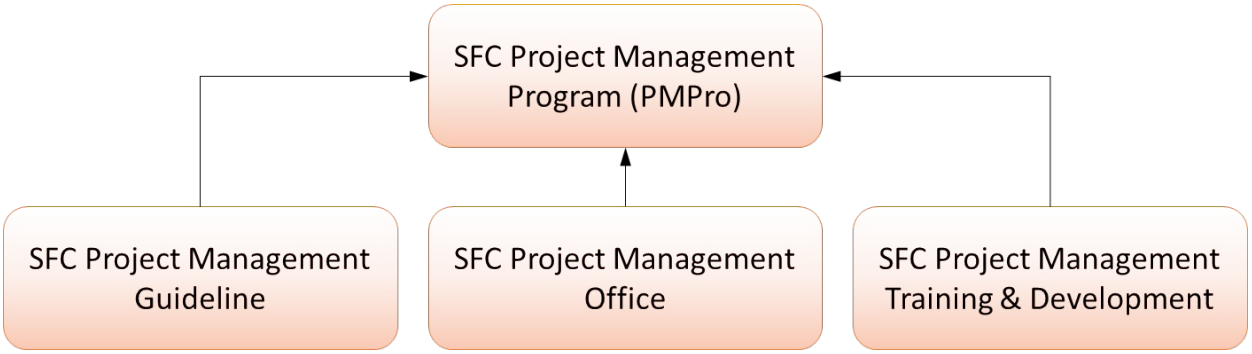
## 1.1 Introduction

**Project management** is the application of principles, skills, tools, and techniques for the purpose of defining, planning, executing, controlling, and completing a project. Chapter 6 of the *Criteria for the Sanitation Facilities Construction Program* (also known as the Criteria Document) describes the use of the project as the "fundamental premise for conducting all aspects of the P.L. 86-121 Sanitation Facilities Construction Program". SFC projects are initiated when a water, sewer or solid waste deficiency is identified. Once the problem is identified and understood, a project is developed to address the deficiency. Accordingly, it is through the delivery of projects that the SFC Program supports the Indian Health Service mission of raising the health status of American Indians and Alaskan Natives to the highest level.

Given the direct link between SFC project delivery and SFC mission accomplishment, the SFC Program must have a clear and effective project management strategy. The SFC PMPro is a multi-component framework that incorporates formal project management practices as essential elements of SFC project delivery. It defines the operating policy of the DSFC in its management of projects and has the primary purpose of building quality and consistency into project development, planning, design, execution, and closeout. The PMPro consists of three major components (see Fig. 1.1), each of which is explained in the subsections that follow.

- Project Management Guideline
- Project Management Office
- Project Management Training and Development

**Figure 1.1 The SFC Project Management Program (PMPro)**




The SFC Strategic Plan vision element that prompted the development of the PMPro is a simple statement with a complex and high-level goal: to make formal project management part of the SFC culture. The PMPro was designed to achieve this vision by integrating project management best practices into the delivery of SFC projects and by supporting project managers' collaboration and development. It should be noted that the creation of a project management program does not by itself create a culture of project management; active support, engagement, and an aim for continuous improvement across all levels of SFC staff are required.

A note on terminology: the term "**project manager**" is used throughout this document to refer to the individual that has been designated with responsibility and authority for the day-to-day implementation of an SFC project. "Project manager" is not an official position description within the IHS DSFC, but the project manager is the person ultimately responsible for the project as a whole. The project manager is the person that integrates the outputs of the project stakeholders toward the goal of accomplishing the project objectives. IHS Areas and Tribes may employ different people in these roles and may officially refer to them as project engineers, project administrators, engineering technicians, or use other titles. Regardless of the title, the roles and responsibilities of the project manager incorporate the same concepts, and this guideline is intended to apply whenever SFC projects are developed and executed.

## 1.2 Project Management Guideline

The Project Management Guideline outlines the project management best practices for the SFC Program and describes the roles and responsibilities for SFC project managers. It defines the SFC project phases and includes recommendations on how to apply project management knowledge toward SFC projects. The project management principles discussed in this guideline are based on the industry-standard best practices outlined in the Project Management Body of Knowledge (PMBOK, 6th ed.), published by the Project Management Institute.

This guideline is intended to be a "what to do," rather than a "how to do" document. Varying circumstances and stakeholder requirements make every project unique. This guideline is a general framework of project management best practices that will lead to effective use of SFC project resources. It is up to the project manager and the Area management team to determine the best specific approach to manage a given project. In almost all cases, individual project managers have the best perspective of their project's environment and are best suited to understand the appropriate approach.

## 1.3 Project Management Training and Development

A key component of the SFC PMPro is the training and development of project managers on the various elements of the program, including this guideline, the PM Office, and related best practices within SFC. Project management training is conducted on both a formal and informal basis. Both online and in-person classes are periodically offered through the IHS Office of Environmental Health and Engineering (OEHE), Environmental Health Support Center (EHSC). PMPro training has also been integrated into the IHS OEHE Orientation course that is regularly presented to new DSFC staff. As the guideline and related PMPro processes are modified, the training material must be updated. The EHSC continues to manage and improve the training and development component of the PMPro.

## 1.4 Project Management Office

The purpose of the SFC Project Management Office (PMO) is to serve as a virtual center for project excellence and a source for knowledge transfer, where best practices, tools, templates, and examples are captured, and where SFC field staff can access resources and reach out to their colleagues to find answers. PMO content areas include design support, drafting support, project

management resources, operation and maintenance resources, and training information. The PMO is currently hosted as a SharePoint site managed by the Environmental Health Support Center at https://collaborate.ihs.gov/sites/ehscDSFC. Note that effective knowledge transfer requires more than a passive information database; interactivity and collaboration through the PMO are highly encouraged. Person-to-person contact is an essential element of PMO effectiveness.

# 2.0 SFC PROJECT MANAGEMENT: AN OVERVIEW

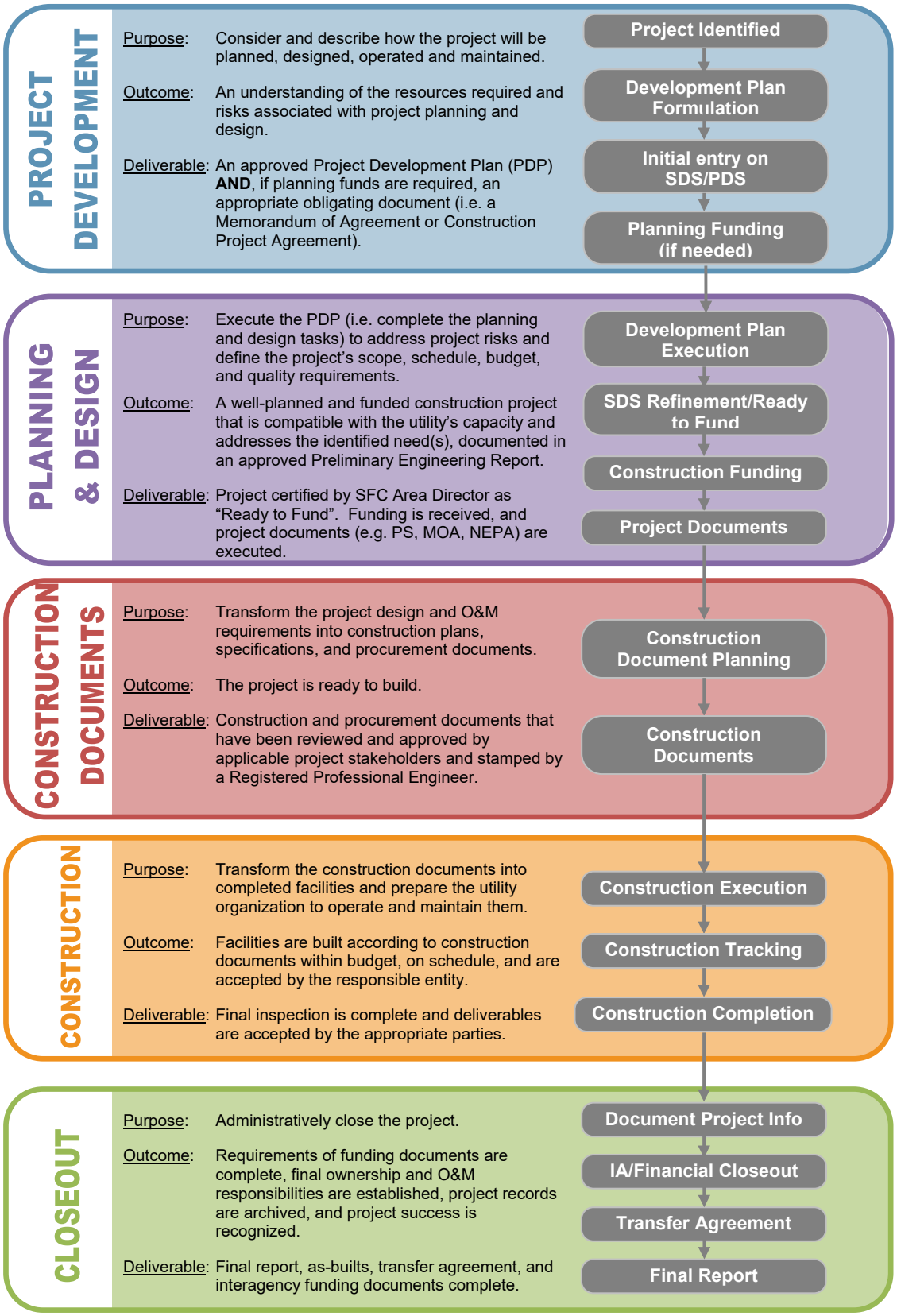
## 2.1 Project Definition and Structure

In project management terms, a **project** is a temporary endeavor with a definite start and end date that creates a unique product or service and is complete when its stated objectives are accomplished. Figure 2.1 describes the five phases of an SFC project. The PMPro's five-phase project structure is intended to provide a general framework for managing SFC projects, regardless of the specific work involved. The guidelines presented herein for each phase will help SFC project managers identify the steps and tasks necessary for the project to be successfully planned, designed, constructed, and ultimately operated and maintained by the Tribe or others. Using this structure will help avoid common problems associated with insufficient project planning and management, including the following:

- The sanitation need and its corresponding solution are not well-defined at the start.
- Inaccurate cost estimates result in insufficient or inflated project budgets.
- Project delays occur due to unanticipated requirements (e.g., endangered species clearances, 404 permits, archeological requirements, environmental requirements, surveying oversights, right-of-way clearances, etc.).
- Significant project scope changes are required.
- The facilities installed fail to meet quality standards or stakeholder expectations.
- Key resources are not available when needed.
- Tribal customers and/or other project stakeholders are dissatisfied.
- Facilities are provided that are beyond the capacity of the tribal operating entity to finance, operate, and maintain.
- Documentation and as-built information for completed projects is inaccurate, missing, or incomplete.

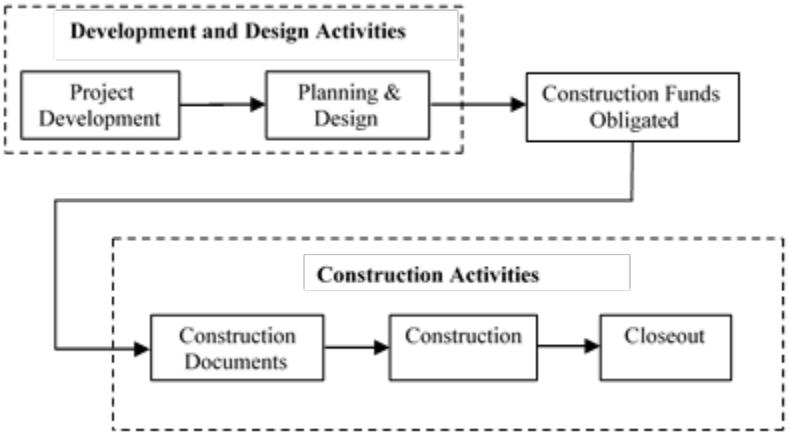
The PMPro project phases are introduced in this chapter, along with the overarching project management concepts that apply across the project life cycle. Subsequent chapters describe each phase in more detail. Figure 2.1 provides an overview of the PMPro project structure, including the purpose of each phase, the expected outcome of each phase, and the specific deliverable(s) required prior to continuing to the next phase.

## Figure 2.1 – SFC Project Phases



The five project phases cover two distinct types of activities: the development and design activities and the construction activities, as seen in Figure 2.2 below. A key concept is that the development and design activities are completed prior to the obligation of funds for construction activities. The thorough and thoughtful completion of the development and design activities is essential to establish a solid foundation for project execution.

**Figure 2.2 Two Distinct Types of Activities**




Prior to the implementation of the PMPro, project planning and design work may have been initiated during SDS project development, but most was carried out during the production of the construction documents, after the project was funded. Completing the planning and design work for a project after it is funded creates a variety of risks, including the potential that the SDS cost estimate used to obligate funding does not include all of the necessary project scope. Additionally, considerations for operator training, as-built surveys, record drawings, and operation and maintenance (O&M) manuals may be overlooked. Neglecting to include these items in the project scope creates challenges for tribal utilities charged with assuming operation and maintenance of the completed facilities.

Under the PMPro methodology, the planning and design work is complete and significant risks to the project are addressed prior to project funding. O&M requirements are established early during project development and planning, and the O&M capacity of the utility organization that will receive the facilities is a key consideration. This restructuring was developed to better position projects for success and ensure that IHS can meet the commitments it makes to Tribes through the project's obligating documents: the Memorandum of Agreement (MOA) or Construction Project Agreement (CPA).

## 2.2 Key Project Management Concepts

The SFC PMPro adapts concepts from the PMBOK to the SFC project environment. While each phase of the typical SFC project is described in detail in subsequent chapters, there are several key project management concepts that apply across all project phases. SFC projects are unique undertakings, and each project must have a tailored approach; however, the following concepts apply to all projects:

- Management of project objectives
- Risk management
- Communications management
- Operation and maintenance considerations
- Project success

The concepts listed here are not all-inclusive of the PMBOK's knowledge areas, but they represent the foundation upon which each SFC project should be established. SFC project managers should familiarize themselves with the PMBOK's other knowledge areas so that they can be applied as needed.

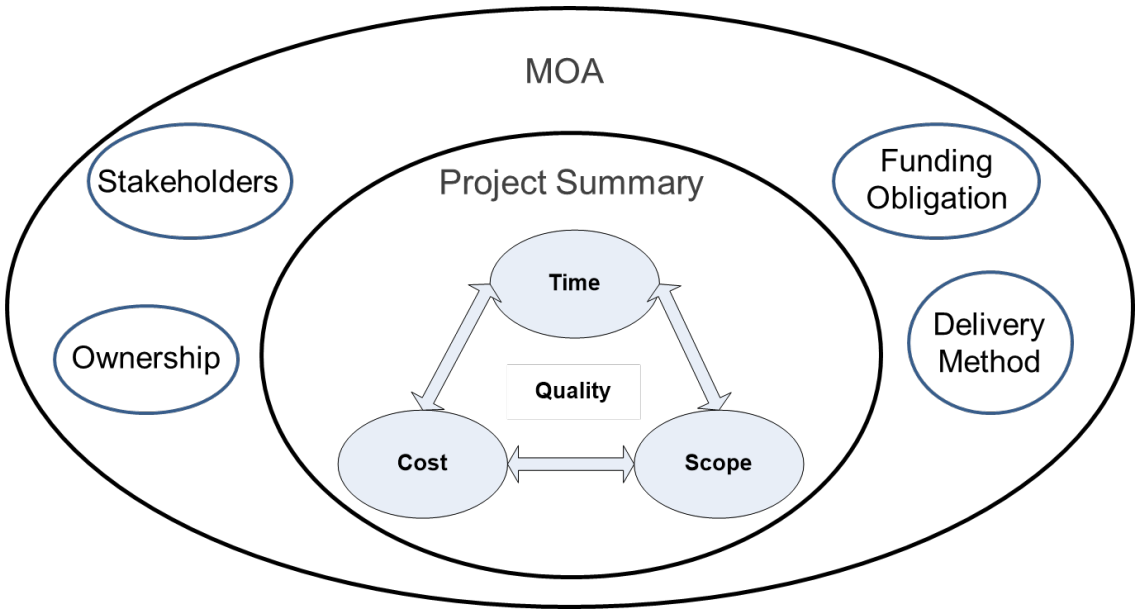
The remainder of this chapter provides a brief overview of the key project management concepts and their application to the SFC project environment. SFC project managers are encouraged to study these topics in greater detail than provided herein. There are a variety of training resources available on these topics from EHSC and outside project management organizations, and the PMO SharePoint site can be used to share tools, templates, and other SFC-specific best practices.

### 2.2.1 Management of Project Objectives

A foundational concept of project management is that projects are established with specific objectives, and the project is complete when (and only when) those objectives are met. The three traditional project objective categories are **scope**, **schedule**, and **budget**. More recently, **quality** has been established as an objective category to highlight the importance of planning for quality during project development and design. The project manager's role is to ensure that the project objectives are met. Factors and events that can impact the objectives, such as risks and stakeholder requirements, must be tracked and managed. Over the course of a project, trade-offs amongst the project objectives may be necessary as risks and opportunities are realized. The interrelationship of project objectives means that a project cannot have a change in one objective (e.g. the addition of scope) without affecting the other objectives (a change in schedule, budget, or quality).

