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TWDB Contract No. 2021602444
Final Report
Received: May 4, 2021

Assessment of Texas Water Development Board Engineering Review Procedures with Respect to Existing Guidance and Regulations of Appropriate Entities

Prepared for:

Texas Water Development Board

May 4, 2021

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List of Acronyms

APD	Alternative Project Delivery
B&C	Biddability and Constructability
CFR	Code of Federal Regulations
CMAR	Construction Manager at Risk
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DB	Design-Build
DBB	Design-Bid-Build
DBE	Disadvantaged Business Enterprise
DFund	Texas Water Development Fund
DMAIC	Define, Measure, Analyze, Improve, Control
DSHS	Texas Department of State Health Services
DWSRF	Drinking Water State Revolving Fund
EDAP	Economically Distressed Areas Program
EFR	Engineering Feasibility Report
EPA	Environmental Protection Agency
FIF	Flood Infrastructure Fund
FNI	Freese and Nichols, Inc
GMP	Guaranteed Maximum Price
GPR	Green Project Reserve
IUP	Intended Use Plan
MOU	Memoranda of Understanding
OLA	On-line Application
P&S	Plans and Specifications
PEFR	Preliminary Engineering Feasibility Report
PIF	Project Information Form
RWAF	Rural Water Assistance Fund
RWPD	Regional Water Project Development
SP	State Participation Program
SWIFT	State Water Implementation Fund for Texas
TAC	Texas Administrative Code
TCEQ	Texas Commission of Environmental Quality
TWC	Texas Water Code
TWDB	Texas Water Development Board
U.S.C.	United States Code
VPN	Virtual Private Network
WQMP	Water Quality Management Plan
WRRDA	Water Resources Reform and Development Act of 2014

EXECUTIVE SUMMARY

The Texas Water Development Board (TWDB) offers a variety of loan and grant programs that help Texas communities fund planning, acquisition, design, and construction of critical water infrastructure projects. As part of its funding programs, TWDB performs detailed engineering reviews of the funding application, planning, design, and construction documents prepared by project owners and their consultant teams. The reviews serve as due diligence on behalf of the State of Texas to verify compliance with program requirements and state design criteria. In an effort to improve its processes, TWDB solicited Statements of Qualifications (SOQ) from consultants to provide an assessment of its engineering review procedures. TWDB selected Freese and Nichols Inc. (FNI) to assist the TWDB with this effort.

FNI utilized continuous improvement problem solving processes to assess the current work procedures, look for bottlenecks, redundancies, or other impairments that when alleviated, would increase efficiency by reducing the person-hours required to perform the work. The assessment performed by FNI was a highly interactive and collaborative effort with TWDB staff through workshops, surveys, and one-on-one discussions.

FNI's scope of work is summarized below.

Task 1 – Data Collection/Review and Executive Alignment

Task 2 – Programmatic Requirements and Existing Process Mapping

Task 3 – Staff Interviews and Workshops

Task 4 – Resource Requirements

Task 5 – Root Cause Analysis and Process Improvement Recommendations

Task 6 – Presentation to Executive Team and Final Report

Approach

The FNI project team utilized a Continuous Improvement problem solving methodology referred to as the Define-Measure-Analyze-Improve-Control (DMAIC) process. FNI's scope of work extended through the Analyze phase, which included formulation of potential countermeasures to address problems identified in the Define and Measure steps, analysis of the feasibility of potential countermeasures, and assistance with development of an implementation plan. The Improve and Control phases are steps that TWDB will take at the conclusion of this study to implement selected countermeasures (Improve phase) and monitor the results of the improved process over time (Control phase).

Define Phase **-** The problem definition phase is crucial to the success of the process improvement effort. Typically, the improvement goal is stated as a gap between the actual performance and the performance goal. Because the TWDB does not have performance metrics for the project review process, FNI could not develop a problem statement based on a specific performance gap. Instead, the team translated the TWDB's objectives into a Goal Statement, as follows:

> Goal Statement: The project review process needs to improve to handle increasing workloads.

FNI developed process maps of the existing review process based on guidance documents, checklists, and the experience of FNI's project team members to document the workflow used by project reviewers.

Measure Phase - The process maps were presented in workshops with project reviewers to validate FNI's understanding of the workflows and to stimulate discussion with project reviewers to identify bottlenecks, inefficiencies, and frustrations. Subsequent to the workshops, FNI developed an on-line survey to gather additional data and expand on issues identified in the workshops.

Analyze Phase - Issues identified from the workshops and survey were stratified into related or dependent groups and a fishbone (Ishikawa) diagram was developed to aid in identifying potential root causes. After the root causes were identified, the team brainstormed a number of potential countermeasures for each root cause. FNI recommended priorities for implementation of countermeasures and is assisting the TWDB with development of an implementation plan.

Regulatory/Program Requirements Review

FNI performed a detailed review of regulatory authorities which authorize the TWDB's financial assistance programs, including the Texas Water Code (TWC), the Texas Administrative Code (TAC), Memoranda of Understanding (MOUs), and the United States Environmental Protection Agency (USEPA) regulations governing the Drinking Water State Revolving Fund (DWSRF) and Clean Water State Revolving Funds (CWSRF). To gain an understanding and background of the requirements of each program, FNI reviewed a listing of TAC sections focused on the engineering work product; state design criteria; internal guidance documents, forms, checklists; externally available guidance documents, and applications. The goal was to identify requirements placed on funding assistance applicants and procedures followed by TWDB engineering reviewers not supported by rule, law, or regulation. The evaluation concluded that almost all requirements placed on applicants can be traced to the TAC and the TWC, and the enabling acts (Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) and EPA regulations for the SRF programs. Two exceptions to the above were noted:

- The federal code provides requirements for environmental review procedures but has no guidance or requirements for engineering procedures or plans and specifications (P&S) review. The current state regulations for determining review authority are outlined in an MOU between the TWDB and TCEQ.

- The TWDB performs biddability and constructability (B&C) reviews on all projects. Although the TAC 371 and 375 rules for the DWSRF and the CWSRF require contract documents to be reviewed for biddability and constructability, there are no requirements for B&C reviews in the TWC, EPA regulations, or the SRF enabling acts. Likewise, there are no such requirements for these reviews on state funded projects either.

Problem Definition

FNI utilized cross functional (swim lane) diagrams to document the existing engineering review processes. Swim lane diagrams show workflow as individual tasks in swim lanes (rows) assigned to the various process participants. Individual tasks are connected by arrows to illustrate the flow of work. The arrow connectors between tasks represent an exchange of work product or communication between participants. FNI developed swim lane diagrams for six (6) review processes (Application, Commitment Closing, Feasibility Report, Plans and Specs, Change Order, Project Close-out) using the Texas Water Development Fund (DFund) as the template. Review procedures vary somewhat between the different funding programs, but the efficiency issues identified during the study were systemic and applied to the review processes in general and not specific program(s).

FNI facilitated several workshop-style interviews with project engineers and project reviewers to verify the accuracy of the process maps, determine the consistency of procedures between reviewers and obtain input on process inefficiencies. Four such meetings were conducted, each focused on a different phase of the review process and with a different mix of experience levels and representation from the TWDB's regional project teams. Following these meetings, FNI developed a web-based opinion survey to gather additional information on specific issues that were raised in the interviews.

FNI also reviewed the TWDB's procedures for projects utilizing Alternative Project Delivery (APD) methods (construction manager at risk, design-build). FNI determined that there were no issues or problems specific to the TWDB's review procedures, and in fact, the TWDB's flexibility and commitment to facilitate applicants' use of APD is highly commendable as many states have struggled to implement funding for APD projects. The main challenge with APD for the TWDB has been the workload associated with multiple construction packages which adds to the workload of project reviewers.

FNI also conducted a hands-on review of TxWISE, the TWDB's project tracking database. TWDB provided FNI with Virtual Private Network (VPN) access to the testing environment for TxWISE. FNI supplemented that review with an email survey of project reviewers to capture common issues/complaints, and finally an in-person workshop with a TxWISE super-user. Project reviewers cited TxWISE as a major impediment to efficient execution of their daily work, requiring significant effort to enter data and documentation while providing little value to support effective project management. The key finding is that TxWISE serves as a document management system but does not provide easy access to data, collaboration between team members, scheduling, or status reporting.

Process Review Findings

The purpose of the process review was to identify bottlenecks or other inefficiencies that, if alleviated, would improve efficiency and increase the number of projects completed in a given time period at the same staffing levels. FNI identified very few opportunities to gain efficiency through first level actions such eliminating redundancies or unnecessary tasks, improving communications, standardizing inputs/outputs, etc. The reason for this is the process is very linear and project reviewers are responsible for the vast majority of the tasks in the review process. To achieve marked improvements will require shifting tasks from project reviewers to other resources that are either underutilized or better suited to execute those tasks or improving tools or technology. These actions are more disruptive to the organization because they require redefinition of roles/responsibilities, additional training, possibly realignment of teams, and capital investment. Before undertaking such actions, it is essential to confirm that the solutions will address the underlying root causes of the problem and not just symptoms. FNI performed an analysis to identify the major root causes of the problems before considering countermeasures. The analysis identified the following root causes:

- ***Team Structure (See Section 3.6.2)*** – The regional, fixed membership team structure contributes to several issues, including, among others, a lack of consistency between project teams; reduced opportunities for transferring best practices; imbalance of workload between teams; challenges sharing resources between teams.

- ***Project Reviewers Perform Broad Range/Too Many Functions (See Section 3.6.3)*** – In addition to the need to understand all of the TWDB funding programs, the current process tasks project reviewers with performing project management, technical reviews, financial management, constructability reviews, document control, administrative functions and more. The experience level varies widely between staff/teams, but even very experienced engineers are not likely to possess all skillsets required of the position.

- ***Inconsistent Training (See Section 3.6.4)*** – The interviews determined that there were inconsistencies related to the use of checklists, guidance documents, communication protocols, document management and TxWISE contributing to reduced efficiency and creating impediments to sharing resources between teams.

- ***Inconsistent Process Execution Processes (See Section 3.6.5)*** **–** Similar to the preceding root cause, there are notable variations in project execution processes between the regional teams, contributing to reduced efficiency and creating difficulties sharing resources or handing off projects to other teams to balance workload.

- ***Lack of Project Management/Collaboration Tools in TxWISE (See Section 3.6.6)*** **–** It is understood the main purpose of TxWISE is to document compliance, and support reporting and auditing of the SRF programs, but the consensus of the reviewers was that TxWISE requires a significant amount of effort with little or no benefit to their project delivery functions. Project reviewers identified the need for project management collaboration tools as their greatest need to improve their efficiency.

Process Improvement Recommendations

The data clearly indicates the primary process improvement strategy will be relieving the workload carried by project reviewers so they can handle more concurrent projects or move projects through the review process more quickly, or both. A second strategy will be improving production efficiency of the project reviewers and the entire project team through process consistency and enhanced management and collaboration tools. FNI developed specific countermeasures to each root cause to support these process improvement strategies.

- ***Countermeasure to Team Structure and Project Reviewers Perform Broad Range (Too Many) Functions (See Section 4.1.1)*** – Any modification to team structure or team member roles must consider the need to maintain continuity of service of ongoing projects. The current team structure places great demands on project reviewers to be experts over a broad range of subjects. One way to reduce this burden is to offload technical review of planning and construction documents to others better equipped with the engineering background and experience to perform those duties. FNI's opinion survey determined that project reviewers spend up to 40% of their time on technical reviews. Offloading technical reviews could allow project reviewers to focus on customer facing functions, project management, programmatic requirements, and coordinating TWDB internal functions. Other functions that may be possible to offload to other team members include initial application reviews, budget management/outlay request processing, document control and TxWISE maintenance.

- ***Countermeasure to Inconsistent Project Execution Processes (See Section 4.1.2)*** – Standardizing work procedures, file structure, file naming conventions, communications protocols, etc. can provide some improvement in efficiency. When processes, inputs, outputs, work products, and communications are consistent and repeatable, there is less time wasted on clarifications and rework. The major benefit to standardization is the ability to share resources between teams with minimal loss of efficiency, and improved ability to identify the root causes of problems. As process improvements are developed, they are incorporated as best practices across the organization.

- ***Countermeasure to Inconsistent Training (See Section 4.1.3)*** – Standardized training will go far in reducing process variability across the organization. Training should be provided by subject matter experts and ideally be available on demand as basic training for new employees or when existing employees change roles. Designating experienced staff to serve as technical resources on a "help desk" will also help assure consistency in responses to questions and accelerate process improvements by identifying the nature and frequency of issues.
- ***Countermeasure to Lack of Project Management/Collaboration Tools in TxWISE*** – Project reviewers cited the need for tools for tracking schedules and project status to support their project management roles, as well as tools for collaborative (studio type) review/editing tools, and potentially a platform to support structured workflows.

Recommendations Regarding Regulatory Reviews

- ***Plan and Specifications Reviews (See Section 4.2.1)*** - The TWDB reviews all plans and specifications (P&S) for project eligibility/programmatic requirements as well as compliance with state design criteria, and according to the project reviewers, these reviews consume considerable amounts time. The TWDB could consider foregoing P&S reviews for design criteria where those reviews are redundant to reviews by the Texas Commission of Environmental Quality (TCEQ) (drinking water) or municipalities where TCEQ has delegated review authority (wastewater projects) or using the TCEQ self-certification process. It is recommended that the TWDB consider adopting some form of self-certification similar to TCEQ for wastewater projects and recognize TCEQ's review of drinking water projects. If the TWDB elects to continue review of P&S for state design criteria, it is recommended these reviews be performed by staff with relevant technical expertise to relieve project reviewers of these duties.
- ***Biddability and Constructability Reviews (See Section 4.2.2)*** **-** Project reviewers are tasked with performing biddability and constructability (B&C) reviews for all projects. Although the TWDB TAC rules for DWSRF and CWSRF program regulations require TWDB to review P&S to verify adequate information is provided for bidding and construction, there are no requirements in the TWC, EPA regs, or federal law to do so. The TWDB should consider this opportunity to reduce time spent on B&C reviews. Regardless of whether the TWDB opts to continue B&C reviews for all projects, it is recommended that B&C reviews be performed by staff with the necessary training and experience to perform meaningful reviews.

Alternative Project Delivery (APD) Process Improvements

- To limit the number of P&S reviews to be performed by project reviewers, the TWDB should require logical and complete construction packages for construction manager at risk (CMAR) and design/build (D/B) projects.
- Provide training to project reviewers, project teams and funding applicants on best practices for risk management through construction packaging and delivery of CMAR and D/B projects.
- If necessary, restrict the size or duration of projects that can be broken into multiple construction projects.
- Designate APD coaches with appropriate experience to support project teams and funding program applicants.

