INTERIM GUIDANCE PAPER
FOR
FORMULATING AND EVALUATING ALTERNATIVES
TAHOE BASIN WATER QUALITY IMPROVEMENT PROGRAMS

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Interim Guidance Paper
For
Formulating and Evaluating Alternatives

Tahoe Basin Water Quality Improvement Programs

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PURPOSE OF GUIDANCE PAPER

A formulating and evaluating alternatives (FEA) document was drafted in July of 2004 to supplement the project delivery process previously adopted by the California Tahoe Conservancy (CTC), the United States Forest Service (USFS), the Tahoe Regional Planning Agency and the Nevada Division of State Lands (NDSL) for stormwater improvement projects. This document outlined recommended information collection, compilation and analysis procedures to formulate and evaluate project alternatives and to select a preferred design alternative.

Since the adoption of the FEA, project implementers, regulators, funders and consultants have utilized the FEA process for planning of water quality projects throughout the Tahoe Basin. There has not been consistent application of the FEA however due to a number of issues. The inconsistent application of the FEA has been due in part to the FEA process not being well understood by project implementers, project consultants and technical advisory committees. These inconsistencies have lead to elevated planning costs and time delays which has reduced the efficiency of planning efforts and decreased the number of projects implemented.

For these reasons, an update of the FEA document is warranted to improve the project delivery process. Several planning documents are currently under development that must be considered as part of any updates to the FEA. It is expected that the Total Maximum Daily Load (TMDL) will be adopted by the Nevada Division of Environmental Protection (NDEP) and the Lahontan Regional Water Quality Control Board in 2009. Also, TRPA is working towards the adoption of a new Regional Plan. Lastly, several water quality models are currently being constructed which will assist project implementers in developing and selecting alternatives that best address pollutants of concern within each watershed ((Pollutant Load Reduction Model (PLRM) and Water Erosion Prediction Project (WEPP)). Once these documents and models are completed and a funding source is identified a full revision of the FEA should be completed to account for new methods, tools and regulations that have been developed/adopted since the completion of the FEA document.

The intent of this paper is to clarify and convey issues as interim guidance to improve efficiency and to cut unnecessary planning processes and costs until SWQIC develops and adopts a more complete revision of the FEA document. The interim guidance document addresses comments and questions from users of the FEA which were reviewed and compiled by the Storm Water Quality Improvement Committee (SWQIC) into seven specific issues/topics:

1) Preferred design approach, watershed approach and FEA guidance

2) Developing goals and objectives for water quality improvement projects

3) Water quality strategies and alternatives

4) Level of detail for the existing conditions analysis

5) Connectivity of impervious areas

6) Developing the recommended alternative to the 30% design

7) Managing uncertainty within the SWQIC Project Delivery Process (PDP)

Each topic is addressed individually in this paper using the following sequence:

- First, the issues associated with each topic are introduced based on the direction provided by the members of the FEA Implementation Subcommittee and the members' collective experiences.
- Next, the guidance currently provided in the FEA and the intent of the guidance are clarified, and any necessary interim revisions to the FEA are noted.
- Finally, frequently asked questions are presented and answered and lessons learned from initial applications of the FEA are discussed.

There is hope that the collective experiences of applying the FEA presented here will further streamline and improve the overall efficiency of project implementation in the Tahoe Basin for both new and veteran project participants. Although the ultimate goals of each stormwater project are very similar, the manner in which the greatest efficiency of implementation can be obtained is likely not consistent throughout the basin. Therefore the FEA process and this interim document should be viewed and utilized as guidance, allowing individual entities to modify the process in a manner that is appropriate for their jurisdiction and specific project and which will be consistent with requirements of funders and regulatory agencies.

PREFERRED DESIGN APPROACH, WATERSHED APPROACH, AND FEA GUIDANCE

INTRODUCTION

In July 2004 the Storm Water Quality Improvement Committee (SWQIC) released the *Collaborative Storm Water Quality Project Delivery for the Lake Tahoe Basin*, a document intended to improve the process for planning, designing, and constructing public water quality improvement projects. This document introduced the Project Delivery Process, Interactive Protocol, and the Conflict Resolution Process. As part of the Project Delivery Process, SWQIC also released *Formulating and Evaluating Alternatives for Water Quality Improvement Projects* in July 2004 (commonly referred to as the FEA). The FEA is described in the above documents as a practical planning process and means of facilitating application of the Preferred Design Approach (PDA). The PDA is a general design principle adopted by funding and regulatory agencies and used by project designers throughout the Tahoe Basin. The FEA refers to the PDA and to using a watershed approach for project planning, but specific guidance on integrating these approaches is currently not included in the document.

Since the release of the FEA, there have been numerous questions about how to integrate the PDA and a watershed approach within the FEA process. The purpose of this section is to describe the relationship between the PDA and the FEA process and to clarify the meaning of a "watershed approach."

CLARIFICATION

PREFERRED DESIGN APPROACH

Throughout the United States, efforts to protect surface waters or manage stormwater have emphasized the use of source-control best management practices (BMPs) and maintenance of natural hydrologic function. In the Tahoe Basin this concept has been adopted by water quality grant programs and is often referred to as the PDA. The PDA was first adopted by the California Tahoe Conservancy (Conservancy) in 2001 as part of its guidelines for erosion control projects. The U.S. Forest Service's Lake Tahoe Basin Management Unit and the Nevada Division of State Lands (NDSL) have also adopted or integrated the PDA into their respective programs.