In the SFC project environment, the management of project objectives takes on added significance. The project objectives are first established during the Project Development Phase and are refined during the Planning and Design Phase. When projects are funded and delivered through Direct Service, the Project Summary captures the project objectives, and the MOA then incorporates them by reference as the agreed-upon project plan. The Public Law (P.L.) 86-121 Memorandum of Agreement is a tool unique to the SFC Program that establishes a government-to-government commitment to deliver the project. The MOA also establishes other key project management elements, such as the primary stakeholders, communication requirements, obligation of project funds, the project delivery method, and ownership of the completed facilities. Figure 2.3 provides a visual map of how the project objectives relate to the SFC Direct Service project environment. Note that under Title V of P.L. 93-638, different documents are used, but the general concepts still apply. The project manager must understand that any changes to an SFC project's objectives have to be considered in the context of the wider project environment. Changes to those commitments must be addressed through appropriate measures (e.g. an amendment to the PS and MOA).

**Figure 2.3 Project Objectives in the SFC Direct Service Project Environment**




### 2.2.2 Risk Management

Risk management is discussed in depth in Chapter 3, Project Development, where it is used as the foundation for creating the Project Development Plan. Risk management is an ongoing concern for the project manager, however. Risks may be identified and addressed in any project phase. The project manager should be aware that there are a variety of tools available for risk identification and tracking, including the following:

- Risk management plans
- Risk checklists
- Issue logs

Sample risk management templates can be found on the PMO SharePoint site. The appropriate tool for managing risk on a project is dependent on the project's size and complexity. An understanding of risk management and use of the appropriate tracking tools over the life cycle of the project is essential for pro-active project management. When risks are identified and planned for, problems can be prevented or made less likely. The alternative – reactive project management – typically results in higher costs, schedule delays, lower quality, and/or scope that does not meet the original project's objectives.

### 2.2.3 Communications Management

Communication issues are often cited as the most frequent cause of problems on projects. On any given day, project managers spend most of their time communicating. Communication needs can become overwhelming for SFC project managers that oversee multiple active projects at the same time. Therefore, it is essential for project communications to be planned and managed, just like other key management areas (e.g. scope, schedule, risk).

Communications planning begins with having a thorough understanding of the stakeholders involved in the project. **Stakeholders** are the individuals, organizations, and other parties that may be affected by the project (both positively and negatively). The project manager must identify the relevant stakeholders during project development and planning and understand their requirements and expectations. This becomes the basis for managing communications. A well-developed communications plan will save the project manager time by eliminating unnecessary communications and help ensure that the project meets its objectives by preventing changes and misunderstandings. Communications management tools for a project could include the following:

- Stakeholder identification matrix
- Analysis of stakeholder interests and expectations
- Communications management plan
- Email distribution lists
- Quick reference sheet with key stakeholder contact info
- Follow-up inquiries to ensure that communications are effective

The project manager should take an approach of being of service to the project. SFC projects have the potential for addressing serious public health issues and may have high visibility, multiple funding partners, and a wide variety of stakeholders. Being of service to the project means being aware of and responsive to stakeholders' needs and acting as the primary coordinator of project success. As with all functional areas of project management, the project manager must regularly evaluate communications to ensure their effectiveness.

### 2.2.4 Operation and Maintenance Considerations

Operation and maintenance considerations are highlighted here as a key project management input because they are inseparable from successful SFC project delivery. SFC project managers must have a thorough understanding of both the system's operation and maintenance requirements and the capacity of the utility organization that will own and operate the completed sanitation facilities. The partnership between the SFC project technical staff, the Tribal Utility Consultant, and the utility's manager and operator(s) forms the foundation for each SFC project.

At every stage of the project, the project manager must ensure that O&M considerations are incorporated. The Operation and Maintenance Guideline for the SFC Program (also known as the O&M Guide) provides best practices for the O&M services provided by the SFC Program. SFC project managers should be aware of the Area's O&M support services and plan for their meaningful inclusion in each project phase. The following chapters describe how this integration occurs in more detail.

### 2.2.5 Project Success

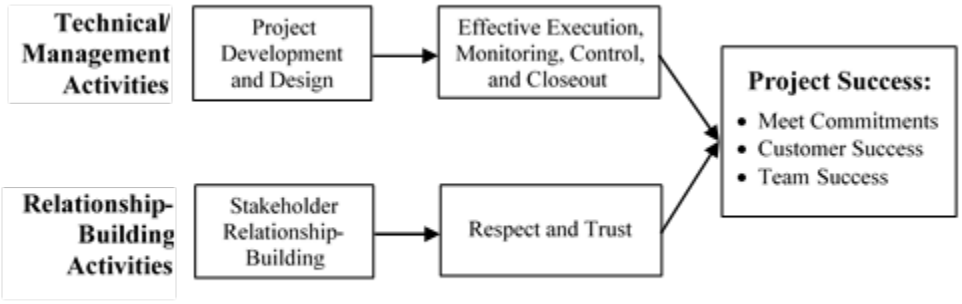
Throughout the project life cycle, and especially during the development and design activities, project managers should consider the elements and determinants of SFC project success. As previously noted, projects can be considered complete once they have met their objectives. The

concept of project success, however, extends beyond whether the objectives are met. Determining whether a project is successful can include the following:

- **Meeting Commitments** – whether the delivered project matches the commitments to the Tribe through the project's MOA or CPA (e.g. were the scope, cost, schedule, and quality objectives met?)
- **Customer Success** – whether the Tribe's and other stakeholders' needs were met (e.g. were the deliverables used by the Tribe/customer, and were they satisfied?)
- **Project Team Success** – whether the project team had positive results (e.g. were resources used effectively, did the team develop skills and strengthen relationships?)

While meeting the Government's commitments to the Tribe as described in the project's obligating documents is the foremost priority, the other elements described above are vital to the maintenance of a productive and effective project delivery environment. In general, the drivers of project success can be divided into two types of activities: **technical/management activities** and **relationship-building activities**. Figure 2.4 shows how both types drive project success.

**Figure 2.4 Drivers of Project Success***




* Adapted from T. Kloppenborg, *Contemporary Project Management* (2nd ed.)

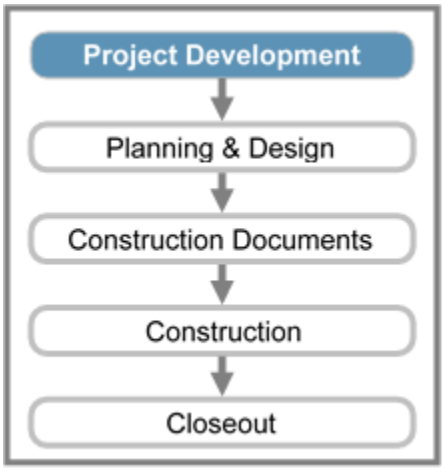
The technical/management activities on the upper track of Figure 2.3 can be described as the "hard skills" one most often associates with project management, and these are the primary focus of this guideline. However, SFC project managers should also aim to build their "soft skills" as shown on the lower track. These skills will support the development and maintenance of positive working relationships with tribal partners, internal staff, funding agencies, and other project stakeholders. Relationship-building activities can include the following:

- Practicing and promoting open communication;
- Pro-actively addressing issues and securing buy-in;
- Ensuring that the appropriate processes for decision-making and problem-solving are known and followed; and
- Establishing a wide network of contacts.

Approaching projects along both tracks ensures the best potential for success. The following chapters will examine each phase of the SFC project life cycle in detail.

# 3.0 THE PROJECT DEVELOPMENT PHASE

## 3.1 Introduction



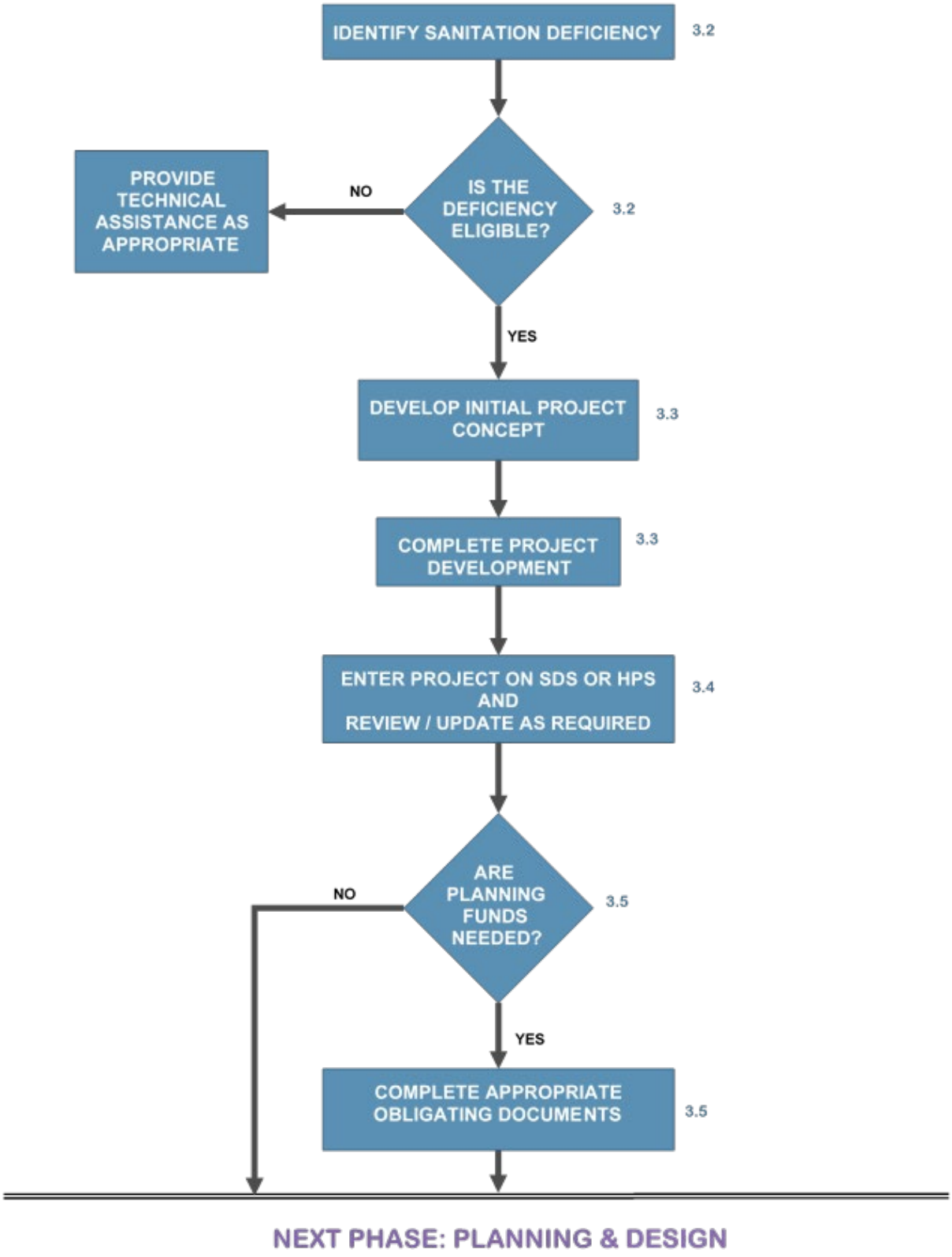

The Project Development Phase includes the identification of sanitation deficiencies and the determination of the activities that need to be completed during the Planning and Design Phase. The PMPro establishes Project Development as an independent project phase to highlight the importance of *tailoring the planning and design activities* to the specific problem identified and its environment.

Many project managers underestimate the importance of sound, informed project development. There is often pressure on SFC project managers to move quickly through the Project Development and Planning and Design Phases, in order to get a project listed on the SDS. This pressure can be reinforced by the fact that the sanitation deficiencies addressed by the project often represent significant threats to public health that require a timely response. However, the failure to fully identify sanitation needs, project requirements, and risks involved in planning and executing the project can lead to a variety of problems, including, but not limited to: failure of the project to address the root problem, changes in scope, cost overruns, project delays due to time spent seeking additional funding, and construction delays due to unanticipated conditions and requirements. These resulting problems will almost always outweigh any efficiencies gained by moving rapidly through project development and planning.

Figure 3.1 shows an overview of the Project Development Phase. The primary phase deliverable is an approved **Project Development Plan (PDP)**. The PDP outlines the work required to complete the project's planning and design and address the identified risks. For projects that require planning funds, an additional phase deliverable is an approved obligating document (e.g. a Memorandum of Agreement) for the funds required.

Project development work may or may not result in a project being created. Sanitation deficiencies that are identified but do not meet SFC eligibility requirements will not progress past the Project Development Phase. These needs may be referred back to the Tribe to seek other funding sources. Projects that progress through the Project Development Phase will have a road map in place for all of the work necessary to complete the project's planning and design.

**Figure 3.1 Project Development Phase**



## 3.2 Identifying Sanitation Deficiencies

The Project Development Phase begins when a sanitation deficiency is identified. Identifying deficiencies and the potential projects to address them should occur throughout the year. Project managers and other DSFC staff must be proactive and engaged with the Tribes and communities they serve to identify sanitation needs. Care must be taken to understand the system as a whole and the root cause of the deficiency as opposed to identifying the symptoms. For example, the failure of a community drainfield may not be simply due to the aging of facilities; it could be the result of inadequate sizing for the soil characteristics or inadequate primary treatment. At a minimum, the DSFC team that works with a particular Tribe should:

- Know the components of the water, wastewater, and solid waste systems, understand how they work, and be aware of what deficiencies exist. A Geographic Information System (GIS)-based asset inventory with a hydraulic model (as applicable) provides the best foundation for system understanding.
- Recognize and engage with the stakeholders (tribal and non-tribal) that have an interest in the sanitation facilities serving tribal homes and communities. There is often more than one stakeholder group for each type of sanitation facility, and they may have differing views on what the needs are.
- Maintain a close working relationship with the water, wastewater, and solid waste operators to understand the system's day-to-day operation and maintenance issues.
- Participate in regular community infrastructure sanitary surveys.
- Be aware of applicable regulatory requirements for sanitation facilities (e.g. EPA Safe Drinking Water Act requirements for public water systems).
- Have a system in place to maintain awareness of sanitation deficiencies for individual homes (e.g. a tribal point of contact for the community that works closely with the local SFC office on IHS Housing projects).
- Ensure that regular communication occurs between SFC Tribal Utility Consultants and Project Engineers.
- Understand the IHS Sanitation Deficiency System and other funding avenues for projects (refer to the SDS Guide and Criteria Document for details).

Once a sanitation need has been identified, a determination of its eligibility for IHS funds must be made. The SDS Guide and Criteria Document cover these topics in detail. Deficiencies that are not eligible for IHS funds should not be ignored; SFC staff should assist Tribes as appropriate to determine if other funding partners can assist. SFC staff should also be aware of projects managed by the Tribe that will impact sanitation facilities (e.g. commercial development projects, new environmental regulations).

## 3.3 Project Development

Once an eligible deficiency is identified, the project manager must develop the basic structure of a project to address the deficiency. At this point, very little may be known about the problem or the appropriate solution. Often, there is pressure to address the technical issue and 'solve the problem'. A better project management approach, however, is to start with examining the high-

level issues that typically have a greater influence on project success. For most projects, the project manager should begin by identifying the following, at a minimum:

- **Basic project justification** – a high-level summary of the reason for undertaking the project. This should include the sanitation deficiency being addressed and any other significant driving factors (e.g. failure conditions that created the deficiency).

- **High-level requirements** – an understanding of the conditions that must be satisfied for the project to be successful. These are typically performance requirements (e.g. compliance with a particular code or standard, compatibility requirements with existing facilities)

- **High-level risks and constraints** – conditions that could result in the project not meeting its objectives or failing entirely. This can also include major limiting conditions, such as the expected construction season. It is critical to identify these key factors early in the Project Development Phase so that the appropriate planning activities can be identified.

- **Initial list of key project stakeholders** – project stakeholders can include any individuals or organizations impacted by the project. The purpose of this initial list is to identify the key stakeholders that will be critical to the project's success and capture their primary motivations and interests in the project, as well as their potential roles and responsibilities. This list should include both internal (IHS) and external stakeholders.

In project management terms, these initial elements are similar to the concept of creating a project charter. This initial project concept serves as the basis for identifying the required planning activities and completing the Project Development Plan as described below.

Building on the initial project concept, the project manager continues project development by identifying and scheduling the activities to be completed during the Planning and Design Phase. A key concept of the SFC PMPro is that risk management serves as the foundation for carrying out project development work. The PMBOK (6$^{th}$ ed.) defines a project risk as "an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives". A risk may have one or more causes and, if it occurs, may have one or more impacts.

During project development, the Project Manager will identify and analyze the risks associated with planning and designing the project, identify the information required to complete the project design and address risks, and consider the human and financial resources required for those planning and design tasks. The process of project development can be modeled as answering the following questions:

- **What do I know?** – developing an inventory of the known data (system information, as-builts, hydraulic information, key stakeholders, etc.)

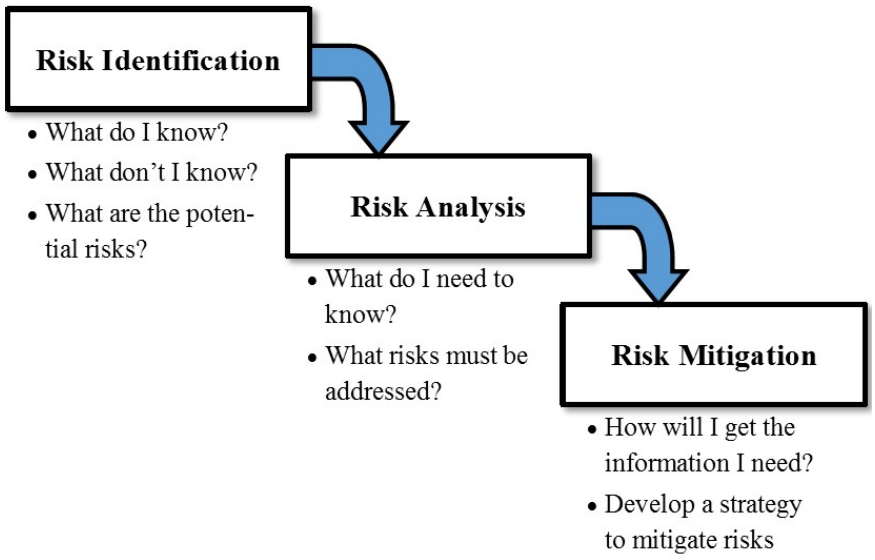
- **What don't I know?** – understanding the information required to develop a complete and accurate design, and identifying what can go wrong and right about the design process (i.e. risks and opportunities)

- **What do I need to know?** – analyzing and prioritizing the identified information needs and risks associated with the design process

- **How will I get the information I need?** – developing a strategy to address information needs and risks by identifying planning activities (e.g. test pits, hydraulic analysis, biological clearances, specialized engineering services)

Figure 3.2 illustrates how these questions follow the stages of risk management.