Recommended Prioritization of Countermeasures

FNI recommends prioritizing the recommended countermeasures based on 1) benefits of reducing workload on project reviewers; 2) minimizing organizational disruption; 3) minimizing impact on ongoing projects; 4) consideration of predecessor/successor relationships between countermeasures. Based on these criteria, FNI's recommended prioritization is as follows:

- ***Allow Self Certification and Municipality Reviews (see Section 4.2.1)***
- ***Curtail Biddability and Constructability Reviews (see Section 4.2.2)***
- ***Alternative Project Delivery Process Improvements (see Section 4.3)***

- ***Revise Team Structure and Roles (see section 4.1.1)***
- ***Standardize Project Execution Processes (see Section 4.1.2).***
- ***Project Management/Collaboration Tools (see Section 4.14)***
- ***Standardize Training (see Section 4.1.3)***

Development of Performance Metrics

As TWDB has no performance metrics for the existing process, it will be important to develop process performance metrics, or Key Performance Indicators (KPIs) that measure progress toward the TWDB strategic objective of improving productivity of the project teams to meet increased program demands. Since the strategic objective is to increase the number of projects completed by the project teams in a given time period, KPIs related to number of active projects and percentage of projects on schedule are likely to be the most meaningful metrics. While much in the life cycle of a TWDB funded project is outside the control of the TWDB teams, project elements performed by the TWDB could be tracked against an initial (baseline) project plan or against goal durations. Development of metrics will be dependent to a great extent on the capabilities of the tools and technology selected by TWDB to support the work of the project teams.

Implementation

FNI recommends the TWDB develop a Change Management Plan (CMP) to support implementation of the recommended improvements. The CMP should include a detailed project plan with discrete tasks required to implement the changes; timeline; communication plan; strategies to address resistance; transition plan to accommodate on-going projects; and training plan to help staff adapt to the changes.

In general, successful implementation will follow this progression:

- ***Review, assess and adopt countermeasures:*** The TWDB executive team needs to carefully consider the proposed countermeasures and select which ones to implement.
- ***Define changes in organizational structure, roles and responsibilities:*** Some of the countermeasures may result in changes in organizational structure, roles and responsibilities. These changes need to be defined and understood to be able to develop the revised project execution process.
- ***Develop revised project execution processes (workflow):*** The process mapping performed as part of this study can serve as a good starting point for developing the revised project execution process.
- ***Develop communication and document management protocols to support the revised workflow:*** Using the process map for the revised workflow, determine how communication between project participants is to occur, what documents and work products are to be exchanged, distribution lists, digital file structure, file naming conventions, and document management.
- ***Identify project management and collaboration tool requirements:*** Based on the workflow, determine what project management and collaboration tool capabilities and features are required to support the project execution processes.

- ***Develop metrics to monitor performance and initial performance goals:*** Considering the capabilities of the project management tools, develop metrics to monitor the performance of the revised processes.
- ***Configure tools to support the workflow, communication management protocols and performance metrics:*** Configure the tools as needed to support the workflow and produce the output needed by project team members.
- ***Develop the Change Management Plan:*** Developing a robust Change Management Plan CMP is a critical step to effective deployment of process improvements.
- ***Develop training program and materials:*** Develop of training materials to support the transition followed and standard/new employee training.
- ***Roll-out process improvements plan and preview training to senior managers:*** Make the initial roll out presentation to senior managers, listen and address their concerns and incorporate their feedback into the materials to be presented to the general staff. Support of senior managers is essential for successful implementation.
- ***Roll-out process improvements plan to general staff:*** When the tools are configured and tested, training materials and technical resources in place to answer questions and address issues, roll out the process improvement plan to the general staff and provide the initial training.
- ***Provide a means for feedback and continuously improve the process:*** Consider using a survey to get feedback from staff on the process improvements, roll-out, communications, training materials, etc.

1.0 INTRODUCTION

The Texas Water Development Board (TWDB) offers a variety of loan and grant programs that help communities throughout the State of Texas fund planning, acquisition, design and construction of critical water related infrastructure projects. An integral part of its funding programs is a detailed engineering review of the funding application, planning, design and construction documentation prepared by the project owners and their consultant teams. These reviews serve as due diligence on behalf of the State of Texas to ensure compliance with program requirements, state and federal design requirements, and good engineering practice. TWDB funding programs have grown significantly and as the number of projects has increased, there has also been an increase in the size and complexity of projects and, in recent years, more frequent use of collaborative project delivery methods (Design-Build (DB) and Construction Manager at Risk (CMAR)) which has increased the workload on its project review staff.

TWDB is continually seeking to improve its processes to allow it to meet its statutory responsibilities while meeting the needs of its stakeholders, including being able to accommodate the various types of project delivery methods available to owners. Therefore, in the spring of 2020, the TWDB solicited Statements of Qualifications (SOQ) from consultants to provide an assessment of its engineering review procedures to which Freese and Nichols Inc. (FNI) responded and was ultimately selected to assist the TWDB with this effort.

The TWDB's need for improved efficiency is to produce more work with the same number of resources. The TWDB's workload was already high and increasing even before the addition of the new Flood Infrastructure Funding (FIF) program, which will add many more projects to its caseload in a very short period of time. Increasing staffing levels significantly at the TWDB is not likely to occur, and even if it is possible, takes considerable time. The approach proposed by FNI was to utilize continuous improvement problem solving processes to assess the current work procedures, look for bottlenecks, redundancies, or other impairments that when alleviated, would increase efficiency by reducing the person-hours required to perform the work, and thereby increase the number of projects that can be processed concurrently, or shorten the schedule and thereby increase production rates.

The assessment performed by FNI was a highly interactive and collaborative effort with TWDB staff. FNI wishes to acknowledge the effort and express profound gratitude to the many members of the TWDB staff that contributed to our understanding by providing feedback through workshops, surveys, and one-on-one discussions. Their insight into the project review processes, workflows and tracking database functionality was both essential and invaluable.

1.1 SCOPE OF WORK

FNI's scope of work is summarized below. The full contractual scope of work is included in **Appendix A.**

Task 1 – Data Collection/Review and Executive Alignment

- Meet with TWDB Regional Water Project Development (RWPD) group executive leadership team to align approach with TWDB expectations
- Collect and review all available and pertinent information including guidance documents, checklists, Texas Administrative Code (TAC) rules, etc.
- Review TWDB tracking database, TxWISE

Task 2 – Programmatic Requirements and Existing Process Mapping

- Review State and Federal programs, TAC rules found in in Title 31, Part 10 (TWDB), Chapters 354 (Memoranda of Understanding (MOU)), 363 (Financial Assistance Programs), 364 (Model Subdivision Rules), 365 (Rural Water Assistance Fund (RWAF)), 371 (Drinking Water State Revolving Fund (DWSRF)), and 375 (Clean Water State Revolving Fund (CWSRF)), Title 30, Part 1 (Texas Commission of Environmental Quality (TCEQ)), Chapters 210 (Reclaimed Water), 217 (Design Criteria for Domestic Wastewater Systems), 290 (Public Drinking Water); Intended Use Plan (IUP) and Disaster Relief programs; and Environmental Protection Agency (EPA) SRF eligibility handbooks and Water Resources Reform and Development Act (WRRDA) 2014 guidance specifically for obligations for technical or programmatic reviews by TWDB project reviewers.
- Develop process maps for existing engineering review procedures

Task 3 – Staff Interviews and Workshops

- Verify accuracy of process mapping
- Determine consistency of procedures between reviewers
- Obtain input on inefficiencies

Task 4 – Resource Requirements

- Obtain input on time split between administrative, engineering and correspondence using actual data where possible
- Estimate hours by task to assist with evaluation of staffing requirements

Task 5 – Root Cause Analysis and Process Improvement Recommendations

- Develop a root cause analysis to identify focus areas for process improvements
- Develop potential countermeasures to address root causes

- Conduct a workshop with Executive Team to present root causes and potential countermeasures, gain input for prioritization of countermeasures
- Develop recommended implementation plan
- Develop recommended process performance metrics to support

Task 6 – Presentation to Executive Team and Final Report

- Conduct a final presentation with Executive Team to present findings, root causes and potential countermeasures
- Prepare final report

1.2 APPROACH

The TWDB's goal for this project was "to ensure that TWDB's project reviews and tracking are being conducted as efficiently as possible and to ensure those reviews are focused specifically on TWDB's role as defined in rule, regulation, programmatic guidance, policy etc." Determining whether a process is "efficient as possible" is a rather nebulous objective. Efficiency is defined as "effective operation as measured by a comparison of production with cost (as in energy, time, and money)." An assessment of efficiency requires measures of inputs and outputs over time (i.e., manhours/project, number of projects/reviewers/year, etc.) and a comparison of those metrics to historical data or benchmarking against similar operations. However, the TWDB does not utilize these types of metrics, so another means of assessing the project review processes was needed. FNI's approach was to evaluate the review process for operations that were identified by the TWDB project reviewers themselves as inefficient (i.e., requiring time/effort out of proportion to the importance of the task), challenging, or frustrating. Additionally, FNI looked for inconsistencies between project teams, deviations from written guidance, work arounds and bottlenecks.

TWDB also wanted to assess its tracking systems, which consist of guidance documents, checklists, the On-Line Application (OLA) portal, and the TWDB's project tracking database, TxWISE. TWDB provided FNI access to the tracking systems, which the team reviewed, and then interviewed and surveyed project reviewers to capture issues and shortcomings the reviewers have experienced, as well as issues observed first-hand by the FNI project team.

The FNI project team utilized a Continuous Improvement problem solving methodology referred to as the Define Measure Analyze Improve Control (DMAIC) process, as illustrated below in **Figure 1**.

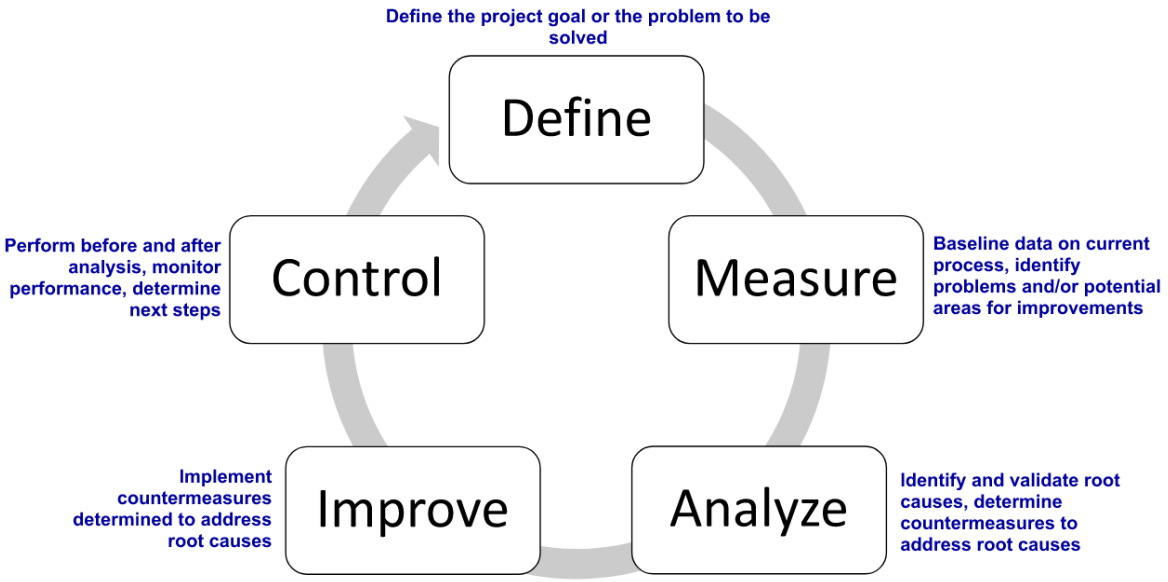

Figure 1: DMAIC Approach Diagram

FNI's scope of work extends through the Analyze phase, which includes formulation of potential countermeasures to address problems identified in the Define and Measure steps, analysis of the feasibility of potential countermeasures, and assistance with an implementation plan. The Improve and Control phases are steps that TWDB will take at the conclusion of this study to implement selected countermeasures (Improve phase) and monitor the results of the improved process over time (Control phase). The process is presented as a continuing sequence indicating that the process will be evaluated and improved continuously on a go-forward basis.

Define Phase

In the DMAIC process (and any problem-solving approach), the problem definition phase is crucial to the success of the process improvement effort. Albert Einstein once said, *"If I had 60 minutes to solve a problem, I would spend 55 minutes defining it and 5 minutes solving it."* Malcolm Forbes said it another way: *"It's so much easier to suggest solutions when you don't know too much about the problem."* Without a clear understanding of the root causes of the problem, there is a high likelihood that solutions will treat the problem's symptoms and may not actually address the underlying root causes.

Process improvement efforts are often undertaken to address gaps between actual performance and performance goals as defined by specific performance measures. The gap between actual performance and the performance goal can be translated directly into a problem statement. For example, if a fire department has a goal average response time of 10 minutes, but their actual average response time is 12 minutes, the problem can be stated as follows:

> Example Problem Statement: The department's average response time exceeds the goal response time by 20%.

Because the TWDB does not have performance metrics for the project review process, the FNI team could not develop a problem statement based on a specific performance gap. Instead, the team translated the TWDB's objectives into a Goal Statement, as follows:

> Goal Statement: The project review process needs to improve to handle increasing workloads.

As part of the problem definition step, the FNI team developed process maps of the existing review process based on guidance documents, checklists, and the experience of FNI's project team members to document our understanding of the workflow used by project reviewers. The process for development and validation of the process maps is described in Section 3.1 Existing Process Documentation.

Measure Phase

Because the TWDB had no performance metrics to help identify problem areas in the project review process, FNI gathered data directly from the project reviewers. The process maps were presented in workshops with project reviewers to validate FNI's understanding of the workflows and inputs and outputs of the project review processes. The review of the process maps was also used to stimulate discussion with project reviewers to identify bottlenecks, inefficiencies, and frustrations. Subsequent to the workshops, FNI developed an on-line survey to gather additional data and expand on issues identified in the workshops.

Analyze Phase

FNI captured the comments from the workshops and survey and condensed those comments into short issues statements. The team then stratified the issues statements into related or dependent groups and developed a fishbone (Ishikawa) diagram to aid in identifying potential root causes. After the root causes were identified, the team brainstormed a number of potential countermeasures for each root cause.