The PDA is a set of guiding principles that emphasizes project designs that minimize the mobilization of sediment and nutrients and reduce the volume of runoff reaching source waters. The PDA, as it is applied in the Tahoe Basin, consists of three fundamental principles:

- **Source Control—**Measures that prevent the mobilization of pollutants from their original source. *Examples*—Retaining walls, soil conditioning or revegetation, slope stabilization, street sweeping, fertilizer management for turf, traction abrasive recovery, etc.

- **Hydrologic Design—**Measures that encourage the maintenance of natural hydrologic processes or minimize runoff through infiltration, avoiding concentrated flows, protecting natural and functioning drainages, and restoring nonfunctioning drainages. *Examples*—Infiltration facilities (e.g., basins, drywells), bioswales, curb cuts in low slope areas with back of curb swales, and separation of relatively dirty urban runoff from relatively clean nonurban runoff.

- **Treatment—**A device or system that removes pollutants of concern from stormwater. *Examples*—Constructed wetlands, mechanical treatment devices, detention basins, and filtration units

(Note that the examples provided above may fit into more then one category.)

The PDA is based on the premise that source control and hydrologic design are generally cost effective and technically efficient means to minimize pollutant loads and improve water quality. Water quality treatment measures that remove pollutants from runoff are to be considered after application of the other two principles (source control and hydrologic design).

WATERSHED APPROACH

A watershed approach to planning is frequently used by organizations involved in the management and protection of water and other resources throughout the country. A watershed approach considers the natural hydrologic function and other resources and processes within an entire watershed, particularly when working within a component part. A watershed is a hydrologically defined geographic area that drains to a specific drainage channel or discharge point via a drainage or fluvial system (e.g., Blackwood Creek watershed). In the context of water quality improvement projects, a watershed approach recognizes that hydrologic processes are fundamental to the generation and transport of pollutants, and that changes in one portion of a watershed affect other portions. This approach emphasizes using watershed or drainage boundaries as planning boundaries to the extent feasible. At a minimum, a watershed approach requires project designers to continually consider how their projects are influenced by watershed processes ,resources and pollutants above them, and how improvements made within their project boundaries may affect watershed processes, resources and pollutants below them.

FORMULATING AND EVALUATING ALTERNATIVES

The FEA is a guidance document that suggests a process for use during the planning phase of water quality improvement projects. Recommended procedures are included for some aspects of this process, recognizing that creative and effective variations are both allowable and desirable. Project designers should choose the elements of the FEA that are most useful for their particular projects. The FEA document is not a cookbook, but does suggest a logical process to analyze existing conditions, formulate alternatives, evaluate alternatives, select a recommended alternative, and develop the recommended alternative into a preliminary design.

FREQUENTLY ASKED QUESTIONS AND LESSONS LEARNED

FREQUENTLY ASKED QUESTIONS

1. What Is the Relationship between the PDA and a Watershed Approach?

The PDA emphasizes the application of three fundamental principles (source control, hydrologic design, and treatment) for water quality improvement projects in Lake Tahoe. A watershed approach emphasizes water quality planning in the context of watershed boundaries and processes. The PDA inherently reflects a watershed approach, particularly through the principle of hydrologic design, but other aspects of a watershed approach (e.g., coordination of efforts between projects or agencies in the same watershed) are not included in the PDA. Both these concepts are applied throughout the country by organizations involved in the management of water resources, soil conservation, and other natural resources that are related to hydrologic processes.

2. What Is the Relationship among the FEA, the PDA, and the Watershed Approach?

Figure 1 depicts the relationship between the PDA, a watershed approach, and how they are related to the FEA within the context of larger programmatic efforts in the Tahoe Basin to improve water quality (blue boxes in upper section of figure). The FEA describes a process for applying the PDA and a watershed approach to the design of water quality improvement projects in Lake Tahoe. The PDA and watershed approach are guiding principles or concepts (described above) that have been adopted by funding and regulatory agencies to assist in meeting program guidelines and Tahoe Basin water quality thresholds or desired conditions.

To fully address the question of the relationship among the FEA, the PDA, and the watershed approach, two other common questions must be answered (see responses below):

- How are the FEA and PDA different?
- When should the PDA be applied during the FEA process?