**Figure 3.2 Stages of Risk Management**




It is important to note that at this stage, the focus is on planning the design process. The level of effort required will vary based on the size, complexity, and uncertainty involved with the project. For a basic project (e.g. an on-site septic tank/drainfield system), there may be very little uncertainty about the information required to complete the design. For this type of project, **risk identification** could consist of the project manager making a few notes in the homeowner file following the initial site visit. For larger projects, a more in-depth process is typically required. The process used for identifying risks can be creative, using brainstorming to capture all potential issues; disciplined, where a team might use a checklist built upon experiences from similar projects; or a combination of the two. Tools for risk identification, such as risk category charts and detailed risk checklists, are located on the PMO SharePoint site.

Similarly, **risk analysis** should be based on a structured approach. Once the broad range of risks are identified, some effort must be made to determine their likelihood and potential impact, which will drive the eventual risk mitigation strategy. This will typically involve an estimation of each risk's probability of occurrence and its impact if it occurs. Risks with a likely occurrence and a high potential impact to one or more of the project objectives can then be prioritized ahead of risks with a low impact and/or little chance of occurrence. Detailed information on performing risk analysis can be found in the PMBOK and other project management texts. Examples of completed risk analyses for SFC projects are located on the PMO SharePoint site.

**Risk mitigation** covers the different ways that risks are addressed. Using the prioritized/ weighted list of risks from the risk analysis stage, a general mitigation strategy for each risk is developed, and specific tasks to carry out that strategy are assigned. Mitigation strategies can include the following for negative risks (those that would negatively impact the project objectives):

- **Risk avoidance** – usually involves developing an alternative strategy that has a higher probability of success, but usually at a higher cost (e.g. rerouting a water main alignment to avoid potential permitting issues)

- **Risk sharing** – involves partnering with others to share the responsibility for managing the risk (e.g. developing a design review process with a utility company to avoid utility conflicts)

- **Risk reduction** – an investment of funds to reduce the risk on a project (e.g. performing test pits to identify soil/rock composition along a proposed alignment)

- **Risk transfer** – shifting the responsibility for risk to another party (e.g. contracting with an outside engineering firm for a water tank foundation)

- **Risk acceptance** – does not include ignoring the risk, but does mean that the likelihood and/or impact is low enough that the potential consequences can either be accepted if they occur or dealt with at that time (e.g. the potential for survey equipment not working is low, but if it occurs arrangements can be made to repair it and/or borrow other equipment)

The result of this work should be a detailed list of tasks that will adequately address the risks and information needs during the Planning and Design Phase. Section 4.2 includes a list of typical planning and design activities. The rest of the Project Development Phase involves building this task list into a well-developed **Project Development Plan (PDP)**. The Project Development Plan is the primary deliverable of the Project Development Phase. The PDP captures the work completed during the Project Development Phase. It clearly states what planning and design work will be done, outlines any personnel or scheduling requirements associated with the work, and describes the desired outcome of the planning effort.

If the planning and design activities require funding (e.g. for the services of a geotechnical consultant), the PDP will include a cost estimate (refer to Section 3.5 for details on funding

planning activities). The PDP can be expanded or contracted based on the size and complexity of the project, but it generally addresses the following topics:

**Project Development Plan – Key Elements**

- **Sanitation Deficiency Statement** – a brief description of the sanitation deficiency with applicable background.
- **Scope of Work** – a description of the planning and design activities that will be carried out during the Planning and Design Phase, both by IHS staff and outside contractors (when needed). These activities include all of the necessary field investigations, regulatory requirements (e.g. right-of-way research, permit applications), and technical calculations that are required to fully scope the construction work, understand the O&M requirements, and ensure that significant risks to project success have been analyzed and appropriately addressed. Refer to Section 4.2 for a list of typical planning activities.
- **Schedule** – a Gantt chart, milestone schedule, or other appropriate schedule that shows the timing of planning tasks and their relationships (e.g. predecessor/successor), if applicable.
- **Planning & Design Cost Estimate** – an estimate of the costs required to complete the planning and design work, if any. These are typically the costs for outside contractors and permitting agencies (i.e. not costs for in-house IHS staff). This estimate does not include the capital cost of the proposed project.
- **Communications Plan** – the list of key project stakeholders developed previously is expanded to include how the project manager will communicate with them during the Planning and Design Phase.
- **Procurement Plan** – a discussion of how the services of outside contractors will be procured, if necessary.
- **Risk Management** – a description of the potential risks associated with the planning and design work and how they will be addressed.
- **Human Resources** – identifies the roles and responsibilities of the IHS, contractor, and/or other project personnel that are expected to be involved in the planning, design and review of the project. Special training needs for IHS staff should be identified.

The Project Development Plan should be reviewed and approved by the District Engineer, at a minimum. Sample PDP formats and completed examples are located on the PMO SharePoint site.

## 3.4 Enter Project on SDS or HPS

The IHS Sanitation Deficiency System (SDS) is an inventory of the current water, sewer, and solid waste infrastructure needs of American Indian and Alaska Native (AI/AN) homes and communities. This inventory of existing needs is annually reported to Congress as required by the Indian Health Care Improvement Act, P.L. 94-437, as amended (25 U.S.C. 1601 et seq). The IHS Housing Priority System (HPS) is an inventory of sanitation facility needs for eligible new or like-new homes. The SDS and HPS systems are components of the Sanitation Tracking and Reporting System (STARS), the comprehensive data system for the SFC Program.

Once the initial project concept has been identified and the PDP has been developed, an entry will typically be made in SDS or HPS to describe the project. This initial entry has the primary purpose of documenting and reporting the need. The entry includes descriptions of the sanitation deficiency and the facilities proposed to address the deficiency. The current version of the Guide for Reporting Sanitation Deficiencies for Indian Homes and Communities (also known as the SDS Guide) describes the requirements for entering project into SDS. Updated guidance for entering projects into HPS is currently pending.

Projects entered in SDS must include a cost estimate that captures the costs for planning, construction, O&M tools and training, and project closeout-related items. Costs for contingencies, professional fees, IHS project technical support, Tribal Employment Rights Office (TERO) requirements, tribal taxes, and administrative support may also be included as required. At this stage, the construction costs will represent a best estimate, since the planning and design work identified in the PDP is not yet complete. Areas may have additional guidance for SDS cost estimating and formatting in their Area-specific guidelines.

## 3.5 Funding for Planning and Design

When funds are needed to complete planning and design work, the amount and proposed source of the funds must be identified in the PDP. A variety of funding sources can be used for planning and design activities, including IHS Regular and Housing funds, unspent funds from previous projects, IHS Special funds, and contributed funds from the Tribe or other funding agencies. The limitations of each funding source are described in Table 3.1.

*Table 3.1 – Funding Source Limitations for Planning Activities*

| Funding Source | Funding Source Limitations |
|---|---|
| IHS Regular | • Funds must be used to support project planning and design activities for *existing* AI/AN homes.<br>• Current year Regular funds can be used for planning activities only after all "Ready to Fund", higher-ranking SDS construction projects have been funded.<br>• Funds must be applied to projects in SDS in priority order.<br>• Funds cannot be mingled with IHS Housing funds but may mix with contributed funds.<br>• Funds cannot be used for stand-alone planning projects (i.e. planning activities not tied to a listed SDS project).<br>• Unspent prior-year Regular project funds can be used for planning activities in accordance with Area guidelines. |
| IHS Housing | • Funds must be used to support project planning and design activities for *new or like-new* American Indian and/or Alaska Native homes.<br>• Funds cannot be mingled with IHS Regular funds but may mix with contributed funds.<br>• Funds cannot be used for stand-alone planning projects.<br>• Unspent prior-year Housing project funds can be used for planning activities in accordance with Area guidelines. |
| Contributed | • Limitations are based on the contributing agency's requirements.<br>• No restrictions on combining with IHS Housing or Regular funds.<br>• Funds can be used for stand-alone planning projects. |
| IHS Special | • Limitations are outlined in Chapter 5, Section VI of the Criteria Document.<br>• Funds can be used for stand-alone planning projects. |

The MOA Guideline (Chapter 1, Section 2d) notes that some planning activities do not require the prior execution of an MOA, such as the purchase of materials or aerial photography services. However, the majority of planning tasks fall into one of the three categories identified in the MOA Guideline that require an MOA to obligate funds:

1) funds being contributed from one governmental entity to another
2) activities requiring tribal involvement
3) activities requiring use of tribal lands, facilities, and/or equipment

For these activities, the most commonly used approach is to fund the planning activities necessary for the SDS or HPS project, while the construction activities remain in SDS or HPS. A project is set up in the Project Delivery System (PDS) to manage the planning activities and document expenditures. When the planning activities are complete, the construction activities in SDS or HPS are updated. The alternative approach is to fund a stand-alone planning project that is not tied to construction activities in SDS or HPS. This approach is typically used when the effort to be planned is unusually large or complex (and may generate more than one project), when Special Project funds are being used, or when other circumstances make it necessary as deemed by the Area.

Table 3.2 summarizes the differences between funding planning activities that are tied to a SDS/HPS project versus stand-alone planning activities. The following sections provide further details and examples of how the various types of funding can be used.

*Table 3.2 – Planning Activities Tied to an SDS/HPS Project vs. Stand-Alone Planning Activities*

| Planning Activity Type | Obligating Document | Typical Use | Reporting Requirements | Examples |
|---|---|---|---|---|
| Tied to Existing SDS/ HPS Project | MOA/CPA | Short duration, typically lower cost activities associated with addressing technical, environmental, and other project risks, with the goal of clarifying the project objectives (scope, schedule, budget, and quality). | When planning activities are funded from a listed SDS/HPS project, those costs are moved into PDS and removed from the SDS/HPS project. The PDS Project # is shared with the subsequently construction project when or if it is funded. | The Project Development Plan identifies that subsurface geotechnical information is needed to mitigate the risk for encountering rock along a sewer main alignment. Test pits are funded through a MOA tied to the listed SDS project. |
| Stand-Alone Planning Project | MOA/CPA | Special projects or contributed funds are obligated for longer duration, major design efforts or community master plans. May result in one or more construction projects that will subsequently be listed in SDS/HPS. | Planning activities are not listed in SDS. A stand-alone planning project is created in PDS with a unique PDS number. This number is not carried over when or if construction is funded. | A Special project is created to develop a community master plan for a community with a complicated community water system with multiple technical challenges. |

### 3.5.1 Planning Activities tied to a listed Project – Regular Funds

If the planning activities will be funded with IHS Regular funds, they must be included as part of a listed SDS project that includes costs for planning, design, construction, start-up, O&M equipment and training, and items related to project closeout. Projects that require planning funds should be selected for funding in priority order after all higher-priority construction projects are funded.

When the planning activities are funded and carried out under the Planning and Design Phase, the construction portion of the project will remain listed on SDS (with the planning costs removed). The PDS project that is created for the planning activities will be linked to the SDS project in STARS, and the PDS project number assigned will carry forward for the construction project once construction funding is received. Combined, the PDS planning project and the SDS construction project will represent the total project effort. As construction costs are better defined during the Planning and Design Phase, the SDS construction project will be updated accordingly.

Occasionally, projects may fall into the SDS funding range before adequate planning has been completed. These projects should not be funded for construction until the necessary planning work is completed. The SFC Director, in accordance with HQ and Area guidelines, should apply negative points to the SDS project under the 'Other Considerations' category to lower the project's priority score below the funding range, unless or until the planning activities are complete.

### 3.5.2 Planning Activities tied to a listed Project – Housing or Contributed Funds

Planning activities can be funded for projects using Housing or contributed funds in a similar manner as Regular funds. Regardless of the source of planning funds, a completed Project Development Plan is required to describe the scope of the planning effort. For Housing funds, a project must be listed in HPS, and the planning work is linked to the HPS project in a similar manner as for Regular project funding. Note that HPS does not currently have the same functionality that SDS has for linking a PDS project. Areas should describe their process for managing planning work for Housing projects in their Area-specific guidelines.

Contributed funds can potentially fund planning activities tied to a listed SDS or HPS project. The process remains as described above, although with contributed funds, the Area is not necessarily limited to funding projects in priority order. The contributing agency may have additional requirements for managing the proposed planning work.

As described for Regular funding, the scope and cost estimate of the construction project listed in SDS or HPS will be revised as appropriate during the Planning and Design Phase when planning activities are funded with Housing or contributed funds.

### 3.5.3 Stand-alone Planning Project – Contributed or Special Funds

In unusual cases where a solution to a deficiency is not readily apparent or is expected to be complex, a stand-alone planning project may be executed to carry out the planning activities identified in a PDP prior to listing the project in SDS or HPS. IHS Regular and Housing funds cannot be used to fund stand-alone planning projects. In accordance with Chapter 5, Section VI of the Criteria Document, stand-alone planning projects (also referred to as “engineering investigations”) are a unique project type that are funded with Special project funds or contributed funds. The development of community master plans that analyze and prioritize a range of necessary infrastructure improvements for a community may fall under this category.

An MOA or CPA must be used to obligate funding for planning and design activities under a stand-alone planning project. Stand-alone planning projects receive a unique PDS number that does not get carried forward if or when a construction project is developed. The engineering report or master plan developed as a result of this project may serve as the design basis for a construction project or multiple subsequent projects.

## 3.6 Concluding the Project Development Phase

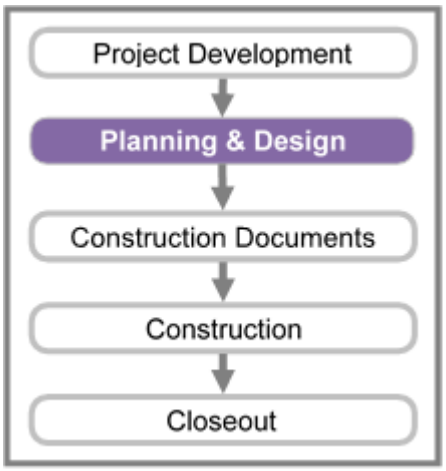
The completion of the Project Development Phase means that the project concept has been identified, the risks associated with the planning and design work have been identified, and the required project planning and design tasks are documented in an approved Project Development Plan. Funding for planning and design activities, if needed, has been secured and obligated through an MOA or CPA.

Projects that are low in the Area’s priority ranking may remain in the Project Development Phase (i.e. no further planning work is completed) for some time, unless or until they rise into the

funding range through the completion of higher-priority projects, or circumstances change that require the project to be re-scoped and/or re-scored. Areas must re-evaluate projects on a regular basis in accordance with HQ and Area guidelines to ensure that the identified deficiencies are being accurately captured. Project cost estimates (planning and construction) and important project information (e.g. key stakeholders, major risks) must be kept current to maintain the quality of the database and ensure that projects are up-to-date in the event that priorities change in the future.