2.0 REGULATORY/PROGRAM REQUIREMENTS REVIEW

The TWDB is a state agency primarily responsible for water planning and for administering water financing for the state. An abbreviated organizational chart for the TWDB is presented in **Appendix B** highlighting the RWPD teams and the other parts of the agency they interact with to accomplish project financing. The RWPD is responsible for providing engineering reviews of initial funding applications, engineering feasibility reports and construction documents. Within the RWPD group are six (6) regionally based teams and one statewide team which perform the reviews. The structure of the regional teams is illustrated in the organization chart in **Appendix B**.

The TWDB's vested powers and duties are shown in the Texas Water Code, Title 2 Water Administration, Subtitle A Executive Agencies, Chapter 6. In the exercise of its duties, the TWDB offers financing for water-related projects through multiple funding programs. Many of these programs are listed below in **Table 1** and in **Table 2** with their pertinent Texas Water Code (TWC) and TAC sections. Also included are the two federal state revolving funds made possible by capitalization grants from the EPA.

Table 1: List of TWDB Financial Assistance Programs

Program Name
Agriculture Water Conservation Loans
Clean Water State Revolving Fund (CWSRF)
Drinking Water State Revolving Fund (DWSRF)
Economically Distressed Areas Program (EDAP)
Flood Infrastructure Fund (FIF)
Rural Water Assistance Fund (RWAF)
State Participation Program (SP)
State Water Implementation Fund for Texas (SWIFT)
Texas Water Development Fund (DFund)

Task 2 of the contract scope of work requires a review of regulatory authorities which authorize the TWDB's financial assistance programs, including the TWC, the TAC, MOUs, and the EPA regulations governing the two state revolving funds. **Table 2** below is a crosswalk of the various regulatory authorities governing the TWDB financial assistance programs. FNI was also provided and reviewed a listing of TAC sections focused on the engineering work product, shown in **Table 3** as well as a listing of relevant state design criteria codes, shown in **Table 4**. FNI reviewed these authorities to gain an understanding and background of the requirements of each program.

Table 2: Funding Program Regulatory Authorities

Program	Texas Water Code (TWC)	Texas Administrative Code (TAC)	U.S. Code (U.S.C.)	Code of Federal Regulations (CFR)
Agriculture Water Conservation Loans	Ch. 17, Subch. J	Chapter 367	n/a	n/a
CWSRF	Ch. 15, Subch. J, §15.603	Chapter 375	33 U.S.C. §1383 & Public Law 113-121 (WRRDA)	40 CFR Subpart K
DWSRF	Ch. 15, Subch. J, §15.6041	Chapter 371	42 U.S.C §300j-12	40 CFR Subpart L
EDAP	Ch. 17, Subch. K	Chapter 363, Subchapter E; Chapter 355, Subchapter B	n/a	n/a
FIF	Ch. 15, Subch. I & Ch. 16, Subch L	Chapter 363, Subchapter D	n/a	n/a
RWAF	Ch. 15, Subch. R	Chapter 365	n/a	n/a
SP	Ch. 15, Subch. E	Chapter 363, Subchapter J	n/a	n/a
SWIFT	Ch. 15, Subch. G	Chapter 363, Subchapter M	n/a	n/a
DFund	Ch. 17, Subchs. C, D, F, & G	Chapter 363	n/a	n/a

Table 3: TCEQ State Design Criteria TAC Code References

Project Type	TAC Section	Subchapter(s)
Reclaimed Water	§210	A - F
Wastewater Systems	§217	A - M
Water Systems	§290	D

Table 4: TAC Code References by Engineering Work Product

Work Product	TAC Code Section		
	DWSRF	CWSRF	State Programs
Application Required Information	§371.31	§375.41	§363.12: *General, Legal, & Fiscal* §363.13: *Preliminary Engineering Feasibility Data* §363.16 *Pre-design Funding Option*
Engineering Feasibility Report Review and Approval	§371.60	§375.81	§363.41: E*ngineering design approvals*
Contract Documents Including Plans & Specifications	§371.62	§375.82	
Advertising & Awarding Construction Contracts	§371.63	§375.83	
Inspection during Construction	§371.81	§375.101	§363.51
Alterations during Construction	§371.81	§375.102	§363.52
Certificate of Approval & Project Completion	§371.85	§375.105	§363.55
Remaining Unused Funds / Movement of Funds Between Projects	§371.74	§375.94	§363.44
Final Accounting	§371.86	§375.106	n/a
Release of Retainage	§371.88	§375.108	§363.56

FNI reviewed MOU's the TWDB has executed with the TCEQ and the Texas Department of State Health Services (DSHS) regarding cooperation with these agencies when a project is seeking specific funding from the TWDB. The MOUs specifically relating to engineering review are shown in **Table 5**.

Table 5: MOU's Regarding Engineering Review

TAC Rule	Title	Description
§354.3	MOU Between the TWDB and the TNRCC (now TCEQ)	Duties and responsibilities regarding the administration of the Drinking Water State Revolving Fund in Texas
§354.5	Letter of Agreement Between the TWDB and the TCEQ	Coordination of reviews of plans and specifications (and change orders) on water supply projects seeking funding from the TWDB
§354.6	Interagency Cooperation Contract between the Texas Water Development Board, the Texas Commission on Environmental Quality and Department of State Health Services	Public health nuisance surveys performed by the DSHS on projects seeking funding from the EDAP program

Next, FNI examined existing engineering project review internal guidance documents, forms, and checklists to gain an understanding of the actual work content and actions performed by TWDB

project engineers and reviewers, as required under Task 2b. A list of documents examined is shown in **Table 6**. To aid in the understanding of the programs and the engineering requirements, an additional review of the TWDB's externally available guidance documents, applications, forms, and checklists was also performed. These are found and are listed on the TWDB's website in the Guidance and Forms Library.

Table 6: List of TWDB Internal Guidance, Forms, & Checklists Examined

Review/Process	Documents Reviewed	Version Date
Application including Commitment Memo	Application Review_04.18.19_WSI_3022	April 18, 2019
Commitment Closing	Commitment Closing Review_08.02.18	September 4, 2018
Procedures for Release of Funds	Release of Funds_04.30.18	April 30, 2018
Engineering Feasibility Report	EFR Review_5.19.16	May 19, 2016
Plans & Specifications	Plans & Specs Review_10.15.18_WSI_3017 v1	October 15, 2018
	300 - Plans Specs Submittal Form	October 31, 2019
Biddability and Constructability Reviews	BC FINAL Document_JLD 9.28.15	September 28, 2015
	Generic Buildability Checklist_10-09-18	October 9, 2018
Construction-Phase Reviews including Change Orders	PCC example wording	no date
	Procedure for completing TxWISE construction phase reports_2019.19.19	January 11, 2019
	Change Order Review Proceedures_01-12-17	January 12, 2017
	TWDB Construction Site Visit_Guide 03.24.2020	March 24, 2020
	400 - Construction Award Submittal Checklist (Issuance of Concurrence of Award)	no date
	500 - Executed Construction Submittal Form (Issuance of Concurrence of NTP)	no date
Project Close Out	_Project Close Out_01.11.2019	January 11, 2019

Review/Process	Documents Reviewed	Version Date
Miscellaneous	AIS Guidance, TWDB-1106	July 28, 2014
	TxWISE-2020-02-28-Milestones_All_Programs_Engineer	February 28, 2020
	TAC Code Cheat Sheet_Engineer 2020-07-10	July 10, 2020
	Amending the Project Budget_06.21.17	June 21, 2017
	Davis Bacon Compliance Review Procedures_06.22.17	June 22, 2017
	Land Acquisition_Full Guidance_2.17.17	February 17, 2017
	WSI_3070_RWPD Board Participation Financing 2019-03-01_F	March 1, 2019
	Manager Process Review and Signatures	no date
	EDAP Planning Phase: Facility Engineering Plan / Scope of Services, WRD-023A	June 21, 2011
	AD Guidance_v.2_2020.10.13	October 13, 2020
	TWDB Overview of Requirements by Program, 4-30-18	April 30, 2018

Lastly, FNI reviewed the TWDB's newly released Alternative Project Delivery (APD) Guidance, TWDB-0570, to understand how the normal engineering review process changes when a project utilizes a delivery method other than the standard Design-Bid-Build (DBB) method.

The goal of the above effort is to identify requirements placed on applicants and procedures followed by TWDB engineering reviewers that may not be supported by rules, laws, and or regulations. The evaluation revealed that indeed, almost all requirements placed on funding assistance applicants can be found directly in the TAC and the associated general program outlines found in the TWC. Likewise, regarding the SRF programs, Texas and the TWDB have essentially codified both the SRF-sections of the enabling acts, Clean Water Act (CWA) and Safe Drinking Water Act, and the EPA regulations governing these programs, including the latest additions to the CWA enacted in the WRRDA Act of 2014. Two exceptions to the TWDB's compliance with rules and regulations, meaning current practices the TWDB is performing that are not deemed necessary, were noted as outlined in section 4.2.

2.1.1 *TCEQ Plans and Specs Review Authority*

TWDB review authority for the purpose of plans and specs review was compared with 40-CFR Subpart L to ensure consistency. It was determined that the federal code has left engineering review requirements to be determined by each state. The federal code has provided requirements only for environmental review procedures and has no guidance or code outlining engineering procedures or plans and specs review. The current state regulations for determining review authority are outlined in a MOU between the TWDB and TCEQ, 30 TAC 217, TWC 17.276, and TWC 26.034. The MOU between the TWDB and TCEQ, 31 TAC 354.5, outlines the requirements and actions the two agencies must take to fulfil the agreement. Recommendations relating to the regulatory review are presented in Section 4.2.

3.0 PROBLEM DEFINITION

3.1 EXISTING PROCESS DOCUMENTATION

3.1.1 *Methodology*

A component of the Define Phase of the DMAIC process is to document existing processes to improve understanding of existing workflows and aid in defining problem areas. For this purpose, FNI reviewed existing TWDB engineering review procedure documentation, training and guidance materials, and then developed cross functional diagrams, or swim lane diagrams. Swim lane diagrams show workflow as individual tasks in swim lanes (rows) assigned to the various process participants. Individual tasks are connected by arrows to illustrate the flow of work. The arrow connectors between tasks represent an exchange of work product or communication between participants. FNI developed swim lane diagrams for six (6) review processes, which are listed in **Appendix C**.

Table 7: List of Swim Lane Diagrams

Change Order Process
Commitment Closing Process
Engineering Feasibility Report Review Process
Funding Application Process
Plans & Spec Review Process
Project Close Out Process

FNI prepared swim lane diagrams to document basic engineering review procedures for the most generic funding program, the Texas Water Development Fund (DFund) program. It is acknowledged that review procedures vary somewhat between the different funding programs, but FNI determined that the efficiency issues identified during the study were systemic and applied to the review processes in general and not specific program(s). Additional process steps associated with the different funding programs compared to the DFund program are summarized in the following sections.

3.1.2 *Additional Process Steps for Special Programs*

In addition to the standard review procedures for all funding program projects, certain programs require additional steps/procedures for the applicant and project reviewers, as follows.

Application Phase:

State Revolving Funds (SRFs)

The project reviewer must identify the IUP List Year by accessing the Project Information Form (PIF) and the associated IUP. The list year and PIF are in TxWISE while the IUP is accessible on the TWDB website or from Program Administration and Reporting. The project reviewer must then compare the project description on the PIF with that in the application and understand the project's score, as each project must address the score it received in the IUP process. Similarly, the reviewer will also identify a project requesting Green Project Reserve (GPR) funding and will verify eligibility by reviewing the PIF and the appropriate IUP and project lists. If required, the reviewer project reviewer should engage the GPR review lead or a team designee for their review of the GPR aspects of the application.

A number of federal forms are required to be submitted with the application and a coordination with the TCEQ is initiated with regards to the Clean Air Act and the State's Water Quality Management Plan (WQMP) (CWSRF wastewater projects only). The Federal Forms and Application Coordination Milestone 4140 is loaded into TxWISE which contains three checklist items: Clean Air Coordination Initiated (a transmittal letter plus the application Preliminary Engineering Feasibility Report); a letter to the TCEQ WQMP team regarding the application and transmittal of the Designated Management Agency (DMA) form; and a confirmation that the federal form EPA-424D (Assurances) was received with the application.

Lastly, the project reviewer will ensure the proper Disadvantaged Business Enterprise (DBE) forms are included with the application for all CW & DW SRF "Equivalency" applications. At a minimum in these instances, the TWDB-0215 form should be included with the application.

SWIFT

A review similar to the SRF review occurs with State Water Implementation Fund (SWIFT) Abridged Applications although SWIFT Abridged Applications receive a "PIF" number. SWIFT Abridged Applications and Prioritization Scores are also found on the TWDB website.

EDAP

For EDAP applications, Milestone 3900 Preliminary EDAP Eligibility is loaded. The project reviewer must ensure that the project qualifies for EDAP funding by completing three checklists for system inadequacy (includes possible DSHS coordination for a nuisance determination, the determination that the project service area Annual Median Household Income (AMHI) is not greater than 75% of the State's AMHI and determine compliance with 31 TAC §363.503(4), a residential area was located in the project area as of June 1, 2005. Lastly, the TWDB will check the EDAP Cost per Connection of the EDAP portion of the project against the TWDB Board approved benchmarks.

Agricultural Water Conservation Loan Applications

For an Agricultural Water Conservation Project that includes construction, all of the normal procedures are followed except that an Engineering Feasibility Report (EFR) must be submitted and approved prior to the application being presented to the TWDB Board for funding commitment.

Commitment, Closing, and Release of Funds:

SRF Programs Equivalency Funding
The project reviewer will confirm with the DBE Coordinator that all DBE forms have been received and approved for all services that are to be funding by the funds requested to be released.

For CWSRF Equivalency projects only, the project reviewer must document that the applicant certifies that procurement requirements for the hiring of architects and engineers have been followed. TWDB-1108-A.

For all SRF applications that include principal forgiveness when Outlays = Escrow, the project reviewer must make sure that an appropriate Ceiling Increase Authorization and/or Escrow Release Authorization Memo has been created and approved and that the appropriate budget ceilings have been completed in TxWISE for the funds to be released.

In addition, all SRF projects must submit both a Monthly Davis-Bacon Water Rate Certificate of Compliance (DB-0156) and a Monthly American Iron and Steel Certificate (TWDB-1106-A) with monthly Outlay reports.

EDAP
As with SRF above, for all EDAP applications when Outlays = Escrow, the project reviewer must make sure that an appropriate Ceiling Increase Authorization and/or Escrow Release Authorization Memo has been created and approved and that the appropriate budget ceilings have been completed in TxWISE for the funds to be released.