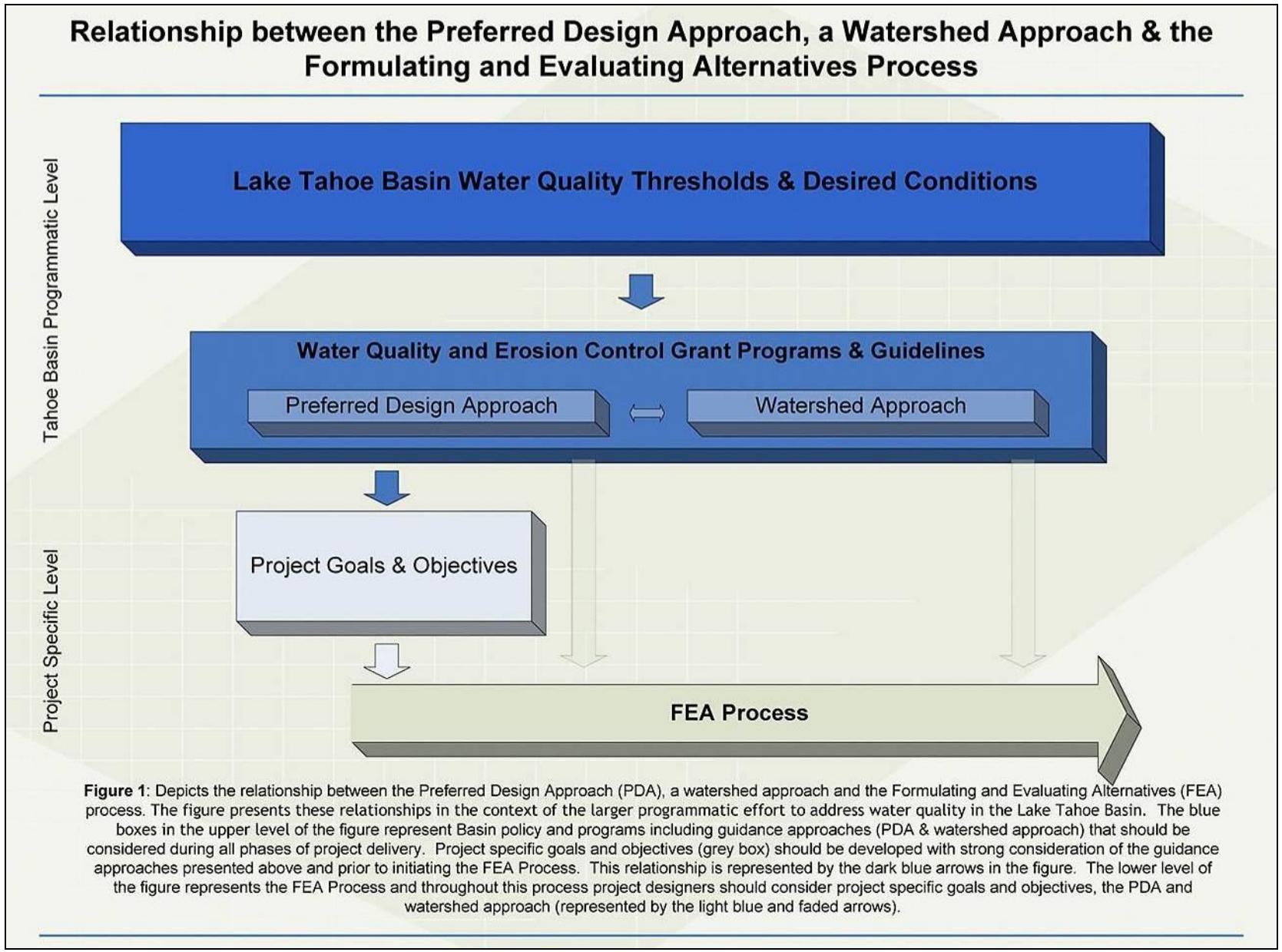


Figure 1. Relationship Between the Preferred Design Approach, a Watershed Approach, and the Formulating and Evaluating Alternatives Process

3. How Are the FEA and PDA Different?

The FEA is a process that provides step-by-step guidance for defining water quality improvement projects through the analysis of existing conditions, formulation of alternatives, evaluation of alternatives, and selection and development of a recommended alternative. The nature of the process allows it to be easily transferable and applied to other resource issues or topics. The PDA is not a process, but rather a set of guiding principles specifically related to improving water quality that should be considered during each step of the FEA process.

4. When Should the PDA be Applied during the FEA Process?

The PDA should be considered during all stages of project delivery. The following examples illustrate this point:

- **Existing Conditions Analysis—**Emphasis should be placed on identifying the sources of pollutants and causes of erosion and other problems that degrade water quality (source control principle). Significant effort should also be given to understanding the hydrologic processes within a project area (hydrologic design principle and directly related to a watershed approach). Emphasis should be placed on identifying the specific sources of pollutants by site, important transport processes within the project area, and priority areas based on estimated pollutant loads.

- **Formulation of Alternatives—**Alternatives formulation should address the specific water quality issues identified in the existing conditions analysis. As mentioned above, it is important to consider the PDA and a watershed approach during the formulation of alternatives, as they help to foster alternatives that are feasible and focused on improving water quality. At times alternatives are formulated without considering these approaches, often minimizing the effectiveness of the alternatives. For example, an alternative that simply emphasizes conveyance and treatment of stormwater flows with little consideration for sources of erosion does not meet the intent of the first guiding principle of the PDA—source control.

- **Evaluation of Alternatives—**One effective way to integrate the PDA into the FEA process is to use the PDA as evaluation criteria. For instance, alternatives that do not effectively consider sources of erosion or watershed processes are highly unlikely to effectively and efficiently improve water quality and, therefore, should not be selected as the recommended alternatives.

LESSONS LEARNED

Lesson 1

It is generally inappropriate to use the three PDA principles as three alternatives (i.e., Alternative 1 = Source Control; Alternative 2 = Hydrologic Design; and Alternative 3 = Treatment). The full FEA document provides an example for formulating three alternatives that each emphasize one of the three PDA principles. In retrospect, the example in the FEA has misled some designers into thinking that each project should have alternatives developed

in this manner. The PDA is not intended to be used in this way. The full revision to the FEA document should revise or omit the current example. All alternatives should apply the principles outlined in the PDA cohesively, but can include variations in emphasis or intensity of design elements based on specific project area conditions.

Example: A small project area may have two alternatives. Each alternative addresses sources of erosion within the project boundary, but Alternative 1 may emphasize distributed design elements focused on fine sediment. Alternative 2 may instead emphasize centralized design elements in the most highly urbanized area of the project to remove fine sediment, nutrients, and oil/grease.