# 4.0 THE PLANNING AND DESIGN PHASE

## 4.1 Introduction



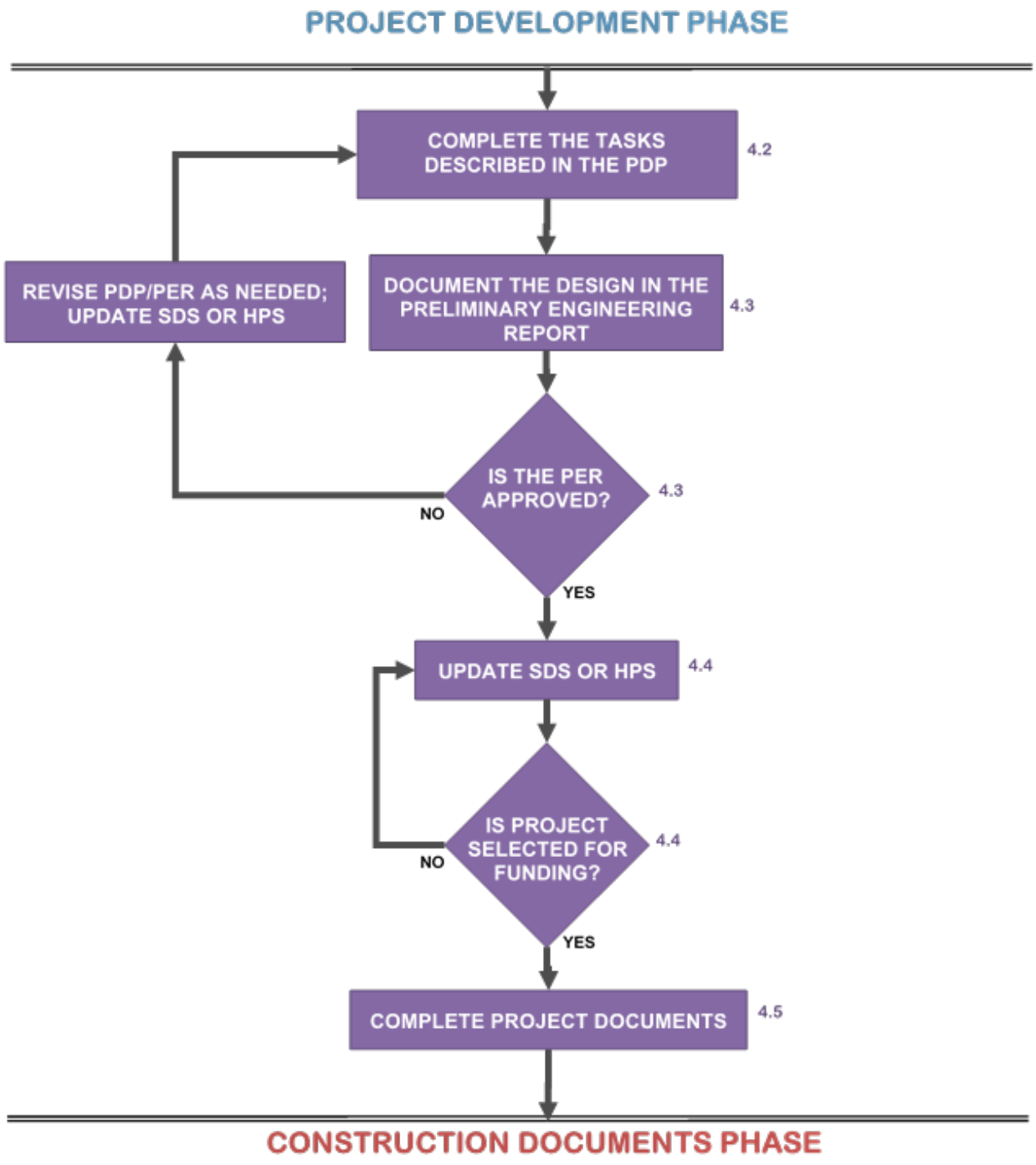

The Planning and Design Phase starts when work begins on the tasks that were identified in the approved PDP. As these tasks are completed, the overall project design and deliverables are refined. Planning and design tasks typically include field visits, environmental and geotechnical investigations, right-of-way surveys, system component sizing, material selection, and analysis of alternatives, among others. Project risk is reduced as this information is gathered and analyzed. In addition to the technical considerations, the project manager must consider the Tribe's managerial, financial, and technical capacity to operate and maintain the proposed facilities, including an in-depth look at the estimated costs to properly operate and maintain the facilities throughout their expected design life.

Figure 4.1 shows an overview of the Planning and Design Phase. A primary deliverable of this phase is the approved Preliminary Engineering Report (PER), which documents the project's detailed design. The primary purpose of this phase is to ensure that the project is well scoped, accurately estimated, and that risks to both construction and long-term operation and maintenance have been identified and appropriately addressed.

Projects that are to be funded with IHS Regular funding will be listed or updated in SDS based on the engineering work completed during this phase. Completion of the tasks outlined in the PDP will ensure that an appropriate level of planning and design has been carried out for the scale and complexity of the project and enables the project to be certified as "Ready to Fund" in SDS and compete for funding.

The decision to fund the project is also included in this phase. If the project is not selected for funding, it remains in the Planning and Design Phase and is updated regularly as appropriate until conditions change such that the project is funded or is no longer needed. If the project is selected for funding, the Project Summary/Project Scope document (PS), the National Environmental Policy Act (NEPA) Review, and the Memorandum of Agreement (MOA)/Construction Project Agreement (CPA) are completed. This phase is complete when the project documents for construction is approved.

**Figure 4.1 Planning and Design Phase**



## 4.2 Complete the Tasks Described in the PDP

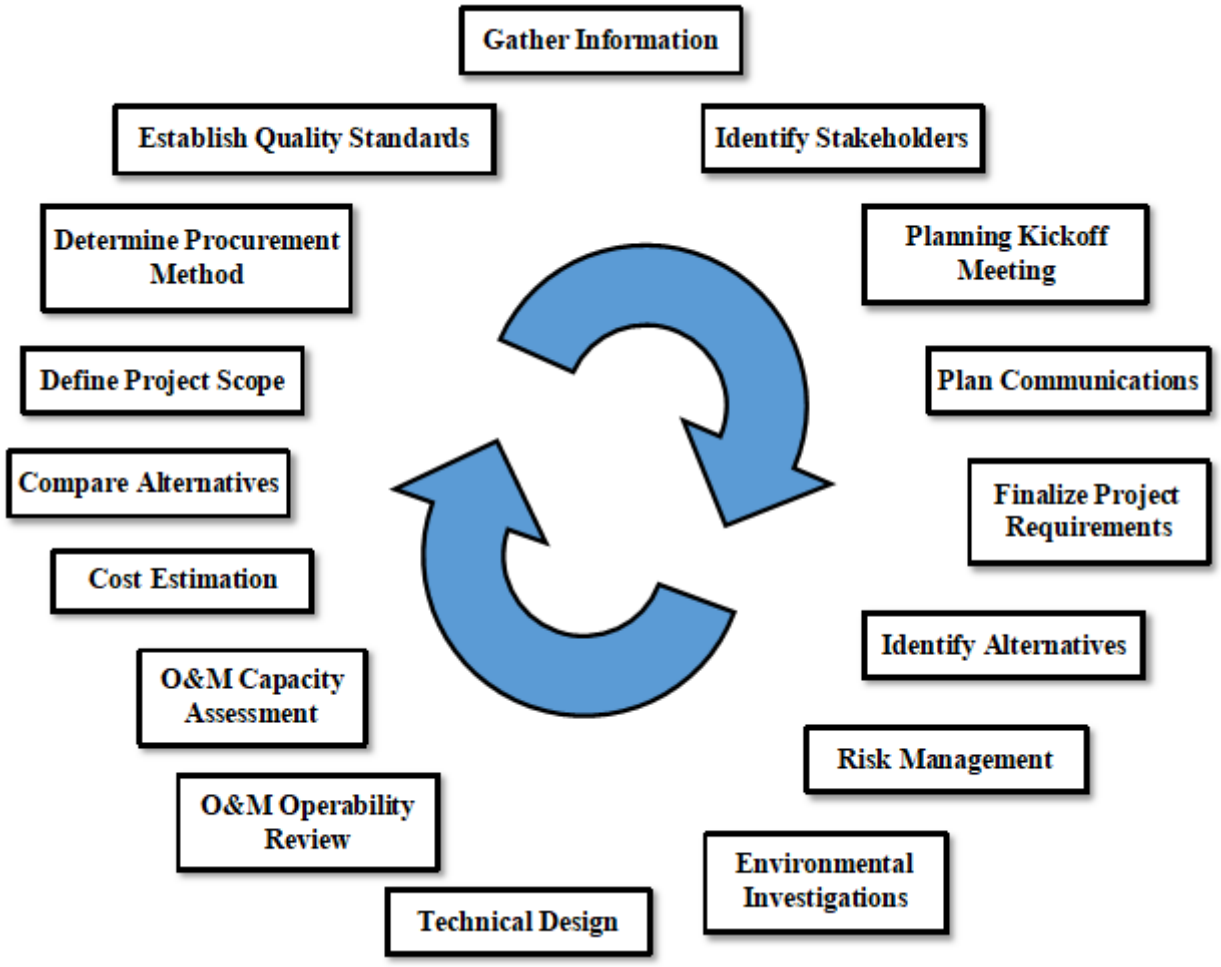
Executing the planning and design activities described in the Project Development Plan (PDP) is the first step of the Planning and Design Phase. As described in Section 3.3, the PDP outlines the planning and design work that will be carried out. Completing these activities allows the project manager to refine the project's requirements and deliverables, address the risks and constraints (e.g. resources, schedule, cost, O&M considerations), understand the interests and responsibilities of the stakeholders affected by the project, and develop a procurement plan for the construction work.

A key concept to consider is that project planning and design is an iterative process. Each activity uses the results of previous activities, and as new information is introduced and risks are understood, project managers must consider whether previous work and assumptions need to be revised. The process should be collaborative, where the project manager gathers input from the appropriate stakeholders in addition to using the results and lessons learned from previous projects. The project manager must keep in mind that events in subsequent project phases (e.g. unanticipated subsurface conditions during the Construction Phase) may require a return to project planning.

Another key concept is that the amount of effort spent on planning and design should be appropriate for the scale and complexity of the project. A project that involves complex mechanical treatment systems or requires a detailed and exacting schedule to meet a required deadline will require more detailed planning. A low-risk project to install basic facilities in a well-known environment will require less detailed planning, but the project manager must still take care to not overlook potential risks and ensure that the project design is properly documented.

Common planning and design activities for SFC projects are outlined in Figure 4-2 and described further below. These activities typically begin with Gather Information and proceed sequentially as described, but the unique circumstances of each project may warrant modifications to the sequence or steps involved. For example, a project that may potentially result in a high O&M burden for the Tribe may necessitate an increased and earlier focus on the O&M capacity of the tribal utility. O&M-related training may be required as part of project planning to educate tribal utility staff and decision-makers before they choose amongst the proposed alternatives.

**Figure 4.2 Typical SFC Planning and Design Activities**




- **Gather Information** – as-builts of existing facilities, GIS-based asset inventories, utility rate information, rights-of-way, environmental information, flow/usage data from hydraulic modeling and/or direct measurement, utility capacity (technical, managerial, and financial) and etc. are gathered and evaluated for completeness. Information gaps are identified.

- **Identify stakeholders** – the initial list of key stakeholders previously identified during the Project Development Phase is updated. Internal and external stakeholders are identified, and their roles, responsibilities, and expectations are determined. A stakeholder management plan may be developed to capture stakeholder information and determine appropriate management strategies for key stakeholders. Sample plans are located on the PMO SharePoint site.

- **Planning kickoff meeting –** a meeting of key project stakeholders may be held to outline the planning process; identify any constraints, requirements, and resources needed; and come to a shared understanding of the project objectives. A key decision at this point is the identification of the project delivery method (Direct Service under P.L. 86-121 or delivery under Title I/Title V of P.L. 93-638). This decision will drive the roles and responsibilities

for IHS and Tribal stakeholders involved in the project. Following the kickoff meeting, the stakeholder management plan should be updated to reflect these roles and responsibilities.

- **Plan communications** – the communications plan developed during the Project Development Phase is updated to cover the remaining project phases. Review meetings are scheduled and status reporting needs are identified.

  A key project management tool to implement at this stage is an **issue log**, which is a tracking sheet to record issues that arise, the stakeholders involved, and when and how the issue is resolved. Sample issue logs are located on the PMO SharePoint site. The log can serve as a communication, stakeholder, and risk management tool, ensuring that issues are tracked and that all parties involved are aware of their outcomes. It also provides a real-time record of what went right and what went wrong on the project, which is useful information to capture for future projects.

- **Finalize project requirements** – based on stakeholder input, the conditions to be met and capabilities to be provided by the project are collected, prioritized, and documented. Note that this includes more than solving the technical problem. O&M requirements, contributing agency requirements, permitting organization requirements, and others should all be captured and recorded at this stage.

- **Identify alternatives** – potential alternatives to address the deficiencies and meet the requirements are developed and documented. Alternatives that prove to be infeasible should be included in the documentation (i.e. the PER) for the sake of showing that they were considered, along with the reason(s) for their infeasibility.

- **Risk management** – the risk management work carried out in the Project Development Phase is expanded to cover the remaining project phases. Specific risks associated with the design, construction, and O&M of each alternative are considered, and strategies to address them are developed. Checklists, issue logs, and other risk management tools are updated as needed.

- **Environmental investigations** – NEPA considerations for each alternative are identified (e.g. archaeological, biological, floodplains, wetlands), and follow-up investigations are pursued as needed to appropriately address any identified risks. While the NEPA Review is typically not fully approved at this stage, enough work should be completed such that the documentation can be completed without delay upon funding being made available for the project.

- **Technical design** – the technical requirements for each alternative (e.g. pipeline sizing, pump selection, treatment processes) are examined and documented. The design must be comprehensive enough that minimal technical risk remains when the project is funded.

- **O&M design/operability review –** a critical challenge in designing a sustainable sanitation project is to match the proposed facility to the capability of the tribe to properly operate, maintain, and manage it. The first step in addressing this challenge is understanding the

O&M requirements for each alternative. Input is solicited from the tribal operator(s), the IHS Tribal Utility Consultant, and/or third-party technical assistance providers during the design process to identify these needs.

- **O&M capacity assessment** – once the O&M requirements of the proposed alternatives are known, they must be compared with the capacity of the utility organization. Short-term and long-term training and certification needs are identified if any gaps exist between the requirements and the utility's capacity. Utility rates may need to be examined, and a plan for long-term operational sustainability may need to be developed.

- **Cost estimation** – the life cycle costs (i.e. construction and O&M costs) for each alternative are estimated. Note that the SDS Guide requires projects in the potential funding range to have construction costs estimated within +/- 10%.

- **Comparison of alternatives** – based on the information gathered and produced, the alternatives are compared, and a recommendation is made. The criteria used to evaluate and rank alternatives should be objective and consistent and should, at a minimum, include comparison of life cycle costs, the O&M capacity of the utility organization that will own and operate the facilities, and environmental impacts. It is essential to ensure that the appropriate stakeholders are involved in the comparison and selection of a recommended alternative.

- **Define project scope** – the project scope is fully defined for the recommended alternative, building on the work previously completed. Requirements, constraints, and risks are all considered in the development of the project scope. In addition to the facilities being delivered under the project, the work required to produce those deliverables must also be understood, including reporting requirements, permits/approvals, etc. Work that is not included in the project scope must be understood as well (e.g. work to be provided by others).

  Comprehensive project scope definition is one of the most critical steps during the Planning and Design Phase. A thoughtful and well-developed scope that considers stakeholder requirements and project risks will prevent unnecessary scope creep and change orders later in the project life cycle. **Scope creep** is a phenomenon where the project scope increases because new products or features are added to a previously approved project design. Depending on the size and complexity of the project, the project manager should consider developing a Work Breakdown Structure (WBS) that organizes and breaks down the project scope into manageable work packages. Information on developing quality WBSs is available in the PMBOK and other project management resources. Examples of completed WBSs are located on the PMO SharePoint site.

- **Determine procurement method(s)** – once the project scope is defined, discussions with the Tribe should result in a procurement method that is appropriate for the particular project. For projects delivered through Title I or V of P.L. 93-638, the Tribe typically procures the construction work. For Direct Service projects, there are a number of procurement options available – refer to the MOA Guideline. Care should be taken to objectively review with the Tribe the advantages and disadvantages of different procurement methods as they relate to

the specific project. A procurement method should not be selected simply because it is the standard practice.

- **Establish quality standards and control processes** – once the project scope and procurement method are understood, forethought should be given to how quality will be ensured during the remaining project phases. This may include sampling and testing requirements, progress review meetings, and/or internal process improvement reviews.

## 4.3 The Preliminary Engineering Report

The outcomes of the planning and design activities must be documented in a format that logically presents the need for the project, the alternatives considered, and the proposed solution. The format must also be appropriate for requesting funding from a variety of sources. The format and level of detail of the documentation is dependent on the scope and complexity of the planning effort. This document is commonly referred to as a Preliminary Engineering Report (PER). Areas may use a variety of terms and formats for documenting planning work, but for the purpose of this guideline, the PER format will be referenced as the standard for all SFC projects.

The PER serves as a critical communication and management tool for the project as the project is executed and monitored. A quality PER is the foundation for a quality construction project that can proceed in accordance with its established scope, cost, and schedule. The PER can serve as a basis for the Tribe's pursuit of funding from other contributing agencies (e.g. USDA, HUD, etc.). Additionally, consistent use of a PER allows the Area to manage lapses in engineering or technical staff by ensuring that new staff can quickly pick up and understand the project and continue moving it forward.

A PER must be completed and approved before a project will be eligible for construction funding. The PER describes a proposed construction project in sufficient detail such that a peer reviewer unfamiliar with the project could read the PER, understand the design considerations, assumptions, and risks, and prepare construction documents (plans and specifications) based on it. Most PERs should include the following information:

- An executive summary that provides a concise review of the existing deficiencies, engineering efforts to date, and project objectives (scope, schedule, budget, and quality);

- A project background that includes the relevant history of the project location and its existing sanitation infrastructure, a discussion of the Tribe's involvement with and support for the project, and a summary of the Indian homes and other users that will benefit from the proposed facilities;

- A description of the planning and design activities carried out and their results, including a description of any risk management, stakeholder management, and communications plans developed;

- An estimate of current and future population demands on the infrastructure. The window for the future population projection shall be the design life of the proposed infrastructure;

- Alternatives considered for the project, life cycle cost analyses, the significant risks associated with each alternative, and the basis for the choice of the recommended alternative;

- A robust description of the proposed facilities' O&M requirements, costs, and the capacity of the Tribe to operate and maintain them;

- An analysis of the Tribe's O&M organizational needs and, if needed, a recommended improvement plan;

- A complete description of the recommended solution – this shall include a designation of major components; the material type, size and layout of pipes and buildings; a detailed project cost estimate; operational considerations; control mechanisms where applicable; site work required; and project management considerations (e.g. schedule constraints, remaining construction risks, and quality control requirements). If a WBS or other scoping document was developed during the Planning and Design Phase, it should be included;

- An assessment of jurisdictional issues and a description of supporting documents, permits, and easements that are required, along with any significant risks to their approval;

- A discussion of general environmental requirements and the background environmental information that will be needed for a NEPA determination, along with any significant risks to its approval; and

- A description of the proposed construction means and methods, including bid format, construction administration and inspection needs, record drawings required, and start-up operator training.