Engineering Feasibility Report:

EDAP
The procedures contained in the EFR guidance document focus on EFR requirements for Federal and State funded projects with the exception of EDAP. A brief general overview of EDAP's EFR (or Facility Engineering Plan) review is included in Section 3 of the guidance document and will follow the EDAP – Planning Phase, Facility Engineering Plan / Scope of Services (Document WRD-023A, revised 6/21/2011).

Plans and Specs Review:

Agricultural Water Conservation Loan Program
Since the typical P&S review is geared for water and wastewater projects, the project review will be mainly for programmatic requirements. The project reviewer shall ensure that the TWDB Supplemental Contract Conditions for State Loan Projects (TWDB-0552) are included in the contract documents, including U.S. Iron and Steel requirements. In addition, the project reviewer will request that the entity's consulting engineer submit a signed and sealed statement certifying that the project complies with design criteria applicable to the project and any local standards and requirements.

Change Order Review Procedures

SRF Programs
For SRF projects, the project reviewer will review the change order to make sure that, if needed, updated DBE forms are provided. Updated TWDB-0373 (Entity and prime contractor) and TWDB-0217 (prime contractor) forms are needed if:

1. contract is increased by 25% or more of original contract cost, OR by $500,000 or more, whichever is less,
2. if the scope of the project is significantly changed, or
3. If a new subcontractor is hired.

Some exceptions apply. Note Attachment #1 to the guidance document.

Project Closeout

SRF Programs
In addition to standard requirements, projects funded by the SRFs must include the Final American Iron and Steel Certification (TWDB-1106). Also, Fiscal Sustainability Certification (TWDB-1700-A) is required of applicants that do not utilize bonds.

State Programs
In addition to standard requirements, projects funded by State programs must include a final Certificate of Compliance with the U.S. Iron and Steel requirements found in Texas Water Code Section 17.183 and/or Texas Government Code Chapter 2252, Subchapter G, as applicable. (TWDB-1105)

Flood Infrastructure Fund

The Flood Infrastructure Fund (FIF) is the newest of the TWDB funding programs which was created by the Texas State 86th Legislature and saw its first funding commitments in late 2020. FNI was not able to consider engineering review procedures for this fund as these are still being developed at the TWDB. The program authorizes four categories of projects, only one of which follows the normal Regional Water Project Development (RWPD) review procedures, Category 2, which can fund the planning, acquisition, design, and construction of projects that mitigate against flooding. For this first round of funding, the FIF utilized specific application forms tailored for each of the four categories and not the standard application, and the TWDB created specialized external guidance documents to assist applicants in creating a FIF EFR and Plans and Specifications (P&S). To our knowledge, internal engineering review procedures were not provided and therefore FNI would only be speculating as to the engineering review process.

3.2 INTERVIEWS AND OPINION SURVEY

FNI facilitated several workshop-style interviews with project engineers and project reviewers. The purpose of the interviews was as follows:

- Verify accuracy of process mapping

- Determine consistency of procedures between reviewers
- Obtain input on inefficiencies

3.2.1 *Team Makeup*

The interviews were conducted over a series of four (4) separate meetings; one with more experienced staff, one with lesser experienced staff, one with a mix of both experienced and inexperienced staff, and one with experienced staff that review projects utilizing Alternative Project Delivery (APD) methods in order to get a variety of perspectives. All participants in the workshops work within the RWPD team as project engineers, project reviewers or team leaders. Generally, each workshop had only one representative from a regional team. The workshops were held virtually due to the ongoing COVID19 pandemic, but the discussion was not impaired by the virtual format, there was excellent participation, and FNI received invaluable feedback. Lastly, Michael Brooks, a project reviewer on RWPD Team 3, gave FNI staff a demonstration on how project reviewers interact with and utilize TxWISE.

3.2.2 *Meeting Topics*

The workshops were focused on four (4) areas of the project review process FNI believed were the most important to understand. These consisted of EFR Review, P&S Review, Application Review, and APD. Each meeting began with an introduction during which FNI explained the goals and objectives of the interview and provided a general overview of the draft swim lane diagrams. The team then performed a detailed review of the swim lane diagram and provided comments, and at the same time, engaged in a discussion in which TWDB participants described inefficiencies, bottlenecks, and frustrations they have experienced. These observations and comments became the basis for the issues included in the root cause analysis as described in Section 3.6.

3.2.3 *Opinion Survey*

In addition to the workshop interviews, FNI developed an opinion survey using a web-based platform to gather additional information on issues that were raised in the interviews. Also, because TWDB has no way of tracking the division of work hours between engineering, programmatic reviews, and coordination, the survey included questions to help develop some basic data on the time reviewers spend on different elements of their duties. The survey was sent to all staff who participated in the interviews, and the response rate was excellent (85%). Information gathered from the survey was compiled with data from the interviews for the root cause analysis.

3.3 ALTERNATIVE PROJECT DELIVERY REVIEW

FNI reviewed the TWDB APD guidance document and as mentioned previously conducted an interview workshop with TWDB project reviewers with the most experience with the application of APD and TWDB funding programs.

As it relates to the various project delivery methods utilized under Texas law for the delivery of water infrastructure projects, the review determined that there are no abnormalities in TWDB's project review approaches for CMAR or DB delivery in comparison to the processes utilized for DBB delivery. In the opinion of the FNI project team, the TWDB staff's understanding of the nuances with CMAR and DB delivery as well as their willingness to work with applicants to use these delivery methods within the requirements of state and federal program requirements is commendable. Several states have struggled to implement DB and Guaranteed Maximum Price (GMP) proposals before final design on CMAR because they cannot achieve a common understanding with applicants on the design requirements for approval of the project to proceed into the construction phase of the contract. This does not appear to be an issue with TWDB.

However, there is a challenge with review of APD that is currently beyond TWDB's control, can (and already has) significantly impact the workload of project reviewers and create additional inefficiencies, and that is multiple construction packages. Multiple construction packages appear to be particularly problematic with CMAR, as state law requires the CMAR to bid out the entirety of the project direct field work and most CMAR will create multiple bid packages to address the various disciplines required (as opposed to bidding the entire project to multiple general contractors). The situation is further complicated if the applicant and the CMAR desire to move into construction early and further break up the project into early-out procurement or delivery packages. What was once a single project to review and coordinate through construction essentially becomes multiple projects. In one example cited by a TWDB project reviewer, a $17M project was broken down into 30 work packages.

It should be noted that appropriate project packaging can be beneficial to construction delivery (and therefore Owners), and likewise, early-out bid packages, especially when certain elements of the project require additional planning, design, or acquisition time to manage unique risks. Further, accelerated purchasing of major equipment can benefit the overall project, especially during times of increased commodity volatility or potential for component shortages. This said, there is no requirement in Texas for each of those packages to be managed as an individual project. In fact, managing them as individual projects minimizes at least one of the benefits expected through CMAR and DB, and that is reduced coordination. If the project was DBB, the subcontracting packages of the general contractor would not become the responsibility of the TWDB for review. Likewise, there should be a way for TWDB to build on the solutions-based approach taken thus far to reduce the number of packages requiring review under a DB or CMAR general contractor.

3.4 TXWISE REVIEW

For the review of the TxWISE system, TWDB provided FNI with Virtual Private Network (VPN) access to the testing environment for TxWISE. FNI conducted a hands-on assessment within the testing environment, then supplemented that review with an email survey of TWDB project reviewers to capture common issues/complaints, and finally an in-person workshop with Michael Brooks, a TxWISE superuser.

During the internal review, the FNI team attempted to simulate the project management process inside the system. This was a whole-system engineering-related evaluation that investigated all

modules and processes after project setup. To help focus the team, a short email survey was sent to TxWISE users inside the TWDB to help identify real-world issues that are faced by users on a regular basis. The replies were then grouped into ten primary categories.

For the in-person workshop, Michael Brooks guided the team through an example of his daily activities inside the system that provided deeper insight, clarification, and confirmation of issues identified in the internal review and the email survey.

The primary issue identified through this effort is a disconnect between what the system is capable of doing, and what project reviewers said should be able to do to support the review processes. Simply put, the system functions primarily as a documentation system meaning that users put information into the system, but it does not provide easy access to retrieve data from the system to effectively manage their projects. Key deficiencies include:

- Lack of notifications/status updates when critical milestones are due or have been completed,
- Lack of status reports that summarize changes to projects between logins
- Reports generated by the system are either incorrect or incomplete
- Documents are centrally housed and unaffiliated with their relevant process or milestone

Moreover, project reviewers cited the inability of TxWISE to function as a collaboration tool to track activity and support project communications. The design limitations of TxWISE prohibit the system from being used in this manner. A common, related complaint is the 'one user at a time' limitation which creates instances where a single user can accidentally lock up an entire project by not logging out correctly. TxWISE is a local application run through a web browser and so requires VPN tunneling to access, and this extra barrier often incentivizes project managers to reduce team member involvement which further prevents the program from being a collaborative space.

Project reviewers expressed (and FNI's review team agreed) that TxWISE provides an unintuitive user experience that increases system mastery time while driving down system adoption. A frequently cited example is the budget management and modification module. Users noted that creating budgets is tedious and confusing since they are maintained at the project level but modified at commitment level. The system also uses domain specific language inside the budget module that is not self-explanatory to the common user which causes confusion. Another issue is the nesting of checklists which does not allow the user to quickly assess the status of their own responsibilities or where a lack of activity (by the reviewer or others) may be holding up project progression.

3.5 PROCESS REVIEW FINDINGS

The purpose of documenting the existing process, conducting interviews and the opinion survey was to bring to light bottlenecks or other inefficiencies in the current workflow that, if alleviated, would improve efficiency and increase productivity. Reducing the number of person-hours required to review a project, shortening the schedule, or both, would increase the number of projects completed in a given time period by the same number of reviewers. Often it is possible to relieve bottlenecks with one or more of the following actions:

- Improving ease and/or timeliness of communication between project participants to reduce cycle times
- Identifying tasks that can be performed concurrently
- Eliminating redundancies or unnecessary tasks
- Improving quality of inputs/outputs to reduce rework
- Improving consistency (standardization) of inputs/outputs to improve efficiency of preparation and processing of work products

These actions are the "low hanging fruit" because they usually do not require redefining project roles or changes in the organizational structure, and there is little or no risk in making these types of improvements. FNI's review of the existing process documentation revealed relatively few bottlenecks that can be alleviated by these first level actions. The reason for this is understandable upon review of the swim lane diagram. The project reviewers are responsible for the vast majority of the tasks in the review process. The process is very linear, with little interaction with other project participants. A few instances of redundancies and communications improvements were observed, but nothing that would yield appreciable improvement.

A second level of actions that can often yield major improvements in efficiency are as follows:

- Shifting tasks from overcommitted resources to underutilized resources
- Shifting tasks to resources best equipped to perform them
- Improving tools or technology

These actions are more disruptive to the organization because they require at least a redefinition of roles and responsibilities. Often these actions require additional training, and possibly even additional resources. Many times, these actions require a significant capital investment in new technology or major modifications to existing systems. It is essential before undertaking these kinds of actions that the actual root causes of the problems have been identified to ensure that changes are addressing the real issues and not just symptoms. The root cause analysis performed by FNI is presented in Section 3.6.

3.6 ROOT CAUSE ANALYSIS

3.6.1 *Root Cause Identification*

The FNI team developed short descriptions of the issues of concern identified from the workshops and opinion survey, organized them into groups of related issues, and then developed a category name to serve as headings on a fishbone (Ishikawa) diagram. The issues were then added to the fishbone diagram, and the team asked the question about each issue "why is it that way?" The reasons for the issues were added as additional layers on the fishbone diagram until the team believed it had identified the root cause of each issue. The resulting fishbone diagram is presented in **Figure 2**, and a discussion of the root causes is presented in the following sections.

TWDB Engineering Review Process
Root Cause Analysis

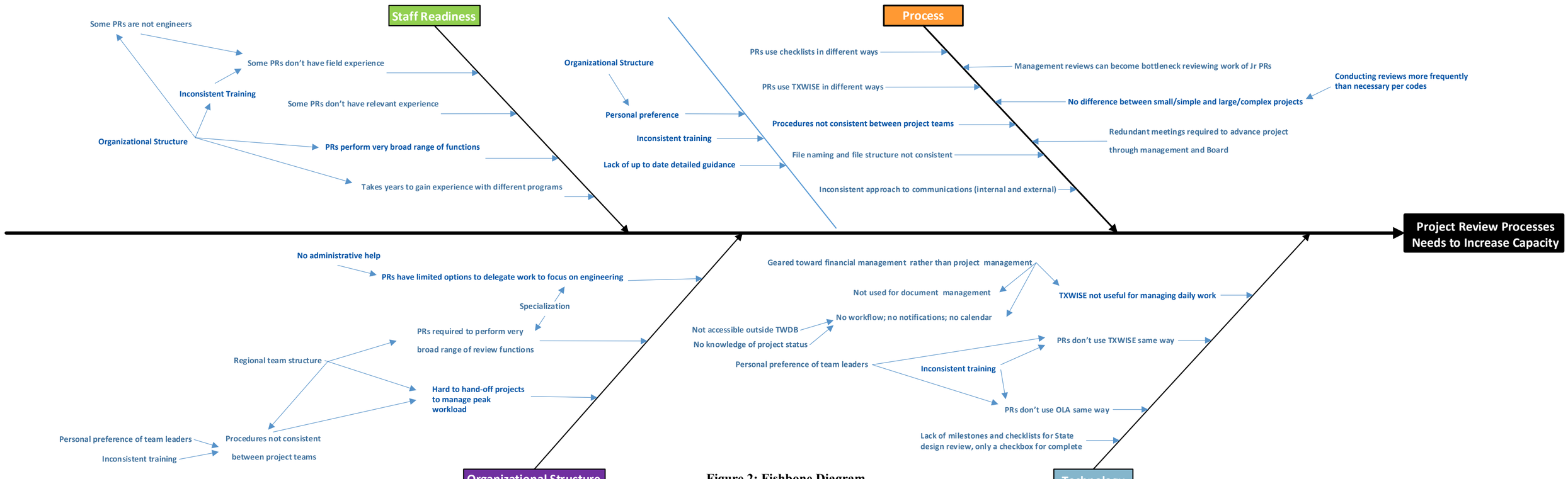

Figure 2: Fishbone Diagram

The issues of concern were grouped under the following main headings:

- Staff Readiness
- Processes
- Organizational Structure
- Technology

Many issues are interrelated and appear under more than one heading. Ultimately, FNI identified the following root causes:

- Team Structure
- Project Reviewers Perform Broad Range (Too Many) of Functions
- Inconsistent Training
- Lack of Project Management/Collaboration Tools in TxWISE

The root causes and their relationship to the major issues of concern cited by TWDB staff and observed by FNI are discussed in the following sections.