Lesson 2

The three PDA principles should not be applied as three tiers of priority, but as two. Source control and hydrologic design both reduce the generation and transport of pollutants and minimize the need for treatment measures in lower watershed areas. A better way of describing these two principles is perhaps pollutant source control and hydrologic source control. The PDA has sometimes been interpreted to give source control a higher priority than hydrologic design, to the extent that source controls might have an adverse effect on hydrology. A revision to the grant guidelines describing the PDA is recommended to ensure that this point is clarified. Alternatively, the full FEA revision could incorporate a revised description and definition of the PDA directly into the FEA process.

Example: An alternative is formulated that includes new impervious surfaces to control erosion and curbs and gutters to control unstable road shoulders. The alternative, as proposed, could lead to increased peak flows and velocities downstream, which could cause erosion. The intent of the PDA is to consider source control and hydrologic design in combination, with relatively equal priority for reducing pollutant generation and transport. The formulated alternative should consider the potential for increases in peak flow and potentially include measures to reduce runoff generated, such as infiltration galleries or additional distribution of runoff from impervious surfaces.

DEVELOPING GOALS AND OBJECTIVES FOR WATER QUALITY IMPROVEMENT PROJECTS

INTRODUCTION

The statement of goals and objectives is a key element in the formulation and evaluation of alternatives for a water quality improvement project. The goals and objectives of a project should be defined very early in the project delivery process – development of goals and objectives should be the first step after project initiation (see Figure 2.1, 2004 FEA for Water Quality Improvement Projects, Northwest Hydraulic Consultants), and should receive formal buy-in from technical advisory committee (TAC) members. The goals and objectives should be directly related to the problem the project is intended to address, and ultimately explain why the project implementer is undertaking the project at all. The goals and objectives statement also demonstrates the problems that will result (or continue) if the project is not implemented.

The goals and objectives for the project define criteria by which project effectiveness can be evaluated, both for water quality improvements and for regulatory and permitting requirements. Project goals and objectives also can provide a means to track programmatic successes, for State bond and grant programs, for the Environmental Improvement Program, for the TMDL, and for water quality planning efforts. In addition, having clearly defined goals and objectives can bring focus to the TAC through the entire planning process. Periodic check-in points during the design process will ensure that the final product meets the original intent of the goals and objectives.

In the context of the FEA process, project alternatives are ultimately developed and evaluated based on the project's stated goals and objectives. The ability of each alternative to meet the goals and objectives of the project should be an evaluation criterion in assessing those alternatives, and project alternatives that don't meet the project's goals and objectives can be rejected from further analysis. If properly described, the goals and objectives limit the range of alternatives that could be considered reasonable, prudent, and practicable.

In certain cases, project constraints identified in the Existing Conditions Analysis Memorandum (ECAM) may preclude the development of alternatives that address project goals and objectives. In these cases, the obtainable environmental benefits of the feasible alternatives must be evaluated to determine whether further project design should take place.

CLARIFICATION

A project's statement of goals and objectives should be detailed, quantified if possible, and relate to the programmatic elements within which the project will be implemented. These programmatic elements could include: CTC, USFS and/or NDSL grant guidelines, stormwater management plans, design criteria for the local jurisdiction, waste discharge requirements, EIP output targets, regulatory requirements, and TMDL pollutant load reductions. The statement of goals and objectives must define goals that are achievable, and measurable. The goals of a project should be described broadly enough to provide flexibility in implementation, but narrowly enough to determine project effectiveness.

The goals of the project should be stated as comprehensively and as specifically as possible. For example: "The project will reduce discharges of sediment less than 20 microns in size from outfall A by 75 percent from current levels." Project objectives should describe specific mechanisms that will be implemented to achieve the project goals. For example: "Stabilize eroding slopes with approved slope stabilization BMP's."

FREQUENTLY ASKED QUESTIONS AND LESSONS LEARNED

FREQUENTLY ASKED QUESTIONS

1. What is the difference between a goal and an objective?

Goals are broader than objectives; objectives typically describe specific measures to achieve a goal, or provide more detail relative to the goal. For example:

Goal: Reduce the load of fine sediment measuring less than 20 microns from the project area that enters Lake Tahoe.

Objective: Employ source control measures at informal parking areas to prevent the mobilization of fine sediment, consistent with defensible space requirements.

Objective: Investigate advanced treatment options for fine sediment less than 20 microns, and employ those options where feasible.

2. How will project goals and objectives change with the TMDL?

The September 2007 Draft Lake Tahoe Total Maximum Daily Load Technical Report (Roberts and Reuter, 2007) has identified fine sediment less than 20 microns from urban upland areas(approximately 72% of fine sediment loading) as the primary pollutant of concern affecting Lake Tahoe's clarity. Secondary pollutants of concern include fine sediment from other sources, as well as nitrogen and phosphorus. However, fine sediment less than 20 microns affects clarity measurements about twice as much as the effect from floating algae stimulated by

nutrients. The recommended strategy for pollutant load reductions outlined in the Integrated Water Quality Management Strategy Project Report dated March 2008 (Praul et. al, 2008) focuses on advanced practices and innovative technology to control fine sediment particles from the urban runoff source category. Reducing the pollutant load to Lake Tahoe, focusing on these identified pollutants of concern, will be a primary goal of EIP water quality improvement projects for the next 20 years.

Tools are currently under development to help EIP implementers and TAC members identify the most cost-effective ways to achieve these pollutant load reductions. Project implementers and TAC members should make use of the best available tools, and the most current information, when setting project goals and objectives. Once the appropriate tools have been developed, quantified goals and objectives related to TMDL pollutant loads will likely be necessary, to demonstrate how the project will contribute to required load reductions for each jurisdiction.