In 2013, IHS, along with the U.S. Department of Agriculture Rural Development (USDA), the Environmental Protection Agency (EPA), and the U.S. Department of Housing and Urban Development (HUD), adopted an interagency format for a Preliminary Engineering Report through a collaborative development process. Use of the Interagency PER is intended to streamline the federal funding application process for rural sanitation projects, and it is typically required for projects that are expected to have federal contributions of non-IHS funds.

The recommendations in the completed PER must be reviewed by the appropriate stakeholders (both internal and external) to ensure buy-in and support prior to funding. Engagement with the public through community meetings or other forums may be appropriate during the Planning and Design Phase to help ensure community support and long-term project success. It is important that all key stakeholders (e.g. tribal governance board members, tribal utility management and operators, funding agency partners) be included in this review process. These reviews should

include a discussion of the annual cost and labor requirements associated with the operation and maintenance of the proposed facilities as well as their expected design life.

The PER template and examples of completed PERs are located on the PMO SharePoint site.

## 4.4 Update SDS or HPS

Upon completion of the Planning and Design Phase's deliverables, the SDS or HPS project entry is updated as appropriate. The approved PER and any other supporting documentation is attached to the project in SDS or HPS. The project narratives, cost estimate, scoring factors, home data, and other relevant project elements are updated to match the project documentation.

With the PER approved and the SDS/HPS project listing updated, the funding priority of the project is made based on the fully defined scope and cost estimate. The decision to fund a project will be based upon the following as applicable: SDS priority scoring, IHS funding availability, and project partner funding availability. Project selection from SDS and HPS will follow the procedures outlined in the appropriate guidance documents (e.g. the Criteria Document and SDS Guide, plus any Area-specific guidelines). If the project is not funded, it should be reviewed and updated regularly in accordance with the relevant guidance.

## 4.5 Project Documents

When funds are identified for a particular project and a decision is made to fully fund it, the IHS project manager typically drafts the Project Summary, Memorandum of Agreement, and NEPA Review. Some Areas have guidance that others (e.g. Area Office staff) may draft some of these documents. Self-Governance Tribes use a Project Scope document and a Construction Project Agreement (CPA) in lieu of a Project Summary and MOA and will have their own approval procedures. In any case, the project manager must be involved and must understand each document in detail. Detailed requirements for developing project documents can be found in Chapters 8 and 11 of the Criteria Document; Part 5, Chapter 2 of the Indian Health Manual; the MOA Guideline; the IHS OEHE Technical Assistance Guide for Public Law 93-638 Construction; and the IHS OEHE Environmental Review Manual. Key points as they relate to project management are described below.

### 4.5.1 Project Summary/Project Scope

The purpose of the Project Summary/Project Scope document (PS) is to provide a synopsis of the key information required by decision-makers that will review and approve the project. Additionally, the PS is incorporated by reference in the MOA/CPA as the agreed-upon scope, schedule, and budget. Because of this, it takes on added significance as a project management tool and must be viewed in the context of the government-to-government commitment made by all signatory parties to deliver what it contains. During project execution, any proposed changes must be evaluated to ensure they do not alter the agreed-upon terms and deliverables. If they do, an amendment to the PS and MOA/CPA must be developed.

The PS typically summarizes the project at a higher level than the PER. It is not an exhaustive report of all project planning activities. It describes, in appropriate detail, the deficiency being addressed along with the proposed sanitation facilities and the number and type of homes to be served by the project. It contains a detailed cost estimate for the project along with a project implementation schedule. The PS also lists the funding sources and amounts. Some PS formats provide key summary elements only and reference the PER for further details.

### 4.5.2 Memorandum of Agreement/Construction Project Agreement

The Memorandum of Agreement is the funding and obligating document used for most projects in the IHS SFC Program (projects executed under the authority of Title V of P.L. 93-638 may use a Construction Project Agreement in lieu of or in addition to the MOA). In addition to outlining the project deliverables, the MOA/CPA designates the primary parties that will be responsible for delivering the project, defines the roles and responsibilities of those parties, establishes the ownership of the facilities to be installed under the project both during and after construction, outlines the procurement method(s) to be used, and formally obligates project funding. By incorporating the PS, the MOA/CPA commits the parties to agreement on the project objectives developed during the Planning and Design Phase.

The MOA/CPA is a tool unique to the IHS DSFC that establishes a formal government-to-government commitment to deliver the project. Because of this, care must be taken to ensure that project management documents such as the stakeholder management and communications plans align with the MOA/CPA. Chapter 8 of the Criteria Document describes the information required for a Memorandum of Agreement. Part 5, Chapter 2 of the Indian Health Manual provides detailed guidance for the development of Memoranda of Agreement. The IHS OEHE Technical Assistance Guide for Public Law 93-638 Construction outlines the use of the CPA.

### 4.5.3 NEPA Review

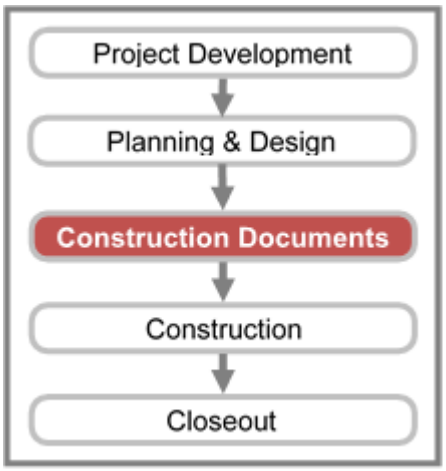
In delivering projects, the IHS SFC Program and Self-Governance Tribes must comply with the National Environmental Policy Act (NEPA), along with other related environmental regulations. The NEPA review consists of one or more documents that summarize the environmental investigations and determinations made during the Planning and Design Phase. As with the other project documents, any changes encountered during project execution must be reviewed to determine if the NEPA Review is still valid or if it must be revised. The IHS OEHE Environmental Review Manual for Indian Health Service Programs describes the Program's environmental compliance requirements in detail.

## 4.6 Concluding the Planning and Design Phase

The Planning and Design Phase ends when the project documents are approved. Projects in SDS or HPS that are not yet ready to fund (e.g. due to low priority scoring or a lack of funding commitments from project partners) may remain in the Planning and Design Phase until those conditions change. In these cases, the project will remain in SDS or HPS and should be updated regularly per the appropriate guidelines. Templates and examples of completed project documents are located on the PMO SharePoint site.

# 5.0 THE CONSTRUCTION DOCUMENTS PHASE

## 5.1 Introduction



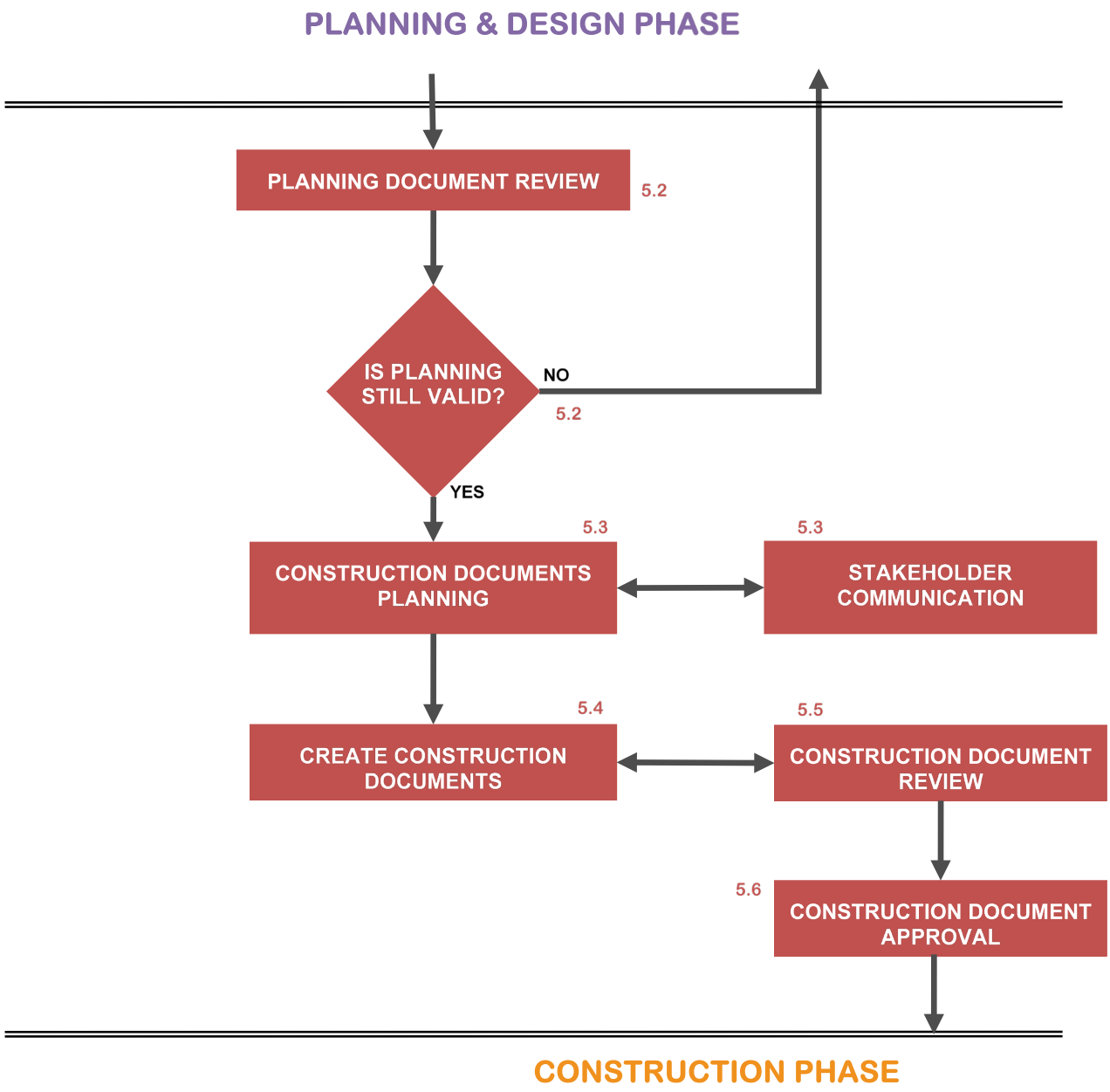

The Construction Documents Phase begins once the project documents are approved and funding for the project has been obligated. The purpose of the Construction Documents Phase is to transform the project design as described in the approved Preliminary Engineering Report into procurement documents that are ready for issue and use. The Construction Documents Phase ends once the SFC construction documents have been approved by the appropriate stakeholders and stamped in accordance with Indian Health Manual policy (Chapter 3-24.3.A).

Figure 5.1 shows an overview of the Construction Documents Phase. The primary deliverables of this phase are the procurement documents used to acquire the equipment, services, construction, and other project deliverables (often referred to as the "construction documents"). This typically includes the bidding documents, general contract provisions, engineering drawings, technical specifications, and other legally binding documents. The method of work (e.g. Federal Acquisition Regulation procurement, tribal procurement, P.L. 93-638 Subpart J contracting) will dictate the specific deliverables for this phase.

Prior to the establishment of the PMPro, the work of producing the construction documents was traditionally considered to be design work. Under this approach, planning and design work was done concurrently with the development of plans and specifications, after project funding was obligated. Additionally, the provision of operator training, record drawings, and O&M manuals was historically considered to be part of project closeout. This approach created significant risk for changes in the scope, schedule, and budget after funding was in place, as well as a potential lack of focus on the necessary tools, training, and support for tribal utility departments and operators that will operate and maintain the facilities installed. Facilities that are installed and transferred to a utility that does not have the capacity to operate and maintain them are likely to receive less than adequate O&M support and, as a result, are likely to fail prematurely.

In the project structure described by the PMPro, the design work is complete and O&M requirements have been established before the plans and specifications are produced. Component requirements, material types and sizes, general pipeline and building layouts, and other design determinations will have been made during the Planning and Design Phase and documented in the PER, along with the necessary O&M training and equipment. In the Construction Documents Phase, the project manager ensures that all of these design elements are translated into the appropriate contract documents.

**Figure 5.1 Construction Documents Phase**




## 5.2 Planning Document Review

The Construction Documents Phase begins with a review of the work completed in the Planning and Design Phase. Typically this requires a review of the Preliminary Engineering Report to ensure that the planning remains valid, especially if significant time has elapsed since the PER was approved. The project manager and project team members should conduct this review collectively. The primary goal of this review is to validate the previously identified deficiencies, review the plan to address them, and confirm the site conditions. At a minimum, the following items should be reviewed:

- The deficiencies to be addressed and any updates regarding their status
- The project objectives (scope, schedule, budget, and quality)
- Planning and design activities completed to date
- Project documents
- Project management support documents: risks, communications, stakeholder management, O&M requirements, etc.
- Project design assumptions and constraints
- Status of any applicable permits required or received
- Any other project issues not yet addressed

The Planning Document Review should include both internal and external input; additional detail is provided in the following sections:

### 5.2.1 Scope Review and Orientation

The PER and other project documents should be thoroughly reviewed to determine if all design work and project assumptions are current and if the project deliverables are still feasible. A site visit may be necessary to verify that field conditions have not changed. After reviewing the PER, the project manager should verify that no further design work is necessary to move forward with the development of construction documents.

The project budget should also be reviewed. It is imperative that the team understand what facilities have (and have not) been included in the project scope identified in the PS, MOA/CPA, and other related documents. Construction documents must only include facilities that are covered in the approved PS.

If the review of the planning and design activities leads to the conclusion that additional design is required, the project should return to the Planning and Design Phase as shown in Figure 5.1.

### 5.2.2 Stakeholders Meeting

The time interval from the approval of the project documents to the beginning of the Construction Documents Phase may be significant. During this time, the stakeholders (e.g. IHS staff, tribal representatives) involved in the project or conditions affecting it may change. Because of this, it may be helpful to bring the relevant stakeholders together at the beginning of the Construction Documents Phase to review and confirm the project delivery and procurement methods, the project scope, and other project objectives.

The major design decisions and elements of the project as detailed in the PER and other project documents should be reviewed during this meeting. Any changes to design assumptions, site conditions, external constraints, risks, and other key project inputs should be documented, reviewed, and addressed.

In addition to the IHS project team, external stakeholders may be included, such as tribal representatives, federal funding partners, and staff and managers of the tribal utility that will

operate and maintain the completed facilities. Communication with the stakeholders should not end with this review meeting; it should continue throughout the Construction Documents Phase.

## 5.3 Construction Documents Planning

If the planning and design work is still valid, the next step in the Construction Documents Phase is to outline how the design will be translated into the construction documents. The project manager and team members may do this collectively if the size and complexity of the project warrants such an approach. Issues to be determined may include the following:

- Deliverable identification
- Task assignments and milestone schedule
- Communications plan
- Quality control procedure for review of the documents
- Special circumstances

### 5.3.1 Construction Document Deliverable Identification

Although the contract type and other construction document requirements for the project should have been identified in previous phases, the project team should confirm the deliverables for the Construction Documents Phase at this time. Identification of the construction document deliverables will likely consider the following:

- Type of procurement
- Anticipated construction document packages (e.g. whether one or several document packages are needed for the work)
- Anticipated plan sheets and scale
- Anticipated detail sheets
- Anticipated specialty sheets (e.g. civil, architectural, electrical, mechanical, structural, instrumentation, and process)
- Anticipated specification sections and formats
- Anticipated contract document sections (i.e. front-end documents) to be included with the specifications

At this point, the project team should clearly understand the construction method to be used, because construction document package requirements are heavily dependent on the procurement method.

The administrative requirements, if any, should also be acknowledged as part of the review process. Requirements such as pre-bid conferences, TERO requirements, Davis-Bacon wage requirements, contract times and schedules, liquidated damages, bonding, and insurance should be identified early in the process so they may be incorporated into the construction documents. This is also a good time for the team to discuss the measurement and payment requirements for the work, in order to prevent potential inconsistencies between the plans and specifications.

The construction document package may include the following deliverables:

Construction Drawings

- General drawings
- Civil drawings, including existing site, topography, and utility plans
- Architectural drawings
- Structural drawings
- Process drawings
- Instrumentation drawings
- Electrical drawings
- Mechanical drawings

Specifications

The Construction Specifications Institute (CSI) MasterFormat is recommended. Most IHS Areas use the 16-division MasterFormat 1995, although some continue to use the Technical Provisions (TP) format. Regardless of the format, the construction specifications typically include these sections or divisions:

- Bidding & contracting requirements
- General provisions
- Special provisions
- Technical specifications

At times the project team may need to accommodate special circumstances or manage unique elements of a project. The project team should make note of any special circumstances associated with the project and how they may impact the development of the construction documents and the construction process. The goal is to make sure completion of the construction documents is timely and efficient, and that there is documentation for future reference on the decisions made.

Special circumstances may include the following:

- Special construction schedules
- Special design disciplines
- Specific agency documents or requirements, including special agency review(s)
- Known significant milestones (weather, NEPA, etc.)
- Coordination with other work, contracts, agencies
- Coordination with other IHS Offices and Divisions (e.g. the Division of Engineering Services when the method of work is federal procurement or 638 contracting)

Some funding agencies may require agency-specific documents in the construction documents package or may require a review at designated completion intervals. In such cases it will be important to account for those items when planning the completion of construction documents. Weather and environmental issues may also dictate the timeframe for construction of a project.

### 5.3.2 Resource Management

A task list should be used to identify the elements of construction documents production and organize those elements. At a minimum, the project manager should prepare a task list that defines the principal tasks (e.g. drawing sheet assignments, specification sections). For complex projects where a task list does not provide enough detail to manage the production of the construction documents, the WBS or its equivalent that was developed during the Planning and Design Phase can be updated to incorporate the necessary work of the Construction Documents Phase. The choice of a WBS or task list approach will depend on the complexity of the project, the number of team members, and the experience level of the team members. For most SFC projects, a task list will be sufficient to effectively manage the Construction Documents phase.