3.6.2 *Root Cause: Team Structure*

Team structure was cited as the cause of several issues impacting efficiency and throughput. The current structure is based on "fixed membership" teams defined as a team in which individuals within the larger organization report and work solely and directly with members amongst their fixed group. The teams are generally comprised of the following:

- RWPD Team Manager
- Sr. Engineer
- Engineer(s)
- Project Reviewer(s)
- Environmental Reviewer
- Financial Analyst
- Attorney
- Administrative Assistant

There are strengths and weaknesses to any organizational structure. A strength of the current fixed membership team structure is the opportunity for team members to work together consistently and develop strong team dynamics over time. Theoretically, this structure should enhance the team's performance through a shared sense of purpose, commitment to other team members, more

effective communications and a higher level of trust compared to dynamic, project-by-project team composition. Dedicating teams to regions presents the opportunity for the team members to gain a deeper understanding of the local issues and the communities in the region.

There are also potential weaknesses of the fixed membership team structure. The fixed membership team structure appears to contribute to a lack of consistency in work processes between teams, with each team developing its own process variations based on the preferences of the team. The structure is prone to the isolation of engineering reviewers on separate teams with reduced opportunities to transfer best practices between teams that occurs more organically in a dynamic, project-by-project team membership environment. The fixed member team structure is also vulnerable when a staff member leaves or is absent for an extended time and it becomes necessary to backfill that position on a temporary basis with staff from another team.

A potential weakness of the regional structure is its potential for greater imbalances in workload, if not in the number of projects, then in terms of project complexity, with regions containing large metropolitan areas presenting larger, more complex projects (including more projects with APD methods). The workshop participants indicated that on occasion projects are handed off from one team to another to level workload, which in theory should benefit the owner with more timely reviews, albeit at the cost of the local knowledge possessed by the regional team. However, it was noted by the workshop participants that handing off projects was often a challenge because of inconsistent work procedures between teams.

Workshop participants also noted that project reviewers have limited opportunities to delegate correspondence, document control or other administrative type work within their team structure. Although this is a potential cause for bottlenecks at the project reviewer, it appears to be more a role definition issue than an organizational structure issue.

3.6.3 *Root Cause: Project Reviewers Perform Broad Range (Too Many) Functions*

A review of the swim lane diagrams dramatically illustrates the very broad range of functions required of the project reviewers. Discussions with the project reviewers during the workshops quickly revealed the challenge for even the most seasoned reviewers to possess the background, training and experience necessary to handle all the various tasks involved in reviewing projects. Project reviewers are required to perform project management, technical design reviews, constructability reviews, financial administration, document control and more. Adding to their challenge is the large number of TWDB funding programs, each with its own unique requirements and nuances.

While it is quite evident that TWDB project reviewers are highly capable and dedicated to providing superior service, they possess disparate technical backgrounds, levels of experience and training. Some are experienced engineers familiar with water infrastructure projects, others do not possess that background and are gaining that experience on the job. Less experienced reviewers are challenged with having to learn about widely varying types of water infrastructure projects and the complexities of the various TWDB program requirements at the same time. Even experienced civil engineers are unlikely to have a functional knowledge of all the different types of infrastructure projects they are likely to encounter. This issue will be compounded by the addition

of stormwater infrastructure projects under the new FIF program to their workloads, at least Category 2 projects.

3.6.4 *Root Cause: Inconsistent Training*

During discussions with current project reviewers, it became apparent that the training of project reviewers was inconsistent between individuals and between teams. The inconsistencies were related to the use of checklists, guidance documents, internal and external communications, document control, and tracking tools including TxWISE. The fixed membership team structure is not necessarily the root cause of this issue, but the team structure likely contributes to the problem due to the variations between teams in project execution processes.

3.6.5 *Root Cause: Inconsistent Project Execution Procedures*

The workshops revealed notable variations in project execution procedures between the different project teams. Some variation is to be expected, but even the reviewer participants in the workshops seemed surprised by the different interpretations of guidance documents, uses of checklists, OLA tool and TxWISE. It was noted that file structure and file naming variations made it challenging to participate in other teams' projects and made handing off on-going projects very difficult. There are a number of potential causes for this variability, including a lack of standards (or lack of enforcement) and inconsistent training. The fixed membership team structure is not necessarily the root cause of this variability, but certainly contributes to the problem where each team develops its own methods and adaptations based on personal preferences of the team leadership and members.

Project reviewers noted that there are no significant differences in review procedures for small, simple projects compared to large, complex projects. Clearly, the amount of review time and effort for small projects is less than large, complex projects, but the reviewers suggested there may be opportunities for simplification of the review processes for small projects that could reduce their workload, shorten review times, and allow reviewers to prioritize their time to larger, more complex projects.

3.6.6 *Root Cause: Lack of Project Management/Collaboration Tools in TxWISE*

The project reviewers cited a number of concerns related to technology that impacts their productivity. The primary concern was the amount of effort required to populate and maintain the TxWISE database. Project reviewers understand that TxWISE was created specifically to document compliance with programmatic requirements and support reporting and audits to the EPA, but the consensus of the group is that it requires an inordinate amount of effort with little or no benefit to their day-to-day project management effort. For example, TxWISE does not provide any functionality in the way of workflow management, notifications, calendar, or document control to help reviewers keep track of the status of their projects. Moreover, the project reviewers

said that the TWDB has not provided separate project management software that could enhance collaboration with their teams and otherwise streamline operations outside of TxWISE.

Significant differences in the way different teams utilize TxWISE were noted during the workshops. As discussed in other sections, these procedural differences may be caused by inconsistent training, or a byproduct of the fixed membership team organizational structure.

4.0 PROCESS IMPROVEMENT RECOMMENDATIONS

Before potential process improvements can be identified, it is necessary to define the overarching strategies that will drive the desired improvement. The data clearly indicates that the primary strategy will be relieving the workload carried by project reviewers so they can handle more concurrent projects or move projects through the review process more quickly, or both. A second strategy will be improving production efficiency of the project reviewers and the entire project team through process consistency and enhanced management and collaboration tools.

Two obvious solutions to achieve these strategies are acknowledged and but are not included as potential countermeasures because they are considered to be highly impractical.

**** Increase engineering staffing levels:*** With the increase in workload due to both increased customer demand and adding new funding programs, it is clear the TWDB would benefit from more engineering review staff. This solution is not included as a potential countermeasure because it is perceived that the TWDB has little control over staffing levels due to legislatively established operating budgets. It is noted that with the addition of both the SWIFT and the FIF programs, the state legislature did increase the TWDB budget to add some staff. However, the Executive team commented during workshop meetings that hiring qualified staff has been difficult due to a strong economy and the COVID-19 crisis.

**** Replace TxWISE with an Enterprise Resource Planning (ERP) tool:*** TxWise was originally conceived as a reporting tool for the SRF programs. While financial and construction management tools have been added, it still offers limited to no project management tools. Engineering reviewers spend a lot of time uploading documents and clearing checklists and milestones and get very little benefit in terms of day-to-day management of their projects. An ERP is software and systems used to plan and manage all the core services, financial, and other processes of an organization. ERP systems typically have project management modules and can be customized by the vendor to suit the organization's particular needs. The full or partial decommissioning of TxWISE would allow employees to work with another system that increases flexibility and allows insight as well as increased capability. However, FNI recognizes the significant investment TWDB has in TxWISE and estimates it is unlikely the TWDB would be willing to undergo a wholesale change at his time. Indeed, the Executive team advised FNI that improvements to TxWISE are already being contemplated and researched but that scope of those modifications will not significantly improve its project management functionality.

4.1 POTENTIAL COUNTERMEASURES TO ADDRESS ROOT CAUSES

FNI considered all information gathered from the regulatory reviews, process documentation, opinion survey, and staff interviews and has developed potential countermeasures to address the root causes and process improvements to support the strategies of reducing project reviewer workload and improving production efficiency. These potential countermeasures are presented in the following sections.

4.1.1 *Countermeasure to Team Structure and Project Reviewers Perform Broad Range (Too Many) Functions*

As noted previously, there are strengths and weaknesses associated with the current fixed membership team structure. It is acknowledged that staffing levels are likely not going to increase significantly, and it is also recognized that there are significant challenges associated with reorganizing due to the need to maintain continuity of service to complete ongoing projects. Any number of modifications to the team structure could be devised, but this potential countermeasure (4.1.1) would provide the least disruption of on-going operations while continuing to support the regional structure because of the value regional teams add in terms of understanding local issues and the communities in the region.

One of the most difficult challenges of the current structure is the demand placed on project reviewers to be experts over a broad range of subjects, including project management, technical design, constructability, and programmatic requirements of TWDB funding programs. One way to reduce this burden is to offload the technical review portion of their workload and place it with others who are better equipped with the engineering background and experience to perform those duties.

FNI's opinion survey revealed that project reviewers estimate up to 40% of their time is spent on technical reviews. Offloading the technical review effort could allow project reviewers to focus on customer facing functions, providing overall project management, reviewing projects for programmatic requirements, and coordinating the many TWDB internal functions. Technical engineering review functions could be delegated to an engineering group that would serve all teams/regions, ensuring that technical reviews are performed by staff with the background and experience to provide technically sound reviews and better protect the interests of the State of Texas and project owners.

The centralized engineering group could be tasked with staying current on TCEQ design standards to relieve that burden from project reviewers. Capabilities within the engineering review team could evolve over time to develop staff with specialized strengths in water/wastewater utilities, water/wastewater treatment and stormwater projects. Staff with expertise in APD could be developed to serve as APD Coaches to provide support to project reviewers and the entire project team. See Section 4.3 below for more on APD. Likewise, staff with construction experience could perform constructability reviews and review construction budgets. See Section 4.2.2 below for more on biddability and constructability reviews.

TWDB currently has a contractual arrangement with the University of Texas at Arlington (UTA) to perform some planning and design reviews, site visits during construction and final acceptance inspections of TWDB funded projects. One option might be to increase the scope of the arrangement with UTA to perform more technical reviews of planning and construction documents. There may be a middle ground where TWDB staff reviews projects that are within the field of expertise of the project reviewer and anything outside the reviewer's expertise could be sent to UTA (or as a means of managing the reviewer's workload).

The opinion survey asked project reviewers what task(s) they would choose to delegate to improve their productivity if they had someone available to delegate that work. The most frequent responses were:

- Initial application review
- Budgets management, outlay requests

- Document control

To further leverage the time of project reviewers, it may be possible to offload additional duties such as administrative functions (correspondence, document control, TxWISE maintenance) so that reviewers can focus on project management, internal coordination of TWDB functions, and customer service elements of their duties.

There are many other organizational structures that could potentially improve efficiency if TWDB leadership wishes to consider them, but they would be harder to implement and create greater challenges during the transition.

4.1.2 *Countermeasure to Inconsistent Project Execution Processes*

As noted previously, the inconsistencies between project teams in how projects are executed is not necessarily caused by the fixed membership team structure but is likely contributing to the problem. Standardizing work procedures, file structure, file naming conventions, communications protocols, etc. alone can provide some improvement in efficiency. When processes, inputs, outputs, work products, and communications are consistent and repeatable, team members become more proactive rather than reactive, and there is less time wasted on clarifications and rework. However, the major benefit to standardization is the ability to share resources between teams with minimal loss of efficiency. If a project team member leaves the project, or simply requires additional support to meet a peak workload, resources from other teams can more easily step in to provide support if their teams work the same way, using the same procedures, delivering the same work products, and communicating with the same protocols. Resources such as administrative assistants and document control specialists can be used more effectively if everyone uses their services in the same way and inputs and outputs are standardized.

Another benefit of standardized procedures is the ability to identify the root causes of problems. If everyone is doing things the same way and something goes wrong, the question is asked, "did someone not follow the process or is it a problem with the process?" If the process was followed and a problem occurred, it makes it easier to identify the nature of the problem and improve the process to hopefully avoid a similar problem in the future. As process improvements are developed, they are incorporated into the standardized procedures for the benefit all teams, accelerating the dissemination of best practices across the organization.

Standardizing procedures also makes it easier to develop meaningful metrics to assess the performance of the operation over time. Performance metrics at the program and project level would be valuable to evaluate the effectiveness of staff in various roles and identify opportunities for future process improvements.

The process mapping performed in the definition phase of this assessment is a good place to start in standardizing procedures. Based on the process maps, it is possible to develop communications protocols, identify process steps that can be incorporated into structured workflows, generate status (ball-in-court) reports, create templates for correspondence, etc.

4.1.3 *Countermeasure to Inconsistent Training*

The organization would benefit from standardized training for all staff. Standard training for new staff and for staff members moving into new roles will go a long way toward reducing process

variability across teams and ensure that the training is consistent with the organization's preferred operating procedures. Ideally, training for a particular subject should be delivered by the person who is best equipped to provide the training, or at minimum, from a script prepared by persons with expertise in that field. There are many tools available to support this effort, but one of the most effective is on-demand, recorded sessions with live "how to" demonstrations to illustrate the use of TxWISE, checklists, guidance documents, etc. Many organizations create a library of training sessions on the organizations' intranet that can be deployed as basic training for new employees and available as "on-demand" resources for all employees. Additionally, designating experienced staff members as technical resources on a "help desk" to answer questions and provide technical support can reduce process variability by providing consistent responses to questions that align with preferred operating procedures. This approach can help avoid the development of inappropriate solutions or workarounds and can also help accelerate process improvements by tracking the nature and frequency of problems and identify the need for additional training and/or process improvements.

4.1.4 *Countermeasure to Lack of Project Management/Collaboration Tools in TxWISE*

Without a doubt, the biggest issue the project reviewers identified as impacting their efficiency and productivity (and frustration level) was the TxWISE tracking database. Reviewers understand the purpose of TxWISE as a support tool for reporting and audits to EPA. However, TxWISE provides little support to the reviewers as a tool for day-to-day project management. Issues and recommended improvements to TxWISE are presented in Section 3.4. A frequent comment from the reviewers was the need for technology to aid in project management. Tools for tracking schedule progress and status were mentioned most frequently, but there was also discussion of tools to support structured workflows, collaborative (studio type) review/editing tools, and standard document templates. Recommendations for enterprise-wide project management tools is beyond the scope of this review effort, but it is strongly recommended that TWDB consider the benefits of deploying project management tools to improve the efficiency and consistency of the work of the project reviewers. A list of such project management tools was delivered to the TWDB management team under separate cover.