3. How much should goals and objectives emphasize what can be done, versus what should be done? What if the project ultimately does not meet goals that are too ambitious?

EIP water quality project implementers should strive to maximize the reduction of pollutant loads to the Lake. During the project development process, trade-offs among competing goals, project effectiveness, funding, scheduling, and other practical matters will probably occur. However, the articulated goals of a project should aim high, and TAC members should keep these goals clearly in sight when struggling with what's realistic during the project development process. A project is not a "failure" if it doesn't meet its goals; rather, clear project goals can be used as a tool during the project development process to help encourage designs which attempt to achieve the highest level of water quality improvement possible.

LESSONS LEARNED

There seems to be wide disagreement among SWQIC members regarding how to write effective goals and objectives. Generally speaking, implementers prefer language that is realistic, and broad. Regulators and funders prefer goals that are both more ambitious and more specific, and where possible quantified.

With respect to the question of qualitative versus quantitative language, one compromise involves quantifying those goals that can be easily measured and monitored, while using more qualified language for goals that are not easily measured. Both implementers and consultants at the beginning of the project scoping process should be thinking about measurements and calculations related to project goals that may need to be made during the design process, so major changes in scope aren't necessary.

What counts as a well-written goal or objective will continue to be refined through the SWQIC process, and as the TMDL becomes more fully integrated into the EIP. Through this refinement process, TAC members should be

alert to the fact that project goals and objectives can be a sticking point in the project development process, and should leave ample time for development, comment and revision in the project schedule.

WATER QUALITY PROJECT STRATEGIES AND ALTERNATIVES

INTRODUCTION

The FEA document recommends formulation of water quality strategies and alternatives for water quality improvement projects. Before the FEA was adopted, there was no consistent process for formulating alternatives as part of project planning and preliminary design. One objective of the FEA is to ensure that an adequate range of potential solutions is developed for each project. In part, the FEA document was developed in response to concerns from funding and regulatory agencies that the existing process for developing project alternatives might not adequately improve water quality.

A second objective for the FEA was to ensure that proposed project designs have a sound technical basis with respect to water quality improvement. It was recognized that a "cookbook" method for stormwater quality design was not desired and that sufficient technical information was not available to justify single design methods or templates. Also recognized was the subjective nature of estimating water quality improvement effectiveness for complex projects. Therefore, the FEA suggests that designers describe the rationale or strategy behind each alternative in terms of its water quality performance. The intent of this suggested step is to make the thinking behind alternatives development as transparent as possible to facilitate review. The concept of strategies, as the rationale behind alternatives, was written into the FEA document for this reason.

Since the FEA document was adopted, some project designers have struggled with the definitions of strategies and alternatives and their relationship to the project goals and objectives, the PDA, or a watershed approach. The intent of this section is to clarify the definition of water quality strategies and alternatives and the relationship between them. This section also describes the relationship of water quality strategies and alternatives to the PDA.

CLARIFICATION

WATER QUALITY STRATEGY

A water quality strategy describes a means of improving water quality within a specific project area. A strategy provides the rationale for selecting a particular set of improvements or BMPs (essentially, alternatives) for a given project area. A strategy is not a defined set of BMPs, but rather the conceptual approach for water quality improvement that might be implemented by one or more sets of BMPs.

Strategies should be based on project area conditions presented in the existing conditions analysis—probable quantities of pollutants, opportunities for their control, and practical constraints on BMP implementation. Although project area conditions are fixed, there are usually multiple potential conceptual approaches (i.e., strategies) to improving water quality. Potential elements that might be considered to create a strategy are

provided in the current FEA document. A project strategy could be a combination of the elements listed in the current FEA document.

WATER QUALITY ALTERNATIVES

A water quality alternative is a defined set of BMPs that implement a strategy using physical improvements (typically BMPs and drainage facilities).

Alternatives are associated with and intended to implement a particular strategy. Although it may be possible to develop more than one alternative that implements a strategy, the intent of the FEA document was to identify paired strategies and alternatives (i.e., develop one or more strategies and then develop the best apparent alternative to implement each strategy). Exceptions to this might be needed where alternatives are particularly sensitive to uncertainties such as land acquisition.

Designers may find it easier to develop alternatives than strategies (i.e., to formulate a set of physical improvements, rather than a conceptual solution for water quality improvement). In fact, the concept (strategy) and the plan for implementation (alternative) are so closely related that both are likely to be done at once. This process achieves the intent of the FEA document, provided that alternatives are not formulated simply on the basis of what is least costly, or relatively easy to implement in a project area, but are based on what is functionally effective in terms of hydrologic and pollutant transport processes. For example, if a designer develops an alternative, and the designer can describe why the formulated alternative is likely to be particularly effective for water quality improvement given the project area conditions, both a strategy (the why and how) and an alternative (the what) have been generated.

FREQUENTLY ASKED QUESTIONS AND LESSONS LEARNED

FREQUENTLY ASKED QUESTIONS

1. What Is the Difference between a Water Quality Strategy and a Water Quality Alternative?

The most important difference between a water quality strategy and an alternative is that a strategy is a conceptual solution and an alternative is a defined set of BMPs that implements the strategy. An easy way to think about the difference is that a strategy is the justification a project designer would give to a permitting or funding agency to explain why a specific set of BMPs or design has been selected and deployed. This justification or strategy will generally link directly back to the analysis of existing conditions (e.g., priority areas or priority pollutants).