After the task list or WBS is developed, the tasks associated with the construction documents' production will be assigned to individual team members. Completion dates should be assigned for each task or group of tasks. The special circumstances described Section 5.3.1 must be considered if they will affect the timeline. A Gantt chart, spreadsheet, or commercially available project management software may be used to provide an easy-to-read format for the schedule. Such programs can identify and help manage interdependencies between tasks and resources.

For SFC projects, the timing of the delivery of construction documents is often critical; delays of a few weeks could cause the project to miss a seasonal construction window. The project manager must regularly review and update the schedule as the construction documents are developed. Scope creep and resource over-loading are often causes for missing a task deadline. Tasks taking longer than anticipated must be identified early to determine the cause of delay and the potential impact on the project.

### 5.3.3 Update Communications Plan

Adherence to the communications plan is an important part of the Construction Documents Phase. The communications plan identifies the key stakeholders that have communication needs as well as how they will be managed. Team meeting schedules, review points, and feedback mechanisms should be outlined, at a minimum.

## 5.4 Create the Construction Documents

Much of the project work designed and specified by SFC engineers is routine, and standard specifications and drawings can be used. The need for specialty specifications and drawings is driven by the complexity of the installed infrastructure. For example, the construction documents for a mechanical treatment plant may require long-term operator training as part of the construction contract. In cases where Tribes or owners of the constructed facilities have specific local standards, those standards should be reflected in the construction documents.

All engineering plans, calculations, specifications, and reports shall be prepared by, or under the responsible charge of, a Registered Professional Engineer in accordance with Part 3, Chapter 24 of the Indian Health Manual and the licensing requirements, administrative rules, and regulations of the state in which the engineer is licensed.

Regardless of the method of construction, SFC project drawings and specifications should be of consistent quality, clarity and format. The following sections discuss the national standards and guidelines that apply. Individual Areas may have their own standards to establish uniform administrative procedures and quality of constructed facilities. These may include specific requirements for materials and workmanship.

### 5.4.1 Drawings

Drawings will typically be developed using Autodesk software. The SFC Program supports a variety of Autodesk-allied software products at the national level. A standard IHS drawing template is maintained by the AutoCAD managers group, and these standards are used as the basis for all SFC construction drawings. The template includes layering, styles, symbology, and other formatting to ensure consistent-looking drawings.

A quality control procedure for review of the drawings (refer to Section 5.5) must be implemented before they are signed and sealed. If interim engineering documents (e.g. a 50% progress review package) are developed, they shall include a notation as to the intended purpose of the document, such as "preliminary", "draft", "not for construction", "for plan check only", and/or "for review only."

### 5.4.2 Specifications

Most Area SFC programs use standard specifications in the Construction Specifications Institute (CSI) MasterFormat style; some Areas use the technical provision (TP) format. The specifications or technical provisions must describe the design generally and the products and execution specifically. CSI MasterFormat 1995 is the 16-division format typically used by SFC project managers and is recommended for use on most SFC projects. MasterFormat 2004 and 2011 contain 49 and 48 divisions, respectively, and are acceptable alternatives when CSI specifications are used.

The Engineers Joint Contract Documents Committee (EJCDC) agreement form is recommended for the contract agreement when the method of work is tribal procurement. Federal procurement is governed by the FAR, which requires specific forms and contract clauses. Other formats for solicitation and contracting documents will include different clauses and provisions. Together, the solicitation requirements, agreement form, and general/supplementary conditions for a construction project are typically called the "front-end documents".

Care must be taken by the project team to maintain their appropriate roles and responsibilities when developing the construction documents, particularly the front-end documents. For example, in the case of tribal procurement under Direct Service, the project team will often work closely with the tribal contracting officer on the development of the construction documents, but IHS must maintain its advisory role as outlined in the project's MOA.

The specifications should build on the design work completed during the Planning and Design Phase and documented in the PER. The PER will identify sizes, types, and performance standards for construction, equipment, and materials as needed. The PER may also identify

particular specifications to include in the construction documents. However, certain technology and vendor products change over time, so care should be used when developing the specifications to ensure that up-to-date information is used.

The construction documents package must provide enough detail to solicit and construct the proposed work. The construction documents should also provide the administrative, technical and procurement requirements governing the project construction. As a result, the drawing and specification documents together must completely describe the methods of work and desired end product. This includes provisions for submittals review and approval, construction site access and temporary storage areas, quality control and assurance requirements, and construction safety in accordance with the Occupational Safety and Health Administration's regulations in Title 29 of the Code of Federal Regulations (29 CFR).

The final document stamp/seal requirements described in the Indian Health Manual Part 3, Chapter 24 apply for for SFC construction drawings and specifications. Additional resources related to CSI specifications, EJCDC documents, and other contract documents can be found on the PMO SharePoint site.

### 5.4.3 O&M Requirements

Comprehensive integration of the operational perspective throughout the project life cycle is essential for the long-term success of the installed facilities, and it should be well understood that the individuals responsible for O&M are key project stakeholders. The staff of the O&M entity that will operate and maintain the completed facilities and the IHS Tribal Utility Consultant must be included as partners in the development of the project requirements, and their continued involvement during the Construction Documents Phase is critical. The construction documents must provide for the deliverables necessary to support the operation and maintenance of the completed facilities. Examples include:

- O&M supplies, including spare parts, tools, treatment chemicals, filters, etc.
- O&M training, specific to the facilities, components, and controls installed
- O&M manual, comprehensive of the facilities installed and including both operative and preventative maintenance instructions. The O&M manual should be available and covered during the O&M training.
- As-built survey, to provide data for the completion of the record drawings (as-builts)
- As-built/record drawings, to provide information either as marked-up construction drawings or completed as-built record drawing
- Personal protective equipment, specific for the facilities installed and the functions required to support them (e.g. dust masks, safety goggles, aprons, ear protection)

### 5.4.4 Construction Schedule

Although a preliminary construction schedule will have been developed and documented in the PS and PER, an updated schedule that defines construction tasks and milestones should be created during the Construction Documents Phase. Depending on the method of work, this schedule may be used to assign contract start and end dates. The schedule should include

consideration of the procurement process, because the process may establish constraints for bid notification, bid advertisement, and other requirements. The project manager's schedule may also be used to evaluate the builder's submitted construction schedule and to provide the basis on which to evaluate actual performance.

The milestone tab in PDS should be updated based on the revised schedule.

### 5.4.5 Cost Estimate

As the construction documents are completed, the project cost estimate must be updated to reflect any design refinements. Interim and final updates to the estimate must be frequently compared to the project budget to identify potential budget overruns. The project cost estimate provides the basis for evaluating tribal proposals and contractor bids. It should also be included along with actual cost data for the project's historical record.

## 5.5 Construction Document Review

The work flow and staffing at specific SFC offices will likely dictate the construction document review process. Before they are submitted to the District Engineer for review, construction documents must at a minimum be reviewed by the project manager, a Tribal Utility Consultant, and a representative of the Tribe to whom the completed facilities will be transferred.

Prior to review, and ideally as part of the communications plan described in Section 5.3.3, the process for delivering documents to reviewers and receiving comments should be clearly defined and communicated. Normally reviews should correspond to the milestones included in the development schedule. Frequently, progress reviews are completed at the 50%, 90%, and 100% complete stages.

Funding contributors and other stakeholders, including regulators such as EPA, may also request to review the construction documents. In cases when a funding contributor desires to review construction documents, the protocol for that review should be defined in the MOA/CPA. The MOA/CPA should specify the frequency of review, the review period, and the method of communicating comments.

Scope creep has historically been a factor in SFC projects, and one of the primary objectives of the PMPro implementation strategy is to effectively manage scope and deliver completed projects in accordance with the project objectives (scope, schedule, budget, and quality). Unmanaged or poorly defined review processes can lead to scope creep. Staff turnover at any of the stakeholder organizations can exacerbate the possibility of scope creep when new points of view emerge. Timely document review and adherence to the project objectives are essential to the management of project scope.

## 5.6 Construction Document Approval

Individual Areas and Tribes may have specific construction document approval policies. Documents are not considered approved until they are stamped in accordance with the Indian

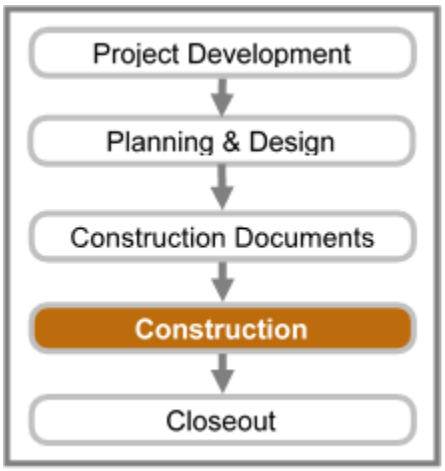
Health Manual Part 3, Chapter 24. Original drawings and plans must be wet-signed and stamped on each sheet of the document.

The engineer in responsible charge of the project will sign and stamp the construction documents following completion of the review process. This may be the District Engineer, if the Field Engineer is not registered. If a project requires multiple engineering disciplines, the lead electrical, civil, structural, chemical, geotechnical, mechanical engineers, and/or registered land surveyors should sign and seal all drawings of their discipline for which they performed or directed the design work.

Following construction document approval, the key project team members should consider meeting to reflect on the process and document any best practices identified as well as areas for improvement. This is especially recommended for complex or unusual projects. The team should compare the original Construction Documents Phase schedule against the actual schedule and determine the cause(s) of any delays. This feedback process will help the team increase the efficiency of future projects and enable them to create more accurate and realistic schedules going forward.

# 6.0 THE CONSTRUCTION PHASE

## 6.1 Introduction




Construction may be the most familiar and visible phase of an SFC project. The sanitation facilities described in the construction drawings, plans, and specifications are built in the Construction Phase. If the method of work requires a bidding process, bidding and contractor selection is completed during this phase. In addition to construction, communication, construction inspection, quality control, performance measurement, payment of work, and acceptance of work are all activities that are completed in this phase. O&M deliverables such as O&M manuals and operator training are also provided during this phase, either as part of the construction contract or through other avenues as identified in the PS and MOA/CPA.

Figure 6.1 shows an overview of the Construction Phase. The Construction Phase is complete when the constructed facilities are in operational condition; required O&M deliverables such as operator training, as-built/composite utility drawings, and O&M manuals have been furnished; and the owner has accepted the facilities. Different Areas and funding partners may have specific documents required to certify construction completion.

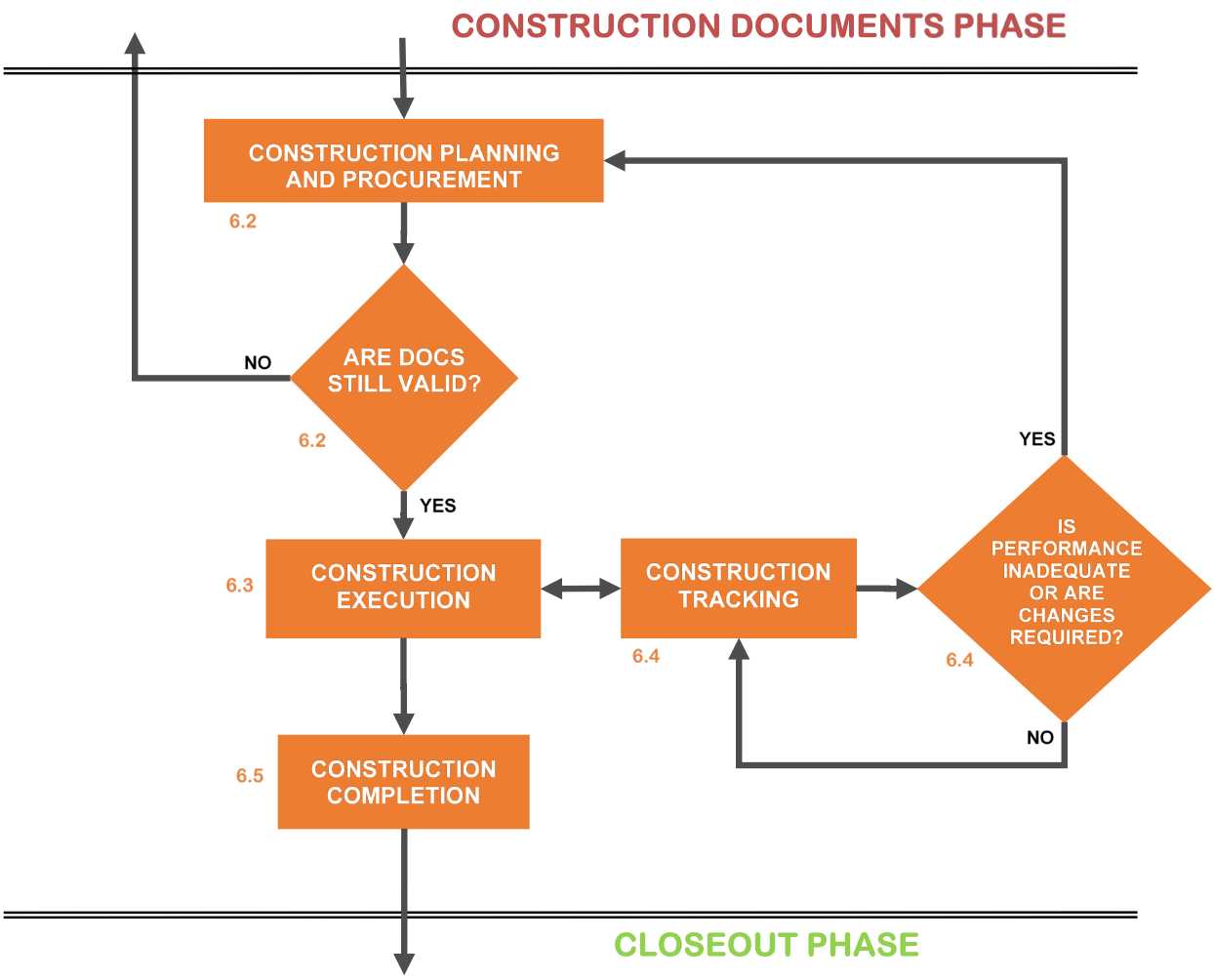
Because this phase includes specific processes that may vary depending on the procurement methods and Area standards, this guideline does not describe each construction phase process in detail, but it does describe the application of project management principles to the phase processes. Refer to the appropriate guidance document (e.g. MOA Guideline, FAR) for details on specific procurement methods and processes.

The processes that must be considered by the project manager during the Construction Phase can be grouped into the following sub-phases:

- Planning and Procurement – preparing for execution/construction, including document review, procurement solicitation, and award.
- Execution – assigning resources, pre-construction meetings, execution of the work, and delivery of O&M support and equipment.
- Tracking – monitoring & controlling construction scope, schedule, cost, and quality.
- Completion – final inspections, acceptance (or rejection) of the work, final payment, and warranty period establishment.

These sub-phases and their connections are outlined in Figure 6.1.

**Figure 6.1 Construction Phase**




## 6.2 Construction Planning and Procurement

Beginning the Construction Phase without proper planning can lead to problems throughout the phase. Examples include attempting to procure services without understanding the constraints of the project documents, proceeding with construction without understanding the roles and responsibilities of all parties, approving payment for work that is not complete, or mishandling change requests. These problems can lead to budget shortfalls, schedule overruns, scope creep, and strained relations amongst the stakeholders. The project manager has to thoroughly understand the work to be completed in the Construction Phase and ensure that sufficient planning has been done to ensure successful completion.

Figure 6.1 shows the Construction Phase beginning with Construction Planning and Procurement. This represents the planning processes, issuance of procurement solicitation(s), and other tasks that take place up through the issuance of a Notice to Proceed or otherwise commencing Construction Phase execution. This sub-phase also represents the work that is done when a change is identified as necessary and new planning work is needed. When changes

prompt a need for new procurement documents (e.g. a new solicitation), the project may return to the Construction Documents Phase as shown in Figure 6.1.

At a minimum, construction planning and procurement tasks should include the following:

- Review construction documents
- Procurement planning meeting
- Review and update project communications, risks, and issue logs
- Issue and administer procurement solicitation(s)

Each of these tasks is described in further detail below.

### 6.2.1 Review Construction Documents

Preparing for the construction phase begins with a thorough review of the work completed in previous phases. An important objective of this review is to understand how the method of work (e.g. federal procurement, tribal procurement) will determine the stakeholders' roles and responsibilities in the construction phase. The method was chosen in the Planning and Design Phase and will be reflected in the project documents. The construction documents will include any procurement packages necessary to complete the work.

A review of the construction documents will identify the contract requirements, the scope of the work as defined in the plans and specifications, and the budget and schedule for the Construction Phase. If the project is complex enough to have required the development of a work breakdown structure during the Planning and Design Phase, the WBS will provide information on the resources needed to complete the work, how the resources will be coordinated with the work packages outlined in the WBS, and a schedule for their expected completion. The WBS will also detail the personnel and equipment assignments for the tasks required of IHS and tribal staff.

### 6.2.2 Procurement Planning Meeting

For some projects, especially those that are large, complex, or politically sensitive, a procurement planning meeting should be held to allow the key stakeholders to discuss the procurement process, requirements, and timeline before procurement actions are initiated. The primary objective of this meeting is to ensure that these stakeholders have a common understanding of the process and their roles and responsibilities. The method of work will dictate the details and which parties should attend the procurement planning meeting. Items for discussion can include the following:

- Construction work method and applicable procurement documents
- IHS role, tribal expectations and coordination of the IHS and tribal personnel
- Discussion of the estimated budget, scope, and schedule, and how they will be tracked
- Review the communications plan and discuss any needs for meetings and reporting
- Insurance, bonding, and TERO requirements
- Review the risk management plan and discuss risks that may impact the Construction Phase, along with strategies to mitigate those risks

The method of work, size, and complexity of the project will also dictate the formality of the meeting. For simple projects (e.g. scattered site work), a telephone call to the tribal utilities manager may suffice. The key point is that the appropriate communication takes place to ensure that team members are aware of their responsibilities and expectations to ensure a successful solicitation and award process. Following the procurement planning meeting, the appropriate project management plans and documents (communications management, risk management, WBS, etc.) should be updated.