4.2 RECOMMENDATIONS REGARDING REGULATORY REVIEW

Based on FNI's review of the regulations that apply to TWDB funding programs, we offer the following recommendations for consideration by the TWDB executive team. It should be noted that all review and recommendations provided by FNI in regard to legal citations and code references are to the best of our understanding as non-attorneys. It is recommended that TWDB staff consult with the TWDB General Counsel on any contemplated changes.

4.2.1 *Self-Certification and Municipality Reviews*

The TWDB reviews all plans and specifications on TWDB-funded wastewater projects per TWC §17.276. However, when a wastewater project does not receive TWDB funding, the TCEQ retains the authority for wastewater project plans and specification review. TCEQ has adopted two rule provisions that have the effect of reducing the number of TCEQ full P&S reviews performed by that agency.

TAC §217.8 – Municipality Reviews: This rule delegates specific wastewater collection system project approval authority to municipalities that have been granted such authority by the TCEQ under this rule and TWC §26.034(d).

The TWDB recognizes this rule and authority in its P&S Work Process Document, listed in **Table 6** above. This document relates to the TWDB meeting state design criteria and programmatic requirements. In this instance and as stated on Page 4 of the guidance document, "If a municipality has received review authority by TCEQ, the project reviewer shall: Request a copy of the review authority delegation letter from TCEQ, and review P&S for project eligibility and for compliance with programmatic requirements." Therefore, the TWDB is not required to conduct a review of state design requirements.

In another instance found in TAC §217.6, TCEQ does not require the submittal and approval of wastewater P&S for all others outside of the Municipality Reviews, only a summary transmittal letter that effectively allows a utility to certify that the plans and specifications are in compliance with all requirements of TAC §217. However, the TWDB does not recognize this form of project "self-certification" and performs a full P&S review as per the above TAC rules and guidance and as per TWC §17.276(d).

The TCEQ does not delegate review authority on most drinking water projects and performs P&S reviews on all applicable projects. A TWDB review of drinking water project P&S for state design criteria would be redundant in this case and could be limited to programmatic requirements to reduce the workload of project reviewers. It is noted that in the instances where the TCEQ has delegated review authority on water projects, the TWDB will still accomplish a review of state design criteria and programmatic requirements.

TWDB staff interviewed for this project stated that reviews of P&S consume a major portion of their time. The TWDB may want to consider adopting some form of self-certification procedure for wastewater projects similar to that found in TAC 217.6 as a measure to reduce project reviewer workloads. Likewise, the TWDB should avoid any duplication of effort on drinking water projects by recognizing TCEQ's review of the project for state design criteria.

4.2.2 *Biddability and Constructability Review*

FNI reviewed TAC code for requirements pertaining to the B&C reviews. The DWSRF and CWSRF programs regulations found in 31 Part 10 Chapter 371.62 & Chapter 375.82 "Contract Documents Review and Approval" were reviewed first. It was noted that for DWSRF and CWSRF projects, the TWDB is required to review contract documents to ensure construction drawings and specifications provide adequate information allowing a contractor to go to bid and construction with no further questions. 31 TAC Part 10 Chapter 363 was also reviewed to validate the need of biddability and constructability reviews for all other financial assistance programs. Aside from this requirement within the TAC code Chapters 371 and 375, no language stating the need for a B&C review to be conducted by the TWDB was found within EPA regulations, the Clean Water Act, Safe Drinking Water Act, and TWC were noted.

As stated above no regulatory statutes were noted to obligate the TWDB to perform B&C reviews. FNI believes that TWC 17.183(b) places the requirement for B&C reviews upon the professional engineer responsible for preparation of the construction documents. The TWDB should consider this as an opportunity to reduce time spent on reviews and discontinue this practice. If the TWDB continues to perform B&C reviews, it is recommended that B&C reviews be performed by staff with the necessary training and experience to perform meaningful reviews. In FNI's opinion, B&C reviews are best performed by staff with considerable construction management/inspection experience. Lacking that experience, the value added by project reviewers performing B&C reviews is questionable, and in fact, during our discussions with TWDB project reviewers, several stated they felt unqualified to perform B&C reviews.

4.3 ALTERNATIVE PROJECT DELIVERY PROCESS IMPROVEMENTS

As noted previously in Section 3.3, multiple construction packages, particularly CMAR delivery, have proven to be a workload challenge for TWDB project reviewers. Both industry expectations on the flexibility in these methods as well as Texas' statutory requirements for use of these methods contribute to a higher likelihood of DB and CMAR projects having multiple construction packages, at least in comparison to traditional delivery methods. Reducing the number of individual packages that must be reviewed would significantly benefit TWDB staff workload. To this end, the following recommendations are provided for consideration:

- ***Make a clear distinction between a construction package and a bid package and require applicants to only submit complete construction packages for approval.*** In our discussions with TWDB staff, an instance was cited where a $17M project was divided into 30 work packages, each requiring a separate review by the TWDB team. We can only assume that the elements of the project that were undergoing individual bids were submitted as construction packages rather than bid packages. This creates a fractured project review that does not benefit the applicant, TWDB staff, or the contractor. If a CMAR project is advanced all the way to final design before a GMP proposal is provided, it would be identical in delivery to a traditional DBB project with the only exception that the CMAR is managing the bid process, not the owner. In this case, the project is one construction package, not the multiple bid packages the CMAR must create to effectively bid out the work under the single package. TWDB can and should require logical and complete construction package submissions for CMAR and DB project work. A complete construction package will include all the work necessary for delivery of that project component and be something that can be fully reviewed and approved based on the information in the drawings. This would not preclude early-out discipline packages such as mass excavation or civil/site work nor would it preclude pre-procurement of long-lead or high-risk items, but it should limit the number of packages requiring review by TWDB staff.
- ***Provide training on best practices for risk management through construction packaging and in delivery of CMAR and DB projects to applicants.*** Texas is still in the midst of a transition to APD becoming "regular" delivery. As such, many organizations have limited experience with APD. Even with a procurement advisor, it can be easy for these

organizations to follow the lead of their delivery team on packaging decisions without consideration for the impact those decisions will have on the TWDB's time to review and approve the project for funding. This is a major risk to successful delivery of these projects. Training on the potential benefits and pitfalls of multiple construction packages and sequenced construction packages as well as training on how to compile construction packages for review can help applicants manage the risk to delays in project funding and reduce the workload on TWDB staff.

- ***If necessary, put guardrails on the size or duration of projects that can be broken into multiple construction packages.*** When done correctly, breaking a project into multiple construction packages is an effective schedule and budgetary risk management approach. The benefits of this approach decrease substantially, however, as the project reduces in size or duration as there is less savings to achieve. Projects less than 18-24 months in construction duration and less than $10-$15 million in construction value are likely going to receive limited benefit from multiple packages. If improved definitions around a bid package vs. a construction package and training do not help in reducing the number of packages requiring review on projects, TWDB should consider rules around the minimum cost and duration where multiple packages will be allowed for review.
- ***Designate APD Coach(es) to support TWDB project teams.*** Understanding the nuances and complexities of APD requires experience gained from exposure to multiple APD projects and could take most TWDB team members a number of years to accrue. One way to support projects and reduce the burden on project reviewers in the near term and accelerate development of APD expertise across all TWDB project teams is to designate staff with APD experience (or outside consultants) to act as APD Coaches to support teams that do not have as much experience with APD. An APD Coach can provide advice to the TWDB team as well as the Owner on all aspects of the APD process including logical and beneficial structuring of construction packages.

5.0 IMPLEMENTATION

5.1 PRIORITIZATION OF COUNTERMEASURES

FNI developed a recommended prioritization of countermeasures based on the following criteria.

- Benefit in terms of reducing workload on project reviewers
- Minimizing organizational structural changes
- Minimizing impact on ongoing project work
- Predecessor/successor relationships between countermeasures required to support implementation of countermeasures

FNI's recommended prioritization of countermeasures and implementation sequence is as follows:

1. ***Allow Self Certification and Municipality Reviews (see Section 4.2.1)***. This practice is already followed by TCEQ, would relieve project reviewers of the burden of reviewing state design criteria, and allow project reviewers to focus on programmatic requirements. This countermeasure is not dependent on other countermeasures to be implemented.

2. ***Curtail Biddability and Constructability Reviews (see Section 4.2.2).*** Biddability and Constructability (B&C) reviews are not required by regulation (other than the two SRF and only in the TAC) which could reduce workload on TWDB project teams. Regardless of whether TWDB continues B&C reviews, FNI recommends designating experienced, qualified staff to perform B&C reviews which would remove the burden of B&C reviews from many (most) project reviewers. This countermeasure is not dependent on other countermeasures to be implemented.

3. ***Alternative Project Delivery Process Improvements (see Section 4.3).*** Implementing the recommendations listed in Section 4.3 could reduce the burden on project reviewers related to APD projects by minimizing the number of individual construction packages for review. Designating APD Coaches could further reduce the burden on inexperienced TWDB project teams, accelerate development of TWDB team expertise with APD, and add value to project owners. This countermeasure is not dependent on other countermeasures to be implemented.

4. ***Revise Team Structure and Roles (see section 4.1.1).*** Shifting technical reviews of construction documents from project reviewers to others with more expertise could significantly reduce the workload on project reviewers, allow them to focus on programmatic requirements, project management duties, and customer service while improving the quality and confidence level of TWDB technical reviews. Additionally, shifting some administrative work from project reviewers to administrative assistants or document control specialists could reduce project reviewer workload. This countermeasure will, at a minimum, require redefinition of roles and responsibilities and modifications of workflow and procedures, and possibly a realignment of project team structure.

5. ***Standardize Project Execution Processes (see Section 4.1.2).*** Standardizing work procedures, document format/templates, file structure, file naming conventions, communications protocols, etc. can yield significant improvements in efficiency over time, as well as facilitating continuous improvement of processes and enhanced ability to shift projects and staff to more seamlessly level workload between teams. Implementation of this countermeasure is dependent upon and should reflect the changes in process, roles and responsibilities resulting from the preceding countermeasures.

6. ***Project Management/Collaboration Tools (see Section 4.14).*** Deploying project management and collaboration tools is strongly recommended to support project team communications, provide visibility into project status and ball-in-court reporting, and efficient development, editing and review of work products. While TWDB project teams cited this as their top priority, FNI cautions that deploying project management tools before the preceding countermeasures are developed could lead to rework setting up the tools to fit the modified processes.

7. ***Standardize Training (see Section 4.1.3).*** Developing training tools for the procedures that all reviewers follow will support the preceding countermeasure of standardizing project execution processes. On demand training videos can help with the consistent delivery of the training. Implementation of this countermeasure is dependent on and should reflect the process changes resulting from the preceding countermeasures.

5.2 DEVELOPMENT OF PERFORMANCE METRICS

A key element of process improvement is measurement of the performance of the improved process compared to the existing process. As discussed previously, the TWDB has no performance metrics for the existing process, so it will be important to develop metrics that are relevant and reinforce the strategic objectives of the TWDB of improving productivity of the project teams to meet increased program demands. Process performance metrics that measure progress toward strategic objectives are often called Key Performance Indicators (KPIs). Well-designed KPIs should objectively show whether the strategy that drove the process change is working toward the strategic objective.

Since the strategic objective is to increase the number of projects completed by the project teams in a given time period, KPIs related to number of active projects, and percentage of projects on schedule are likely to be the most meaningful metrics. It is acknowledged that much of what transpires in the life cycle of TWDB funded project is outside the control of the TWDB team, but those project elements that are performed by the TWDB could be tracked against an initial (baseline) project plan or against goal durations.

Operational metrics may be valuable to monitor status of specific functions of operation but are not direct measures of progress toward the strategic objective. An example of an operational metric might be number of hours spent by team members on specific projects or tasks. These metrics could provide useful data on individual performance as well as aid in future staffing plans and workload management. TWDB systems do not currently support tracking hours by project/task and would require a tool separate from the payroll system specifically for that purpose. It may be

possible to utilize a separate tool and upload data to the payroll system to avoid the need for duplicate entry by the review teams.

Other potential metrics may include:

- Total Number of Projects per Team
- Number of Projects per Stage (i.e., planning/design/construction) per Team
- Construction Value of Projects per Team
- Ball in Court Days

Development of metrics also depends to a great extent on the capabilities of the tools used to support the program. Robust scheduling tools can easily develop reports for actual duration vs. planned duration, while platforms that support structured workflow can create ball-in-court and elapsed time status reports. Defining metrics will be easier as project management tools are selected.

5.3 IMPLEMENTATION

Process improvement programs often fail to achieve the desired result due to ineffective implementation. Implementation of major process improvements for an ongoing operation as large and complex as the TWDB engineering review program with hundreds of ongoing projects is like changing a tire on a moving vehicle. Work on ongoing projects cannot stop, and staff members are already fully utilized on project work, yet implementation of process improvements demands time and effort from the very staff we are trying to help. Because of the time demands, it can be tempting to leaders of the organization to take short cuts or rush to implement improvements before the necessary predecessor tasks are complete. This approach invariably leads to confusion and rework at best and frustration and failure at worst.

The best tool to achieve successful implementation of major process improvements is a Change Management Plan (CMP). The CMP contains a detailed project plan which identifies actions and discrete tasks required to implement the changes, as well as a timeline. It also includes a communication plan to raise the organization's awareness of the impending change, and conveys the rationale, goals, and objectives to help build support for the change. The CMP should contain strategies to address resistance, and a transition plan to accommodate on-going project work during and after the improvements are in place. Finally, the CMP should address the training necessary to help staff adapt to the changes.

In general, successful implementation will follow this progression:

- ***Review, assess and adopt countermeasures:*** The TWDB executive team needs to carefully consider the proposed countermeasures and select which ones to implement.
- ***Define changes in organizational structure, roles and responsibilities:*** Some of the countermeasures may result in changes in organizational structure, roles and responsibilities. These changes need to be defined and understood to be able to develop the revised project execution process. The change management plan needs to consider how

team members whose roles and responsibilities will transition to their new roles and shift their current workload to others (if applicable).

- ***Develop revised project execution processes (workflow):*** The process mapping performed as part of this study can serve as a good starting point for developing the revised project execution process reflecting the adopted countermeasures, and revised roles and responsibilities of the project participants.

- ***Develop communication and document management protocols to support the revised workflow:*** The swimlane diagrams used for mapping the project execution process are valuable in illustrating where communication or exchange of work products occurs in the process. Using the process map for the revised workflow, determine how communication between project participants is to occur (email, letter, phone call, etc.), what documents and work products are to be exchanged throughout the process. Develop distribution lists, guidance on courtesy copies, transmittal formats, etc. Establish protocols for digital file structure, file naming conventions, and hard copy document management.