2. Why Are Strategies Necessary?

Strategies are needed to communicate how alternatives are expected to function in reducing pollutant loads in a project area. A water quality strategy makes the connection between project goals and objectives, existing water

quality problems, opportunities and constraints, and a particular alternative. Strategies are necessary to communicate the intent of the designer in laying out an alternative for review by others.

3. How Are Water Quality Strategies and Alternatives Related to Project Goals and Objectives, the PDA, and the Watershed Approach?

Figure 2 provides a visual representation of the relationship between water quality strategies and alternatives, project goals and objectives, the PDA, and a watershed approach. The upper part of the figure (blue and grey boxes) represents project-specific goals and objectives and guiding principles that were first presented in Figure 1. As presented in Figure 2, each step in the FEA process, including the development of water quality strategies and alternatives, should consider the guiding principles set forth in the PDA, using a watershed approach as well as project-specific goals and objectives.

4. How Many Water Quality Strategies or Alternatives Should Be Developed? Or Why Is It Necessary to Have More than One Alternative?

There is not a fixed number of strategies and alternatives recommended for every project. The number of strategies and resultant alternatives that should be developed depends on the size and complexity of the project. Large, highly urbanized projects may present the opportunity for several very distinct strategies, and some strategies may lead to more than one alternative. Smaller projects may be sufficiently straightforward or constrained by budget or project area conditions that one strategy and two or three alternatives are sufficient.

However, developing more than one alternative is extremely useful to compare constructability, maintenance requirements, costs, and most importantly, water quality improvement potential. If opportunities are present, creative designers will likely find themselves generating multiple strategies and alternatives based on various functional combinations of BMPs and the challenge may be to consolidate these into a manageable number.

LESSONS LEARNED

Lesson 1

Strategies and alternatives should be based on project area conditions and opportunities and constraints identified in the existing conditions analysis. Strategies based solely on general concepts (e.g., source control or a watershed approach) are not specific to the project area and, therefore, are not suitable to form the basis of a project-specific alternative. For example, if a site is densely developed with generally steep slopes, it may not be appropriate to apply a hydrologic design principle like dispersal and infiltration of runoff.

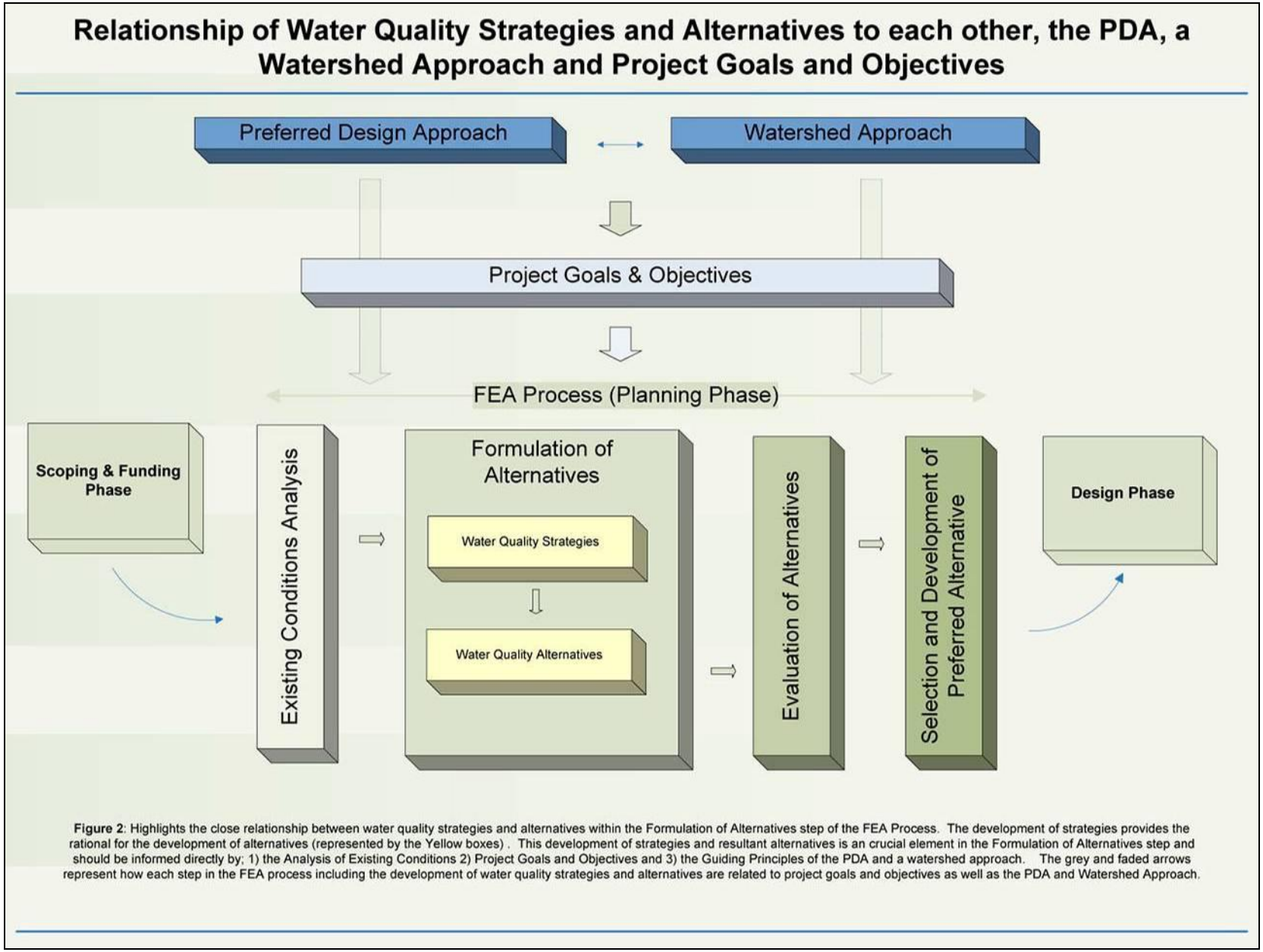


Figure 2. Relationship of Water Strategies and Alternatives to Each Other, the PDA, a Watershed Approach, and Project Goals and Objectives