### 6.2.3 Procurement Solicitation

The project manager's role and the process followed during procurement solicitation will largely depend on the method of work. When tribal or federal procurement is used as the method of work under Direct Service, the project manager takes on an advisory role to the tribal or federal contracting officer, respectively. When tribal or federal force account construction is used, the project manager may have a lead role and may need to negotiate with the entity that will be performing the work.

Regardless of the method of work, the general activities that should occur to initiate and execute the construction include the following:

- Information distribution and communication with stakeholders and potential bidders
- Assigning resources based on the IHS role identified in the MOA
- Assist with procurement, including providing technical support to the contracting officials, conducting the pre-bid conference, responding to bidder questions, and providing clarifications
- Advising the procurement official on award of the work

Procurement solicitation is complete once the procurement has been awarded and a Notice to Proceed has been issued to the contractor.

## 6.3 Construction Execution

Construction Execution is the point in the project where the work is carried out in accordance with the project requirements. For SFC projects, this typically involves the commencement of construction work. It is also the point where misunderstandings, unforeseen conditions, and changes are most likely to occur. Close oversight and communication are crucial in the Construction Phase, as the work can progress quickly and may not be under the direct control of the project manager.

The application of project management principles to construction execution means that the project manager does not simply manage the work; the project manager must pro-actively think about managing the schedule, budget, risks, quality and other elements necessary for success. The project manager must also consider how issues related to one project objective (e.g. a new schedule constraint) can affect other objectives (e.g. reduced quality that may result from accelerating the schedule).

Several important elements of construction execution are discussed in more detail here, including the pre-construction conference, directing and managing the work, managing quality through submittals, and managing communications.

### 6.3.1 Pre-Construction Conference

Some form of pre-construction conference is recommended for every SFC project, although the scope and detail of the meeting will vary with the project's size, complexity, and method of procurement. The communications plan that was reviewed during construction planning should include the requirements for the pre-construction conference.

The pre-construction conference will typically include representatives from the IHS or tribal contracting office, the project manager, and the builder and/or contractor as appropriate. In some cases additional representatives may include subcontractors, other funding agencies, tribal administrative personnel (e.g. TERO, historic preservation), and state or municipal agencies. It should be emphasized that the purpose of the meeting is not to determine or change the contract or scope. The objectives of the pre-construction conference include the following, at a minimum:

- Ensure that all participants have a clear and mutual understanding of all contract, technical, and construction requirements, including O&M deliverables
- Ensure that all parties identify their representatives and understand their roles and responsibilities during the Construction Phase
- Identify and address potential risks

At the pre-construction conference the project manager will normally present the communications plan for construction execution. The project manager may also present a schedule and process for submittal reviews and approvals. Contract time extensions, change order process, weather delays, and the authorities of the various representatives must also be explained during this meeting.

The contractor is typically expected to explain their construction management processes as well. The contractor may present a schedule for project completion, a schedule of work values, and schedule for submittals. Other aspects to discuss may include workplace safety, insurance coverage, bonds, utility conflicts, and anticipated risks. It is extremely important to maintain an accurate record of the pre-construction conference. The project manager is often responsible for taking notes and distributing a summary of the meeting.

Checklists provide a valuable resource for standard communications, including the pre-construction conference. Example checklists are located on the PMO SharePoint site.

### 6.3.2 Overseeing and Managing the Work

In overseeing and managing the work of the project, the project manager has a range of important roles, including the following:

- Integration of the processes that must occur to carry out the work to meet the established project objectives
- Implementation of approved changes
- Allocation of resources and managing their efficient use (potentially across several projects)
- Maintenance of issue logs
- Collection of performance data (e.g. scope completion, budget expenditures)
- Ensuring that the appropriate stakeholders have the proper information about what is occurring on the project and what will be occurring
- Assisting the project team in addressing issues and solving problems
- Providing technical expertise related to the project design
- Recommendation/approval of payments for completed work
- Documenting lessons learned and opportunities for improvement

Directing and managing the work requires an ability to integrate all of the resources, requirements, and documentation involved with the project into one coordinated effort, with the goal of accomplishing the project objectives.

### 6.3.3 Submittals

Quality management includes the processes involved with ensuring that the project's deliverables fulfill their requirements. SFC projects have historically used the submittals review and approval process to manage quality during the Construction Phase. The intent of the submittals process is to build quality into the project and prevent the discovery of quality issues during or after construction. Prevention is preferable to replacement. It is more cost-effective to design the project and its components for the appropriate level of quality than to correct mistakes later.

For key components of the work, the construction documents typically require that the contractor submit material and product information for review and approval prior to those components' installation. The contractor or builder must also provide a schedule that details when the project manager can expect the delivery of the required submittals. The schedule must include a practical arrangement for reviewing and processing the submittals with enough lead time for the material and product suppliers to deliver on time.

It is imperative that the project manager or designee accurately document submittals received and process them within contract-required timeframes. Late responses and unclear recommendations may become the basis for a government-caused delay claim by the contractor. Accurate recording of the date that submittals are received and returned and their status (approved, rejected, or approved with conditions) is essential. A submittal log is a useful tool for this purpose; example submittal logs are located on the PMO SharePoint site.

### 6.3.4 Managing Communications

Poor communication is almost always a root cause of problems that occur during the Construction Phase, and project managers spend the great majority of their time during this phase communicating. Therefore, it makes sense to view communications as a process to be managed pro-actively, rather than a tool for reacting to issues as they arise.

The communications plan initially developed during the Planning and Design Phase and updated in each subsequent phase serves as the basis for the project manager's communications in the Construction Phase. Stakeholders should receive pertinent project information, including progress reports, updates, notices of changes, performance data, and other information as outlined in the plan. A key element of project management is that stakeholders must be identified and involved in the project, and the project manager is responsible for managing their expectations throughout the project. This requires effective communication. Examples of communication channels for SFC projects in the Construction Phase include the following:

- Weekly tailgate planning meetings with the contractor's superintendent
- Weekly construction reports (inspection log book summaries)
- Phone calls to the federal/tribal contracting officer when unforeseen conditions are encountered
- Email notification to the Tribal Historic Preservation Officer that ground disturbance activities are about to commence
- Quarterly appearance before the Tribal Council to provide updates and answer questions
- Quarterly reports to the partner funding agency generated through PDS
- Monthly aggregated performance reporting to the District Engineer (e.g. funds expended, earned value, homes served)
- Final inspection report distributed to the parties identified in the MOA

During the Construction Phase, it is important for the project manager to continually assess the adequacy of ongoing communications and whether they are effective. This may include reviewing the information needs with individuals and when they are needed, confirming that the communication they receive is understood and helpful, and revising the mode or content of communication when necessary to address an issue. The efficiency of communications must be evaluated as well. Communications should prioritize pro-active management of the project, as opposed to reporting on past work. While reporting is helpful and necessary at times to keep stakeholders updated on project progress, project managers should avoid spending so much time reporting that it detracts from their ability to manage the project. The time required to report on issues and problems is likely better invested in pro-active risk management to address those issues in advance.

## 6.4 Construction Tracking

Construction tracking focuses on measuring the performance of the work against the requirements (as outlined in the contract documents and project documents) and taking preventative and corrective action when problems and opportunities are identified. The specific processes involved and actions required of the IHS project manager and staff will depend on the

method of work as identified in the MOA. Typically, the activities required to adequately track the construction will include the following, at a minimum:

- Quality control and inspection
- Cost control
- Schedule control
- Scope control
- Performance reporting
- Risk monitoring

Effective management of project objectives (including cost, schedule, scope and quality objectives) during the Construction Phase is not possible without a complete and thoughtful effort invested in the Planning and Design Phase. Tracking costs, for example, to the established budget is meaningless if that budget did not have an accurate cost estimate or is missing key components. The project manager must have a thorough understanding of the performance baselines established in the PER, PS, and MOA and use them to track performance during the Construction Phase.

An effective method for tracking and reporting project performance is the use of Earned Value Analysis (EVA). A simplified version of EVA adapted for SFC projects is presented in Section 6.4.5. EVA allows the project manager to compare Earned Value (EV), which is a measure of the value of the work performed, with the Planned Value (PV), which is the authorized budget assigned to the work scheduled to date, and the Actual Cost (AC), or the real costs incurred for the work performed to date. Through these metrics, the project's overall performance can be tracked, and forecasts can be made to predict problems and estimate the cost at completion.

### 6.4.1 Quality Control and Inspection

It is important to understand that in project management terms, **quality** is not a measure of how many features a product has or how long it will last; quality is defined as the degree to which the project fulfills its requirements. **Quality control** involves the measurement and analysis of the project's deliverables in order to determine if they meet the established requirements. For SFC projects, this typically means whether the constructed facilities meet the plans and technical specifications in the contract documents and any contractor-furnished submittals and shop drawings. For most SFC projects, quality control is the primary responsibility of the contractor – the contractor is responsible for delivering products and services in accordance with the requirements. However, in order to facilitate the project's overall quality, IHS staff often have an inspection role to oversee the contractor's work and to facilitate corrective action if the level of quality is insufficient.

The role and responsibility of the IHS inspector must be defined in the construction and project documents to avoid misunderstandings and misrepresentation. It can be very easy for an IHS inspector to be viewed as a responsible authority on the job site. In most cases, however, the IHS inspector's role is to observe the work and serve as an advisor and technical representative to the tribal or federal contracting officer, not to direct the use of specific methods or equipment on the job site.

Inspections will be conducted with the builder and, in most cases, with a tribal representative. The project manager will be responsible for ensuring that all necessary reporting is completed in an accurate and timely manner. The project manager will provide construction inspection updates to the relevant federal and tribal officials. Except when the method of work is federal force account, IHS staff will not direct the work, and formal communications with the contractor will be made through the federal or tribal contracting officer. Any discussions with subcontractors or suppliers should be in the presence of the contractor's superintendent or confirmed with the superintendent at a later date.

The results and findings of all inspections must be documented in the project file. Daily inspection logs must be maintained to document the progress of the work, any related issues or problems, important conversations, the results of any testing or third-party permit inspections, and etc. in a complete and factual manner. In the event of legal action or court proceedings, inspection reports can be deposed and introduced as evidence. Including a well-documented photo history of the project with dates and descriptions is also essential, especially because most sanitation facilities are buried once they are installed. Example inspection logs are located on the PMO SharePoint site.

### 6.4.2 Cost Control

SFC project managers have a fiduciary responsibility to be prudent and fair stewards of the public funds invested in SFC projects. This requires care and attention to the management of costs and expenditures. In SFC projects, there can be a variety of procurement methods that will affect the specific approaches necessary for cost control, and the project manager's specific authority will vary. Regardless of the procurement method, the project manager will be involved in or have responsibility for the following key activities:

- Monitor expenditures and ensure that cost and payment approval procedures as outlined in the project and contract documents are followed
- Regularly analyze cost data and monitor expenditures and cost performance to identify and understand any variances (positive or negative)
- Identify and influence or mitigate the factors that can change costs
- Ensure changes are agreed upon and prevent incorrect, inappropriate, and unauthorized changes from being included (see Scope Control below)
- Manage cost changes when they occur – examine trade-offs and attempt to bring cost changes within acceptable limits
- Regularly re-calculate the project's estimate at completion and other forecasts as necessary
- Inform appropriate stakeholders of current and forecasted cost metrics
- Oversee any cost audits required by the project and/or contract documents

### 6.4.3 Schedule Control

There is almost always a relationship between the project schedule and cost. Shortening or extending the construction schedule may be desired or advantageous, but either case will likely impact the project cost. In SFC project management, schedule control typically involves

monitoring a contractor's progress against the schedule baseline established in the contract documents. For force account or cost-reimbursement type contracts, schedule control becomes more critical, as time spent on the work directly correlates to the project cost. Regardless of the method used to carry out the work, the project manager will typically be responsible for the following key activities associated with schedule control:

- Ensure that a project schedule is established in accordance with the terms of the contract documents and that any contract clauses relevant to schedule control (e.g. liquidated damages) are understood by all parties
- Regularly analyze schedule data and monitor progress to identify and understand any variances
- Identify and influence or mitigate the factors that can affect the schedule
- Ensure changes are agreed upon and prevent incorrect, inappropriate and unauthorized changes from being included (see Scope Control below)
- Manage schedule changes when they occur – examine trade-offs and attempt to bring schedule changes within acceptable limits
- Regularly re-calculate the project's estimated completion date and other forecasts as necessary
- Inform appropriate stakeholders of current and forecasted schedule metrics

When schedule delays occur, a typical practice is for the project manager to notify the contractor and the tribal or federal contracting officer if actual work differs by more than 2 weeks from the approved progress schedule. In such cases, the project manager may deem it necessary to develop a corrective action plan to bring the schedule back to or closer to the original finish date. This can be done in a variety of ways, including expediting the work or scheduling certain activities sooner. The project manager, the contracting officer, and the contractor will ideally develop the plan together. The key point is that the schedule should be pro-actively managed, rather than allowed to happen on its own.

### 6.4.4 Scope Control

Scope control is primarily concerned with ensuring and validating that the scope delivered under the project is fully consistent with, and does not exceed or fall short of, the scope committed to in the project and construction documents. Any changes requested must be reviewed for their necessity and consistency with these documents. If the change is deemed necessary, the appropriate change management processes must be followed to amend the construction and/or project documents.

Adherence to the scope that is described in the PS and MOA/CPA is a key concept of the PMPro. Because SFC projects use the PS to outline the scope to be delivered under the project, and because the PS is incorporated by reference into the MOA/CPA, the PS scope becomes a firm commitment by the parties as to what the project will deliver. Any changes to the scope alter this agreement must be addressed by amending the PS and MOA/CPA. Refer to Chapter 8 of the Criteria Document for details on amending the project documents.

Regardless of the method used to carry out the work, the project manager will typically be responsible for the following key activities associated with scope control:

- Ensure that the project scope as outlined in the project and contract documents is understood by all parties as well as the procedures to request and approve changes
- Regularly monitor progress to identify and understand any variances
- Identify and influence or mitigate the factors that can affect the schedule
- Ensure changes are agreed upon and prevent incorrect, inappropriate and unauthorized changes from being included
- Manage scope changes when they are requested – understand the full impact of scope changes on the project's objectives (i.e. cost, schedule, and quality) and ensure they do not create issues with other areas of the project
- Ensure that the delivered scope is validated by documenting the appropriate stakeholders' review and approval/acceptance of the project deliverables (e.g. a state transportation department's approval of piping attached to a highway bridge)

### 6.4.5 Performance Reporting

Important elements of quality, communications, and stakeholder management include the identification of key performance indicators that have value for tracking the project objectives, identification of the performance information needs of the various stakeholders involved (including the project manager), and the timely and efficient delivery of the appropriate information to the appropriate stakeholders. Planning a reporting approach in this manner ensures that the project manager's time during the Construction Phase is focused on managing the project, and time spent reporting past events is minimized.

In order to provide effective performance reporting, the key performance indicators must be identified and understood. Metrics such as 'project funds spent' or 'feet of pipe installed' provide some benefit in describing project activity, but they do not speak to project performance, or how well the project is tracking against the baseline schedule and budget, and they do not allow for projections of future performance. A more useful technique for tracking, reporting, and forecasting project performance is the use of **Earned Value Analysis (EVA)**. There are a variety of resources and publications that describe the use of EVA in depth, but for the purpose of typical SFC projects, a simplified version is suggested here for application in the Construction Phase.

During the Construction Phase, a scope, budget, and schedule are typically established contractually through a procurement agreement. This may be through a construction contract under FAR procurement or through an MOA under tribal procurement. They may also be established in-house through federal force account procedures or negotiated directly with a Tribe through tribal force account procedures.

Note that agreements established through Title I or Title V of P.L. 93-638 usually place the responsibility for performance reporting on the Tribe. Under these types of agreements, the IHS project manager does not normally monitor performance in depth, but because IHS and the Tribe

share risks for scope, budget, and schedule, IHS will retain an oversight role. This role must be clearly identified in the appropriate project documents.

For projects delivered through Direct Service, the established scope, budget, and schedule serve as the baseline for performance reporting. For specific scope items, a "value" is established for scope items at a level of detail appropriate for meaningful reporting. This may require breaking down larger deliverables with a schedule of values (e.g. a pumphouse building may be broken down with separate values for the foundation, electrical, mechanical, etc.). The total value of all scope items adds up to the agreed-upon budget.

These planned values are then applied across the schedule (typically provided by the contractor) to arrive at a task-allocated schedule that allows for basic earned value analysis. Figure 6-1 below provides an example for a simplified project to drill a new well and connect it to an existing community distribution system. Additional examples are available on the PMO SharePoint site.