- ***Identify project management and collaboration tool requirements:*** Based on the workflow, determine what project management and collaboration tool capabilities and features are required to support the project execution processes. This effort can be started early and run concurrently with the preceding tasks, but it is recommended to complete those tasks before committing to a particular project management and collaboration tool.

- ***Develop metrics to monitor performance and initial performance goals:*** Based on the revised workflow, and considering the capabilities of the project management tools, develop the metrics to monitor the performance of the revised processes.

- ***Configure tools to support the workflow, communication management protocols and performance metrics:*** Configure the tools as needed to support the workflow and produce the output needed by project team member to support their daily activities and provide visibility for stakeholders into operations and monitor status of the process. Consider a beta testing group to work out bugs.

- ***Develop the Change Management Plan:*** Developing a robust Change Management Plan CMP is a critical step to effective deployment of process improvements. Among other things, the CMP will include details on how the new tools will be tested, how the revised process will be rolled out, how to handle ongoing projects, how to transition workload of staff whose roles will be changing, how training will be provided, how to address frequently asked questions, who will be the technical resources to resolve problems, etc. The strength and effectiveness of the CMP will have a profound impact on the success of the roll out, and the success of the roll out will have a profound impact on the acceptance of the process improvements.

- ***Develop training program and materials:*** Development of training materials can start early but cannot finish without the final touches on the tool configuration and the change management plan. Prioritize the initial training to support the transition followed by standard/new employee training.

- ***Roll-out process improvements plan and preview training to senior managers:*** Make the initial roll out presentation to senior managers, listen and address their concerns and incorporate their feedback into the materials to be presented to the general staff. Support of senior managers is essential for successful implementation.
- ***Roll-out process improvements plan to general staff:*** When the tools are configured and tested, training materials and technical resources in place to answer questions and address issues, roll out the process improvement plan to the general staff and provide the initial training.
- ***Provide a means for feedback and continuously improve the process:*** Consider using a survey to get feedback from staff on the process improvements, roll-out, communications, training materials, etc.

5.4 CONCLUSION AND ACKNOWLEDGEMENTS

FNI would like to thank all staff at the TWDB who helped make this assessment a reality. Without their willingness to participate, time and energy, and offering their candid feedback, this assessment would not have been possible. The following serves as a list of participants in the staff interview meetings:

Alyssa Azari	Project Reviewer
Behni Bolhassani	Project Reviewer
David Firgens	Project Reviewer
Dennis Newman P.E.	Engineer
Don Dawkins	Project Reviewer
Henry Foust P.E., PhD	Sr. Engineer
Jeff Taylor CPA	Team Manager
Jesse Milonovich P.E.	Team Manager/Sr. Engineer
Jessica Taylor	Project Reviewer
Joe Koen P.E.	Team Manager/Sr. Engineer
Marcus Snell P.E.	Engineer
Mathew Young P.E.	Engineer
Michael Brooks	Project Reviewer
Natalie Thornton	Project Reviewer
Tom Barnett	Team Manager

A special thanks goes to Michael Brooks for giving the FNI staff a live demonstration of TxWISE and the project reviewers' interactions.

Multiple Executive Team meetings were held where the draft report, alternative delivery, and implementation plans were discussed, the following serves as a list of those involved:

Jeff Walker	Executive Administrator
Amanda Lavin	Assistance Executive Administrator
Jessica Zuba	Deputy Executive Administrator
Matt Nelson	Assistant Deputy Executive Administrator
Clay Schultz	PhD/Director
Francia Harutunian, P.E.	Engineering Discipline Lead
Joe Koen P.E.	Team Manager/Sr. Engineer

A special thanks goes to Clay Schultz as TWDB Contract Manager for his direction and support during this effort.

An additional special thanks goes out to Mark D. Hall, P.E., Senior Project Manager with Hanson Professional Services, Inc. Mark was invaluable to FNI with QA/QC reviews of this report.

Lastly, we would like to thank the TWDB Board Members for their on-going leadership in Texas Water:

Brooke Paup	Chairwoman
Kathleen Jackson, P.E.	Director
Peter Lake	Former Chairman

Without the help and support of all the above-mentioned individuals, this report could not have been completed. It is our hope that this report function as the beginning of further improvements and helps the TWDB not only in the near term, but far in the future as the agency continues to serve the State of Texas.

APPENDICES

Appendix A – Scope of Work

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EXHIBIT B

SCOPE OF WORK

SCOPE OF SERVICES REQUESTED
The Contractor will complete the following tasks:

Task 1: Meet with TWDB staff responsible for management of water infrastructure and quality improvement projects, including the Deputy Executive Administrator (DEA) of Water Supply and Infrastructure (WSI) and the Director of Regional Water Program Development (RWPD) and review publicly available agency program information to get a general orientation and understanding of the mission, programs and operation of the agency and the role of review engineers and project review staff in that context.

The CONTRACTOR will collect all available information from the TWDB and other pertinent sources to review and incorporate into the Assessment, including but not limited to:

- Environmental guidance documents;
- Engineering report guidance documents;
- Engineering review checklists;
- Program supplemental conditions;
- Both federal and state iron and steel guidance documents;
- EPA SRF program guidance and requirements regarding Disadvantaged Business Enterprise good-faith effort procurements and Davis-Bacon Act wage requirements;
- Contract/project final inspection and close out requirements;
- Texas Administrative Code rules found in Title 31, Part 10 (TWDB), Chapters 354 (MOUs), 363 (Financial Assistance Programs), 364 (Model Subdivision Rules), 365 (RWAF), 371 (DWSRF), and 375 (CWSRF), Title 30, Part 1 (TCEQ), Chapters 210 (Reclaimed Water), 217 (Design Criteria for Domestic Wastewater Systems, 290 (Public Drinking Water);
- Intended Use Plans and Disaster Relief programs; and
- EPA SRF eligibility handbooks and WRRDA 2014 guidance.

Task 2: Reconcile actual legal, programmatic, and inter-agency agreement requirements with the work currently being performed by staff. The review approach should take into consideration the different contracting methods used by project owners (traditional design- bid-build and alternative delivery methods), and how those differ in the nature and amount of staff workload, as follows:

> Subtask 2a: Regulatory Review - Review existing EPA regulations and guidance related to engineering review for the Drinking Water and Clean Water State Revolving Fund Programs. Review existing agreements between TCEQ and its predecessors and TWDB with regard to its internal engineering review.
>
> The CONTRACTOR will construct a list of requirements to be compared to actual review practices performed by the TWDB.

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Subtask 2b: Review existing RWPD, Engineer project review and Project Reviewer work processes, guidance, training and other relevant documents with a focus on where time is spent and by whom, specifically how efficiently is time spent and what tasks are of the highest benefit to the agency or result in addressing the most significant program and agency risks.

The CONTRACTOR will document the existing review process from application review through project close out via swim lane diagram workflow analyses by reviewing existing TWDB engineering review procedures, training and guidance materials. The analyses will reflect processes by program as well as three delivery methods: Design-bid-build, design-build, and construction manager at risk. The CONTRACTOR will also evaluate the TWDB tracking database for data management and workflow tracking as part of the engineering review process.

The CONTRACTOR will meet with TWDB staff via approved forms of communications (in-person meetings are currently prohibited due to COVID).

Subtask 2c: Compare, correlate, and document the tasks that appear to be required by regulations/agreements with those, presumably, corresponding TWDB review item tasks aimed at meeting those requirements.

The CONTRACTOR will utilize deliverables from Tasks 2a and 2B to identify gaps and begin to determine the priority and risks associated with the identified gaps.

Task 3: Speak with both experienced and recently hired RWPD division Engineers and Project Reviewers to fill in information on procedures and processes and to understand their preparation for the work and how that is applied in practice.

The CONTRACTOR will meet with TWDB staff via approved forms of communications (in-person meetings are currently prohibited due to COVID).

The CONTRACTOR will conduct a workshop with TWDB reviewers to discuss findings from Tasks 1-3 and initial conclusions and identify any conflicting data.

Task 4: Estimate the general split of Engineer work hours between administrative, engineering, and correspondence tasks for the three types of project delivery.

The CONTRACTOR will define the time spent on tasks, including time split between administrative, engineering and correspondence for all staff involved in the review process.

Task 5: Throughout all tasks, identify potential areas of inefficiency, inconsistency, redundancy or tasks that could either be avoided or performed more quickly or by staff other than Engineers. Identify TWDB tasks that are not required by EPA, Texas Water Code, or TCEQ and make recommendations and justifications as to whether those tasks should be retained or eliminated.

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The CONTRACTOR will utilize deliverables from the four previous tasks to identify root causes of inefficiencies and develop recommendations for countermeasures. Countermeasures will be based on ease of implementation, cost, and anticipated benefit. Utilizing Continuous Improvement based problem solving, the development of performance measures will be required to assess the effectiveness of the countermeasure. This will be accomplished through the facilitation of brainstorming sessions with the TWDB project team.

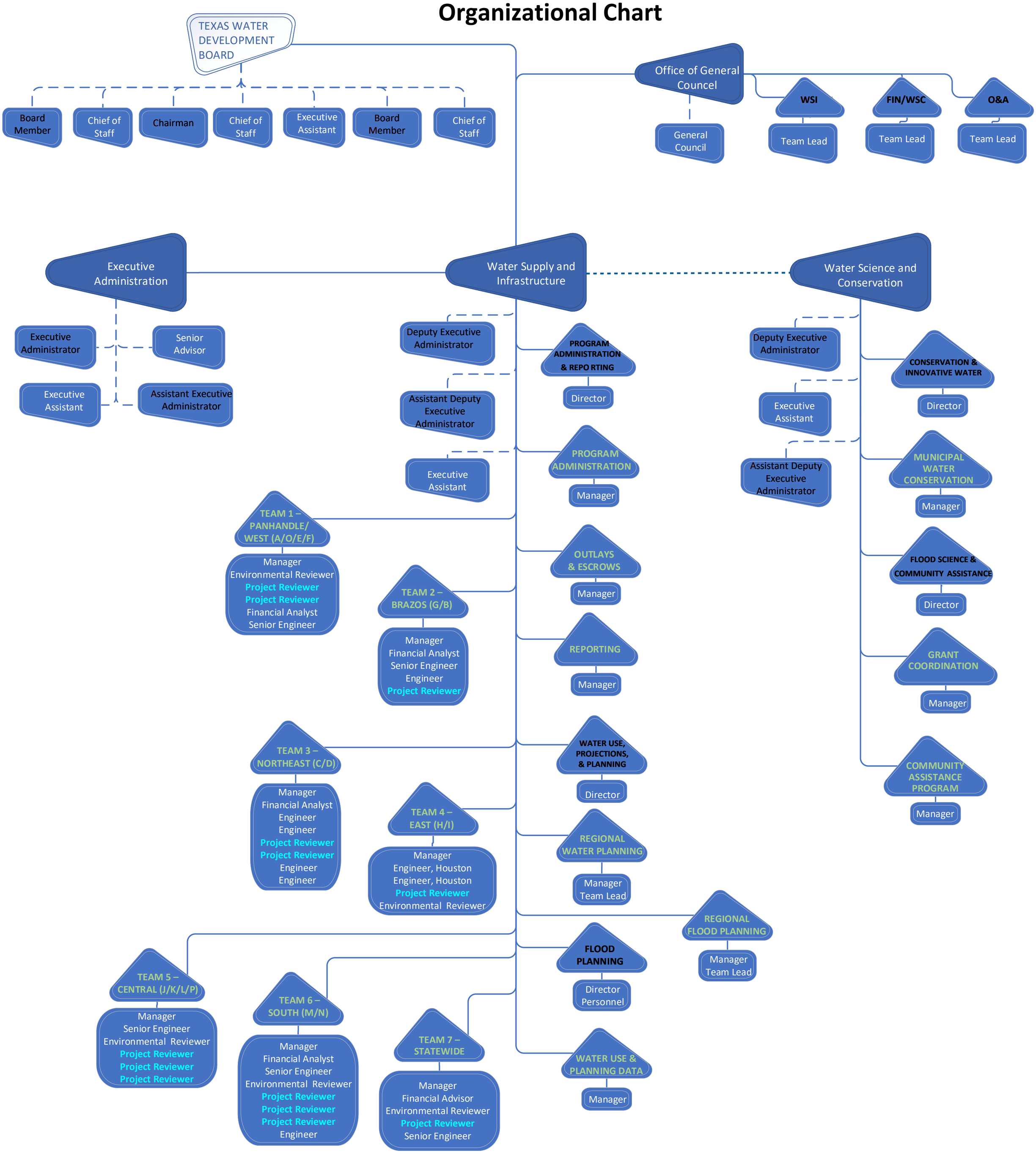
Task 6: Perform follow-up interview with the DEA and Director of RWPD to discuss initial findings and to confirm and adjust interpretations of conditions in preparation for developing findings and recommendations.

The CONTRACTOR will prepare a presentation to the DEA and Director of RWPD, summarizing its findings and recommendations. A draft and final report will be provided. The report will include:

- Summary of work accomplished.
- Engineering review requirements.
- Documentation of existing review process, roles and responsibilities and annotated reference document tying requirements to statute and rule of applicable regulations.
- Findings of opportunities for increased efficiencies and existing Gaps, where review does not meet regulatory requirements or is "overkill".
- Recommendations for process improvements and prioritization for changes.