Lesson 2

The number of strategies and alternatives generated should not be forced to meet a fixed criterion. For example, "dummy" strategies or alternatives composed of uniform but ineffective solutions are not helpful in the process (e.g., source control alone is probably not effective as a stand alone strategy in most project areas). Each strategy and alternative should be feasible to the extent that this determination is possible early in the planning process.

Lesson 3

Strategies and alternatives are generally paired, and they can be developed either sequentially or simultaneously as long as both a strategy (the why and how) and an alternative (the what) have been generated.

Lesson 4

A very large number of alternatives at the formulating alternative stage may be counterproductive, causing unnecessary analysis and review. The number of alternatives should be limited, if possible, to those with major functional differences as identified by strategies. If variations on an alternative are needed to address constraints, they should be grouped to the extent feasible for evaluating performance. For example, two alternatives that have water quality basins of approximately the same size on opposite sides of an intersection are not functionally different; they should be grouped as one alternative (and one strategy) for the purpose of evaluating water quality performance.

LEVEL OF DETAIL FOR THE EXISTING CONDITIONS ANALYSIS

INTRODUCTION

Recent experience with the FEA has highlighted differences in opinion about the warranted level of detail, and thus the resources applied, when conducting an existing conditions analysis.

Three main concerns have arisen from comments provided on previous submittals of existing conditions analysis memoranda (ECAM):

1. The volume of material generated and provided in the ECAM can be excessive. Designers could be required to expend resources that could be applied elsewhere.

2. Presentation of information can be too formal in the ECAM. Again, designers could be required to expend resources that could be applied elsewhere.

3. The overall body of work leading up to the ECAM deliverable tends to focus on presentation of information to the detriment of providing sufficient interpretation of the compiled information.

CLARIFICATION

Two major elements to the existing conditions analysis, information collection and analysis and information interpretation, are identified and defined below. Both elements are highly valuable methods of efficiently addressing the goals and objectives of a project. However, the importance of each element is viewed in a slightly different context by stakeholders in the process, depending on their roles and perspective. Some examples of differing perspectives are provided with each definition.

Information Collection and Analysis—The synthesis of a body of information used as the key reference for the project area during the project delivery process. The term "analysis" is used to describe the development of technical information. For example, the development of a hydrology model and the computation of runoff would be considered analysis.

Examples of differing perspectives for information collection and analysis are as follows:

- Information collection and analysis provides all background material for a study area in a single location for efficient reference throughout the project delivery process.

- A breadth of information collection during this step results in less time locating or collecting additional information during subsequent stages and can help avoid project delays.

- Some information gathered appears to never be used, and therefore is perceived as inefficiency or waste in the process.

- Information collection can dominate the resources applied.

Information Interpretation—Assessing the collected and analyzed information to better understand project area conditions and to identify opportunities and constraints. The term "interpretation" is used to describe how information is perceived to influence and inform opportunities and constraints. For example, the assessment of how computed runoff from a hydrology model will influence pollutant sources, pollutant delivery, or project design for conveyance is considered interpretation.

Examples of differing perspectives for information interpretation are as follows:

- Information interpretation communicates how the information collected and analyzed is being used to identify opportunities and constraints specific to the study area.

- It highlights the possibilities for water quality improvement and the creativity that may be applied when formulating alternatives.

- It provides an indication of the potential resources that may be needed given the opportunities and constraints for water quality improvement.

- Opportunities and constraints that are specific to the study area can be challenging to develop before alternatives are formed.

- It needs to provide an explanation of the data collection and identify the significance of the data rather than simply restating the information collected.

FREQUENTLY ASKED QUESTIONS AND LESSONS LEARNED

FREQUENTLY ASKED QUESTIONS

1. What Is the Appropriate Level of Effort for the Existing Conditions Analysis?

Some recent experiences have shown that uncertainties regarding the FEA process have led to more literal interpretations of the FEA guidance and more comprehensive data collection than may have been warranted. Unfortunately, uniform guidance on the appropriate level of effort for an existing conditions analysis is not feasible; these judgments are part of good project management and involve communication between key stakeholders to agree on a scope of work that defines the level of effort. The guidance in the FEA is not a mandate and must be tailored to specific project area conditions and goals and objectives.

In an attempt to better inform this issue, Table 1 provides guidance regarding the roles, communication responsibilities, and key interaction points for stakeholders of the process. Table 1 suggests increased interaction between implementing and funding agencies during the application processes for grant funding. This increased interaction is intended to better align these key stakeholders in terms of the goals and objectives of the proposed project and the spatial extent of the proposed project. Agreement on these two aspects of the project early in the process is key to determining the overall scope, which ultimately should guide the level of effort in the existing conditions analysis.