**Figure 6.2 Example Task-Allocated Schedule**

| | | Status Date: End of Week 5 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Project Week | | | | | | | | | | | | | | |
| **Task No.** | **Task Description** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Task Value** | **% Complete** | **Earned Value** |
| 1 | Mobilization | | | | | | | | | | | | | $2,000 | 100% | $2,000 |
| 2 | Site Preparation | | | | | | | | | | | | | $3,000 | 100% | $3,000 |
| 3 | Well Drilling | | | | | | | | | | | | | $30,000 | 66% | $19,800 |
| 4 | 6" C900 PVC Pipe | | | | | | | | | | | | | $20,000 | 0% | $0 |
| 5 | Connect to Existing System | | | | | | | | | | | | | $5,000 | 0% | $0 |
| 6 | Contol Upgrades | | | | | | | | | | | | | $3,500 | 0% | $0 |
| 7 | Site Restoration | | | | | | | | | | | | | $1,500 | 0% | $0 |
| 8 | Demobilization | | | | | | | | | | | | | $2,000 | 0% | $0 |
| | **Project Totals:** | | | | | | | | | | | | | **$67,000** | | **$24,800** |

Once the task-allocated schedule is complete, the earned value of the work completed can be compared to the planned value. This is typically the focus for tracking performance. Comparison of these two data points yields the following metrics:

- Schedule Variance (SV) = Earned Value (EV) – Planned Value (PV)
- Schedule Performance Index (SPI) = EV / PV

In the example shown in Figure 6.2, the date of status reporting is the end of Week 5. At this point, the project has 'earned' $24,800 in value, but the planned value at this point was $35,000 (the sum of tasks 1-3). This leads to the following calculations:

- SV = $24,800 - $35,000 = -$10,200
- SPI = $24,800 / $35,000 = 0.71

Force account construction, whether federal or tribal, places more cost risk on IHS, since actual costs (as opposed to bid costs) are paid directly by IHS or reimbursed to the Tribe. Because of this, the project manager will be interested in comparing actual daily worker time sheets, daily

production reports, equipment costs, and material costs with the planned costs to define whether the project is within budget. EVA uses the following metrics to analyze cost performance:

- Cost Variance (CV) = Earned Value (EV) – Actual Costs (AC)
- Cost Performance Index (CPI) = EV / AC

Project stakeholders will often be interested in qualitative measures of project progress, in addition to earned value metrics. Other data points and information that can be included in performance reporting for SFC projects include the following:

- Project completion date
- Cost estimate at completion
- Number of homes served
- Problems encountered
- Issues addressed
- Lessons learned
- Photographic documentation
- Upcoming work planned

### 6.4.6 Risk Monitoring

As construction is executed, the risk management strategies developed during the Planning and Design Phase are implemented. As part of Construction Tracking, the risk responses must be monitored for their effectiveness, and the project team should actively look for new risks that may develop, particularly as changes are proposed and evaluated. Risk monitoring should be continuous and proactive, rather than reactive, because anticipating and addressing risks before they become problems will significantly reduce their impacts on the project objectives.

Using Earned Value Analysis as described in Section 6.4.5 is one technique for risk monitoring. Evaluating the project's performance by integrating cost and schedule data provides a basis for determining whether the project's risk management strategies are effective. It can also provide early warning signs for a project going out of bounds of its cost, schedule, and scope constraints. Another technique for risk monitoring is use of the issue log described in Section 4.2. As issues are identified, recorded, and addressed, their effects on the risk management plan should be considered.

## 6.5 Construction Completion

Construction completion includes the work required to finalize and secure acceptance of the project's deliverables. The project manager will coordinate the final inspections (typically a pre-final and a final inspection) to ensure that the work described in the construction documents is complete and complies with the technical requirements of the contract drawings and specifications. The project manager will also coordinate acceptance of the work by the responsible parties, final payment, and establishment of the warranty period.

Construction completion activities will largely depend on the method of work and the IHS role defined for the specific project. The description of construction completion activities described here are "typical" and are not intended to supersede Area policies, the requirements of the construction documents, tribal policies, or other applicable requirements.

### 6.5.1 Pre-Final Inspection

When the contractor or builder considers the entire work complete, written notice to the Tribe or the federal contracting officer and the project manager will be provided. For larger projects, a pre-final inspection will typically be scheduled to verify that the facilities are complete in accordance with the construction documents prior to the more formal final inspection. The project manager, inspector, a representative of the contractor or force account crew, and other participants as appropriate will conduct the pre-final inspection. In most cases a punch list of items to be completed or corrected will be developed as a result. The contractor is required to correct all deficiencies before final payment is made.

The pre-final inspection is typically held after startup of the constructed facilities and delivery of any required O&M training and documentation (e.g. O&M manuals, as-built drawings). The project manager and/or Tribe may issue a certificate of substantial completion accompanied by the punch list of remaining items to be corrected. Clauses related to certification of substantial completion must be included in the construction documents.

### 6.5.2 Final Inspection

A final inspection must be conducted on all completed SFC projects prior to acceptance and final payment. A final inspection may be conducted on portions of the work that are completed and scheduled for beneficial use before the rest of the project is complete. The following participants may take part in a final inspection:

- Contractor or contractor's representative or force account superintendent, depending on the method of work
- Representative of the O&M entity that will operate the constructed facilities
- IHS project manager
- IHS engineering technician, inspector, or other staff, depending on the IHS role
- IHS O&M utility consultant
- IHS District Engineer
- The Director of the Area Sanitation Facilities Construction Program
- The federal or tribal contracting officer, when the method of work is federal or tribal procurement
- Representative(s) of any other funding agencies that contributed to the project
- State, county, tribal, or other local officials as appropriate

The final inspection must be conducted before the contract completion date. The project manager will typically coordinate with the Tribe and contractor or force account superintendent to schedule the final inspection after all items identified in the pre-final inspection punch list are complete.

The project manager will prepare a final written punch list of deficiencies noted during the final inspection. As part of the final inspection, all required post-construction submittals will be reviewed, including as-built/record drawings, O&M manual, and test reports. Written notification of the findings will be provided to the tribal or federal contracting officer. All deficiencies must be corrected on or before the contract completion date and before final payment is made.

Following the final inspection, the project manager should prepare and distribute a final inspection memo to include the following information, at a minimum:

- The date of the final inspection and a list of all participants
- A list of actions taken for any punch list items previously provided to the contractor
- The final inspection punch list and a clear statement of the required date for completion

Individual IHS Area policy or local utility practice may require the execution of a beneficial use agreement. **Beneficial use** is a legal term describing the right of a party to enjoy the benefits of specific property even though title to that property is held by another party. Components of a project may be completed and put into use before the entire project is complete. In such cases, commencement of beneficial use may be in the interest of the IHS and the Tribe. Consideration must be given to the responsibilities for safety, access, utilities, and insurance during the period of time between beneficial use and final completion. Clauses related to beneficial use and its documentation must be included in the construction documents.

### 6.8.3 Acceptance and Final Payment

Once all parties have agreed that work is complete and all punch list items have been addressed, acceptance of the work is made official by approving final payment and processing any documentation necessary to close the procurement action(s) (e.g. the contractor's release of claims). The specific actions required will vary depending on the method of work. Typically, a certification or affidavit of punch list completion is used to document the actions taken to address the punch list items. This certification is normally written in memorandum form with references to each item number of the punch list and brief notes on how each item was addressed. Example memoranda are located on the PMO SharePoint site.

Acceptance of the work provides confirmation that all requirements associated with the Construction Phase deliverables have been met. When coordinating acceptance, the project manager should consult the communications and stakeholder management plans to ensure that all of the appropriate stakeholders are involved. Note that acceptance of the work does not necessarily mean that its final ownership has been established. Transfer of ownership and responsibility for operating and maintaining the facilities installed is covered during the Closeout Phase (refer to Section 7).

### 6.8.4 Warranty

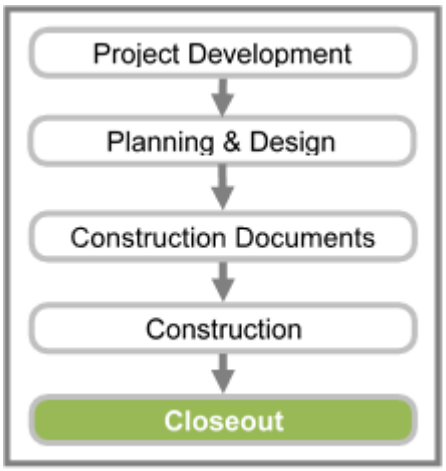
Most SFC projects require that the contractor warrant the work for a minimum one-year period. There may be certain components of the work that require longer periods. Depending on the

specific requirements, the warranty period may begin on the date of final acceptance or from the establishment of beneficial use. Other local events like substantial completion may be specified as the beginning of the warranty period. Clauses related to warranty requirements must be included in the construction documents. In addition to triggering the start of warranty periods, beneficial use may also place the O&M responsibilities on the party using the facilities.

It is critical to communicate the exact warranty dates and the specific items covered to all stakeholders to ensure a common understanding of the roles and responsibilities during the warranty period. This includes communication requirements if issues are identified. Stakeholders should also be notified that a warranty inspection will be held toward the end of the warranty period, usually at or around 11 months. Section 7.6 describes the warranty inspection.

# 7.0 THE CLOSEOUT PHASE

## 7.1 Introduction




The Closeout Phase begins once the project is accepted by the owner. Closeout activities include tasks to put the new facilities into operation, transfer ownership of the facilities to the designated parties, and ensure that all project information and documentation is complete and archived properly in order to make it available for future projects.

Project managers may feel pressure to move on to other projects once construction is complete, but care and attention must be made to ensure that projects are properly closed in a timely manner. Neglecting closeout activities creates risks for problems later on, as documents may go missing, project managers and team members may move away, and funding tied to the project is unavailable for other uses. As time goes on, project closeout will become more difficult. Additionally, opportunities may be missed to capitalize on information and lessons learned that could support and improve future projects.

As applicable, the following items will be completed during the Closeout Phase if they were not completed in previous project phases:

- Finalization of record (as-built) drawings
- Updating composite utility drawings
- Updating asset inventories
- Interagency agreement closeout
- Warranty repairs, inspections, and documentation
- Transfer agreements and notices of completion
- Project financial reconciliation
- Assess customer satisfaction and recognize success
- Document project historical information and lessons learned
- Final report

This phase and the overall project are considered complete with the publication of the final report. Publishing the final report also changes the project status from active to inactive in PDS.

## 7.2 Record (As-Built) Drawings

Record drawings use information from the as-built survey and marked-up construction drawings provided by the contractor or construction supervisor to provide a record of the actual facilities constructed. The project manager and all project staff are responsible for ensuring that record drawings comply with current IHS and Area guidelines.

At a minimum, the Tribe and system operator must review and receive copies of the record drawings immediately after the completion of projects that construct community facilities. Individual homeowners must review and receive copies of the record drawings immediately after the completion of projects that construct individual facilities. The IHS Area, district, or field office responsible for the construction project must also maintain record drawings to support the development of future designs, facility upgrades, and for future O&M reference.

## 7.3 Composite Utility Drawings

Composite utility drawings create a single record representing all utilities in a given community. The availability of accurate and current composite drawings greatly improves the effectiveness and efficiency of system analysis, asset inventory development, O&M planning, onsite system troubleshooting, community planning, and sanitation facilities design. In order to maintain accurate and current drawings, composites should be updated as part of the Closeout Phase for SFC projects, based on the record drawings produced for the project. Because composite utility drawings support the delivery of O&M technical assistance, updating these drawings must be coordinated with the Area or District O&M staff.

Standards for creating and maintaining composite utility drawings can be found in the Operation and Maintenance Guideline for the SFC Program.

## 7.4 Asset Inventories/GIS Data

Tribal utility organizations and governing bodies must have sufficient knowledge about the value and complexity of their utility assets to make informed decisions about the management of their water and sanitation infrastructure. Furthermore, geographically-referenced utility information is a vital resource during the Project Development and Planning and Design Phases when a new project is being developed. Asset inventories established through a Geographic Information System (GIS) database are one of the fundamental tools used to provide this information. Asset information for completed projects should be documented and provided to the facility owner in a manner that is compatible with their data management system(s). Asset inventory information can include identification of components, geospatial information, brand, make and model, installed date, expected life, installed cost, and condition information.

Standards for developing asset inventories can be found in the Operation and Maintenance Guideline for the SFC Program. The SFC Program is currently developing an internal GIS platform that will ultimately be available for all projects.

## 7.5 Interagency Agreement (IA) Close-out

Agreements with partner agencies are relatively common for SFC projects, usually to facilitate financial contributions . The process to close out these agreements is typically included in the IA language and most often requires a final report and financial reconciliation. All IA requirements must be identified at the time the agreement is signed so that the IHS project manager can ensure the terms are included as inputs to the project's planning and design. The project manager must ensure that the actions required to close out an IA are executed in a timely manner once the terms and conditions of the IA are met. Neglecting the proper execution and closeout of IAs jeopardizes the partnerships that the IHS SFC Program has with other funding agencies.

## 7.6 Warranty Inspection and Repair

The construction documents must describe the warranty process and responsibilities during the warranty period. Tribal leaders and system operators must be aware of all warranty periods for their equipment as part of the transfer process. When the method of work is force account construction, Area policies and guidelines will define the procedure to repair failed system components during the warranty period.

Near the end of the warranty period, typically 11 months after it begins, the project manager, the owner and/or operator of the constructed facilities, and other personnel as necessary will perform an inspection to determine if warrantable issues remain. Warrantable repairs must be documented and submitted to the contractor in accordance with the construction documents and terms of the warranty. If no such items are identified during the warranty inspection, or after any such items are corrected, the warranty period will end.

## 7.7 Transfer Agreement

A transfer agreement is the formal document assigning ownership of the completed facilities to the receiving owner. Along with ownership, responsibility for operation and maintenance is also transferred. The project manager should use the issuance of the transfer agreement as an opportunity to reinforce the need for ongoing O&M; the Tribe, individual, or other party receiving ownership of the facilities should understand their O&M responsibilities and any support available from IHS. IHS O&M staff should be involved in the transfer process for community facilities. Homeowners receiving individual facilities should receive operating instructions and have a walk-through and explanation of the facilities installed at the time of transfer.

The project delivery and procurement methods will determine the specific content and timing of the transfer agreement. A transfer agreement will typically be used when the procurement method is federal procurement, and a project completion notice will be used when the procurement method is tribal procurement. Individual IHS Areas may have specific procedures to transfer completed facilities. The Criteria Document includes policies for transferring facilities and a sample transfer agreement.

## 7.8 Financial Reconciliation

Project financial accounts must be reconciled after the project has been completed. A detailed financial reconciliation for each funding agency's contribution will be required, and any remaining funds shall be reported and managed in accordance with the project delivery method (e.g. Title I and Title V agreements under P.L. 93-638 may allow the Tribe to retain remaining funds). If remaining funds are under IHS management, a key project management concept is that those funds should not be used to add new scope to the project. Once the project requirements are met, the remaining funds should be returned to the contributing parties or re-programmed by the SFC Program to support other sanitation facility projects. Financial reconciliation, including final activity in UFMS, must be complete prior to publishing the final report.

## 7.9 Assess Customer Satisfaction and Recognize Success

By locating field staff on or near reservations and working with communities and homeowners throughout the project life cycle, customer service is inherently built into the SFC Program. SFC staff interact with a variety of customers to gain input throughout the development and execution of SFC projects. One function of a mature project management organization is to systematically capture and act on customers' perceptions of the quality of service delivered by the organization.

To assist in the collection of customer satisfaction data, standard survey tools are available on the PMO SharePoint site. The standard survey tools include the following:

- Tribal Homeowner Survey
- Tribal Partner Survey
- Agency Partner Survey
- Post Construction O&M Survey
- Annual Operator O&M Survey

For maximum effectiveness, each completed project should be followed up with some form of outreach to determine customer satisfaction. Projects that provide community facilities can be followed by a Tribal Partner Survey, an Agency Partner Survey if applicable, and a Post Construction O&M Survey. The DSFC Customer Service Guidance Document, also available on the PMO SharePoint site, describes the customer service tools in detail.

As feedback is received from project partners, the Closeout Phase is also an ideal time to recognize the contributions of the various project team members, tribal partners, other funding agencies, and personnel that built the facilities. Thank-you letters and award recommendations are ideal ways to recognize individual and team accomplishments and serve to improve team morale. Communicating the successful completion of projects to our tribal partners through activities such as notices in tribal newsletters, letters of appreciation to tribal staff, etc. can enhance relationships and improve the outcome of future projects. Project managers that take the short time required to coordinate these activities will likely realize significant benefits from the effort.

## 7.10 Document Project Information and Lessons Learned

Project historical information and lessons learned are the key knowledge items developed over the life of the project that can serve to inform future projects. Documenting and using this knowledge during project development can help to improve the project's and the SFC Program's efficiency and avoid the repetition of mistakes. Information that falls under this category can vary by project, but may include the following:

- How the project was identified
- Key stakeholders involved
- Significant planning activities
- Permitting/right-of-way issues
- Project management tools used (e.g. WBS, risk register, issue log, etc.)
- Technical determinations made
- Cost estimating issues
- Bid tabulation information
- Construction problems
- Contractor strengths/weaknesses
- Causes for changes/delays
- Internal staff management issues

The intent is to capture a summary of what went right, what went wrong, any significant issues that developed, and how they were addressed. An example closeout summary document is available on the PMO SharePoint site.

## 7.11 Final Report

A final report must be prepared and published for each SFC project. Chapter 8 of the Criteria Document includes requirements for final report content and directs that they shall be prepared within 12 months of the project transfer date. For projects with complete PDS records, a draft final report can be generated using the "Final Report" button on the Details tab of the PDS project record.

The final report serves two purposes: it supplements the official file with information regarding the technical and legal execution of the project, and it provides a concise summary for project stakeholders of the work undertaken and completed. The final report is a communication tool that should be shared with the appropriate stakeholders identified in the project communications plan.

When the final report is uploaded to PDS, the Area SFC Director must enter the completion date in the "Actual" column of the PDS "Final Report Published" milestone (4999). Entering an actual date in this milestone field will automatically toggle the project status from "Active" to "Inactive".