Appendix B – TWDB Org Chart

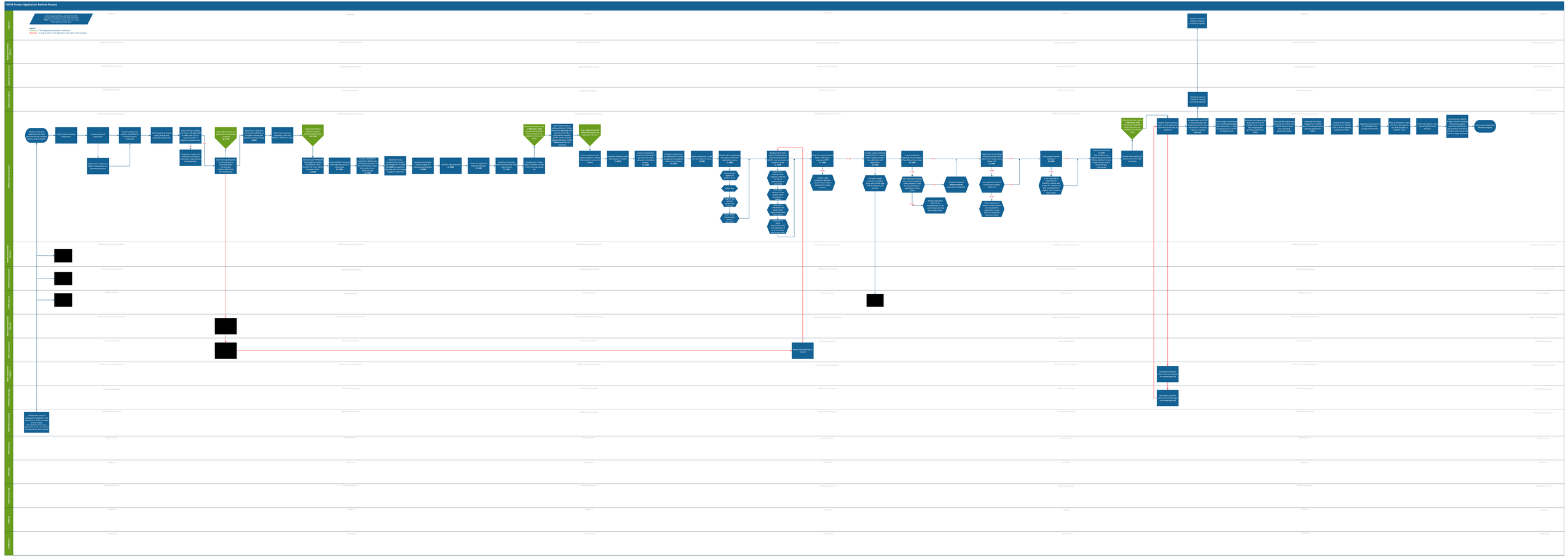
Texas Water Development Board Abrieviated Organizational Chart



Appendix C – Process Swimlane Diagrams

1. Project Application Process
2. Commitment and Closing Process
3. Engineering Feasibility Report Review Process
4. Plans & Specs Review Process
5. Change Order Process
6. Project Close Out

TWDB Project Application Review Process



TWDB Commitment Closing Process

Source: Commitment Closing Review_08.02.18.pdf

Legend
Green box – The beginning and end of a milestone
Red Lines – A loop of actions that depend on each other until complete

Applicant

[redacted]

[redacted]

Applicants Financial Advisor

Applicants Bond Council

Applicant's Engineer

[redacted]

TWDB Project Eng. Reviewer

PE/PR notified by Team Mgr and/or Team Financial Analyst of an upcoming commitment closing and requesting a "Closing Memo", otherwise called a "Ceiling Adjustment / Escrow Release Authorization" memo

For projects in which a Grant Agreement, Principal Forgiveness Agreement or Loan Agreement must be prepared and executed by TWDB's EA and the Applicant's representative prior to the release of funds, legal staff may request the PE/PR to provide an updated project schedule and verification of the budget.

Review the resolution to determine if there are any engineering related funding conditions that need to be completed prior to closing (such as issuance of a water rights certificate, executed engineering contract, etc.)

Prerequisites for release of funds / installment closing for Financing and Planning
ML 6280

Review the ENGCM to determine if there are any other conditions and/or significant issues that should be resolved prior to closing of the commitment.

Check with TWDB Attorney or PUC to ensure CCNs (if required) have been approved
CL 6000

Confirm from application and/or applicant's consulting engineer that there are no significant issues that could delay or cause the project not to move forward. Coordinate with TWDB Environmental Reviewer.
CL 6020

Check to see if TCEQ WW discharge permit (if required) has been filed or if not, ensure project schedule is adequate for the permit approval
CL 6040

Form EPA-4700-4 is no longer required. Mark N/A in TxWise or make a note indicating that the form is no longer required.
CL 6060

Verify that an approved or approvable Water Conservation Plan has been received by Mun. WCP staff or Commitment Memo.
CL 6100

Confirm Sufficiency of Funds to complete project. If 100% funded by the TWDB, mark CL item "N/A." If other sources are used, request a sufficiency of funds letter that is a statement that these funds have been obtained or status of securing those funds. The letter should summarize the project budget and the funding sources and show sufficient funds are available. The letter should be from the Applicant and on Applicant's letterhead.
CL 6140

Check that executed engineering contracts have been received
CL 6160

Check that executed utility and/or service contracts have been received
CL 6200

Commitment Resolution to determine if any special conditions regarding loan closing were included. If so, ensure the requirements of any special conditions are met.

Set budget Ceilings for eligible line items

Check with Team Financial Analyst on release of fiscal services budget items, if any, and for the allocation of funds to loan and Principal Forgiveness

After all checklists have been completed, the Closing Memo is prepared.
CL 6260

Follow Guidance document to open "Funding Actions" in TxWISE, ensuring the proper funding source (program) is selected

Detail: Commitment Number, Date Received, Action Type, Board Funded Costs, Local Funded Costs, Other Funded Costs, Ceiling to Fund, Status of Request, Decision Date, Description of Changes.

Select "Ceiling Increase" from the "Action Type" dropdown

The previous two steps are repeated for each line item (budget category) eligible for release at the time of closing

Generate "Ceiling Adjustment Escrow Release Authorization Memo" by selecting it from the "Select Report" dropdown and then select the report button when view activates

On new window that opens, enter specific details or instructions for the closing and release of funds in the "Justification" field and save in format desired (pdf, xls, doc, etc).

Select any budget category, select "Ceiling Increase" and enter approval date, do not enter a dollar amount or any other information (Page 24 of the Guidance document)

Mark Milestone ML 6280 Complete, including date of completion

Generate Closing Release of Funds Checklist for Engineer: TxWISE path - Project Costs tab, Funding Authorization menu, select Closing Release of Funds Checklist for Engineer from Select Report drop-down select run report from Viewer window

Print Closing Release of Funds Checklist for Engineer, sign, date, and attach to the Closing Memo

Route Closing Memo with Closing Release of Funds Checklist for Engineer to Senior Engineer and Team Manager for approval

TWDB Environmental Reviewer

[redacted]

TWDB Financial Analyst

TWDB Attorney

[redacted]

Water Use/ Projections/ Planning

Water Conservation

TWDB Team Senior Engineer

[redacted]

TWDB Team Manager

[redacted]

TWDB Administrative Assistant

RWPD Director

TWDB DEA

TWDB Assistant EA

TWDB EA

TWDB Board

TWDB Engineering Feasibility Report (DFUND) Review Process

Source: DFUND Website, 2.25.19.
Note: Not to be confused with a software logic or flowchart. The "Yes" or "No" decision points are not necessarily a decision point, but rather a requirement for the Pre-Loan Design & Funding program. For, example, "Is Environmental Review Complete?" means "Has the Environmental Review been completed?"

Legend
Start/End
Decision - The beginning and end of a milestone
Process - A step of action that depend on each other until complete

Applicant | Rural Water Assistance | Engineering Team | Engineering Manager | Pre-Loan Design & Funding Review | Pre-Loan Design & Funding Manager | Vector Engineering | Pre-Loan Design & Funding Director | Check Team Manager | Check Team Director | Check Team Assistant Director | MPA Director | MPA Manager | Team Lead | Check Staff | Check Board

Pre-Loan Design & Funding Review

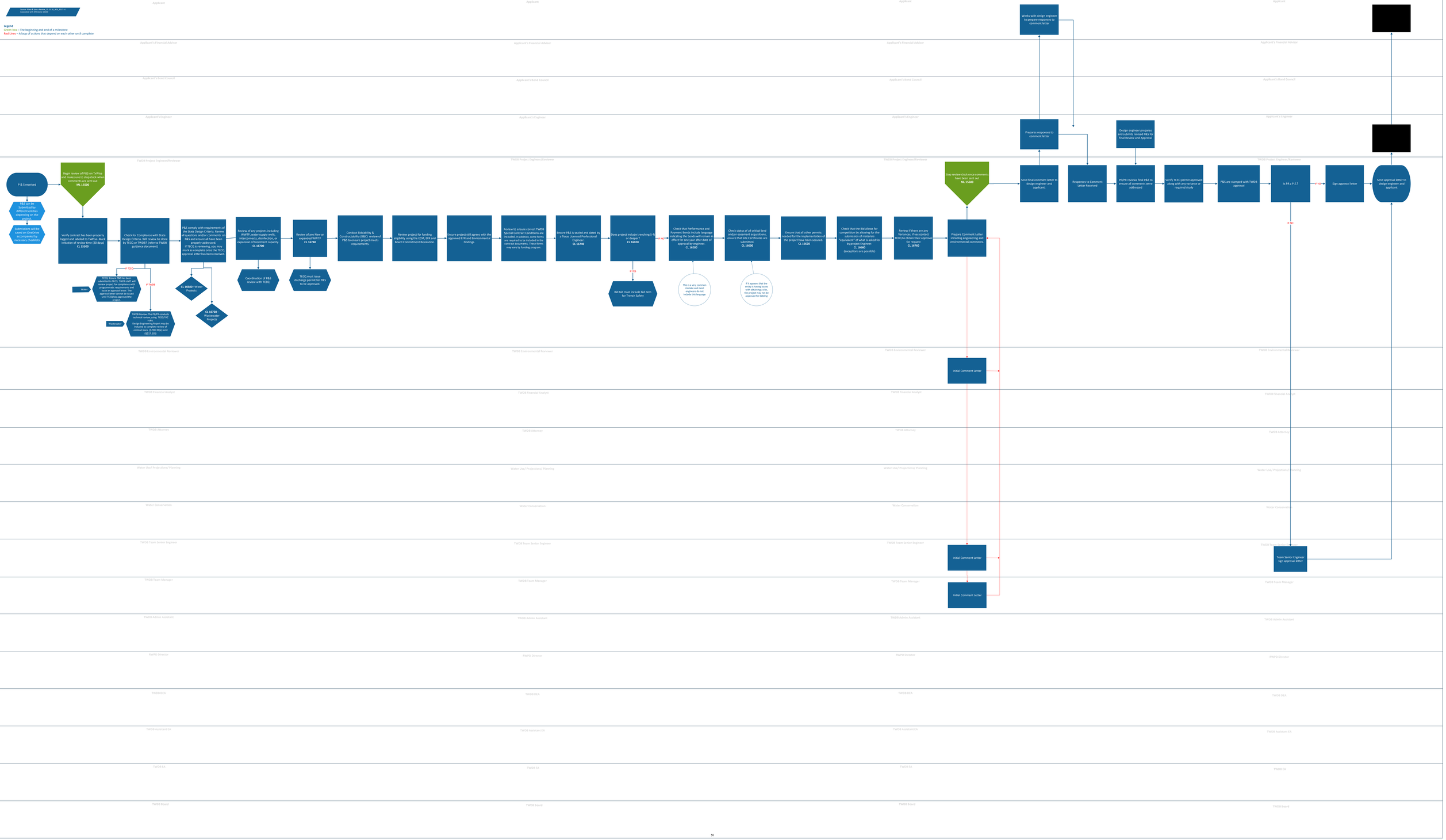
- EFR Received from applicant via online applicant's engineer
- Make copy of "Review Date" assigning review date, eg. 2020
- Check in List if TWA is approved, awaiting EFR or has closed, pending EFR
- Assign EFR to Vector Engineering Director, Check Team Director, and Rural Water Assistance Manager
- Provide copy of EFR to Environmental Reviewer, Vector, CAMPO, TPW, Tsad
- Review EFR for completeness with regards to the DFUND Program Requirements (Version 2.0 Effective on 2.25.19)
- Assign **Reference WIN** (Unique Identifier) based on Applicant, Project Number, Project Number, Project Number

TWDB Plans and Specs Process

Source: Plans & Specs Review 10.19.20_VOL_BCC1.v1
Associated with Workshow 11620

Legend
Green box – The beginning and end of a milestone
Red Lines – A loop of actions that depend on each other until complete

Applicant | Applicant's Financial Advisor | Applicant's Bond Council | Applicant's Engineer | TWDB Project Engineer/Reviewer | TWDB Environmental Reviewer | TWDB Financial Analyst | TWDB Attorney | Water Use/ Projections/ Planning | Water Conservation | TWDB Team Senior Engineer | TWDB Team Manager | TWDB Admin Asst | TWDB RWPD Director | TWDB DEA | TWDB Assistant EA | TWDB EA | TWDB Board



TWDB Change Orders Process

Source: Change Order Review Proceedures_01-12-17, C - Change Order Approval_10-31-17

Legend
Green box – The beginning and end of a milestone
Red Lines – A loop of actions that depend on each other until complete

Applicant

Change order initiated/processed then transmitted to TWDB PE/PR

TWDB Project Eng. Reviewer

Change Order Request received

Review and Approve a Change Order within TxWise

On TxWise select Project Milestone tab and select project contract to add "Optional Milestones"
NOTE: Once a new milestone is created it cannot be removed

Select *Change Order # Approved* and click on Checklist Complete, this will open the *Change Order Project Checklist*

Sequence of change order number is correct. Change order includes date of agreement to changes. Contains signature of loan recipient, consultant and contractor.

Change order costs appear reasonable and necessary. Changes are within the scope of work approved by the Board. Any changes to design must be reviewed for compliance with State Design criteria. If needed, coordination with TCEQ must be completed prior to approval of change order. Any variances, exceptions or waivers to the state design criteria must be approved by TCEQ.

As applicable, budget and time change recorded in the budget table in TxWise.

Changes in project footprint, construction methods, treatment process, or schedule may require environmental review. When changes affect environmental impacts/compliance, uncheck N/A on the Environmental Reviewers checklist item to request their review of the change order.

If the change order increase the contract price by more than 25%, research change order further for possible exceptions, obtain rationale from consultant or entity's attorney and discuss with Team Manager and team's legal counsel. Summarize discussions in notes field as to whether the change is eligible or not and why.

Environmental Review of Change Order Request; ER sends comments back to PE/PR

Once CL Items are complete select Project ML tab and then select **Change Order # Approved ML,** fill out completion date and marker and click save

Stamp paper copy of the change order with TWDB Approval stamp, sign and date

Printing out Change Orders from TxWise

Print out completed Checklist for Contract **Milestone 18880**

Go to Report tab on TxWise. Select Item No **13008 Milestone** Checklist Finalization.

Enter project ID, Select Contract Milestone level, select Change Order # Approved from ML list, to print, click save and select PDF

Write a DRAFT Change Order Acceptance letter Memo

Use the Change Order Approval Template (include the checklist)

O:\WSI\RWPD\RWP&D\Engineering\3. Engineering Procedures\~Helpful drafts and templates\5. Construction Phase\Change Orders

Send Finalized Change Order Acceptance letter to team Senior Engineer for signature

Send Approved/ stamped Change Order to applicant and cc consultant engineer

TWDB Team Senior Engineer

Senior Engineer signs Change Order Acceptance Letter

TWDB Project Close Out Process