Table 1 suggests that the funder and implementer use the FEA checklists (or a similar tool) to agree on a preliminary level of effort during the planning grant application and workplan development steps. The estimated level of effort can be qualitative (i.e., low, medium, or high), but the rationale for the level of effort should be clear and agreed upon. A new step in the process is recommended, referred to in Table 1 as "the Existing Conditions Analysis Check-In Step." The purpose of including this step is to revisit the assumptions used to develop the level of effort to determine if revisions are warranted. The FEA process cannot be applied efficiently without active and iterative communication.

2. What Is the Reason for Identifying Opportunities and Constraints in the Existing Conditions Analysis? How is This Information Used?

The FEA document does not highlight the importance of identifying opportunities and constraints, which is not intended to be a trivial exercise. Recent experience has shown that identifying and developing strong opportunities and constraints that are specific to a project area is difficult for some designers. This step is often given little attention, but it is essential to form the basis for the formulation of alternatives. An emphasis on interpreting information collected and identifying opportunities and constraints should be a focus of resources allocated within each scope of work for the existing conditions analysis.

A full revision of the FEA should elevate the significance of opportunities and constraints relative to other suggested deliverables in the ECAM.

Figure 3, which is provided in the FEA as Figure A.1, is presented here for emphasis. Information collected and analyzed for the project area, hydrologic conditions, and water quality conditions should be interpreted and used to inform the opportunities and constraints.

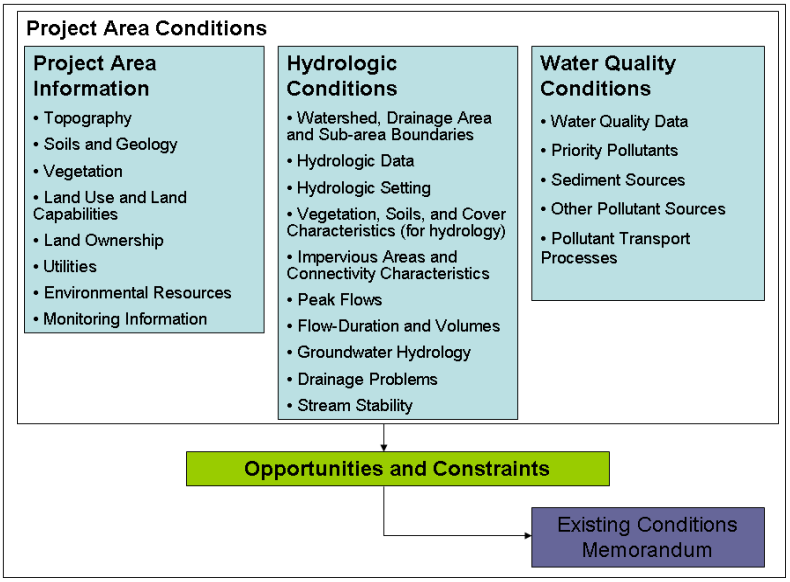


Figure 3. Importance of Opportunities and Constraints

Table 1 Steps to Determine and Communicate Level of Detail in the Existing Conditions Analysis				
Key Point In Process	**Roles in Process and Key Interaction Points**			
	Implementer	**Funder**	**Reviewer**	**Consultant Designer (if applicable)**
Before Application for Planning Grant	Provide best initial estimate of need and anticipated scope.	Provide response regarding overall feasibility and resource availability.	NA	NA
Application for Planning Grant	Working with funder, revise estimate of resources needed and overall scope. Preliminary use of checklists to estimate the level of detail is suggested at this stage. Articulate goals and objectives.	Working with implementer, revise estimate of resources needed and overall scope. Preliminary use of checklists to estimate the level of detail is suggested at this stage. Articulate goals and objectives.	NA	NA
Workplan and Request for Proposal (RFP) Development (if applicable)	Develop the workplan between the funder and implementer based on resources allocated. Specify the level of detail in the workplan where feasible. An experienced project manager should develop or, at a minimum, review the workplan. If applicable, develop RFP within the context of the workplan.	Develop the workplan between the funder and implementer based on resources allocated. Specify the level of detail in the workplan where feasible. An experienced project manager should develop or, at a minimum, review the workplan.	It may be beneficial to begin involvement of reviewers at some level in this step to facilitate a collaborative process. However, this interaction point is optional.	Respond to RFP
Consultant Negotiation (If Applicable)	Develop a scope of work and contract for the consultant designer. Should have basis relating to workplan developed with the funder.	NA	NA	Working with implementer, develop a scope of work. Highlight uncertainty in the scope of work related to the level of detail warranted.
Existing Conditions Analysis Kickoff	Review the rationale for the overall scope and level of detail using checklists or another method. Highlight key areas of uncertainty that may be better defined as the process moves forward. Designate timing of check-in.	Communicate available resources within the context of the assumed level of detail and the goals and objectives of the project.	Review the level of detail proposed and overall scope. Comment on both within the context of project goals and objectives.	Review the rationale for overall scope and the level of detail using checklists or another method. Highlight key areas of uncertainty that may be better defined as the process moves forward. Designate timing of check-in.
Existing Conditions Analysis Check-In	Revisit the level of detail based on progress made and work to date. Focus on key areas of uncertainty. If applicable, revise level of detail needs. Provide draft outline of ECAM deliverable.	Communicate how any potential modifications to level of detail would affect available resources. Review the ECAM outline and convey anticipations for content included in ECAM.	Review the revised level of detail proposed and comment. Review ECAM outline and convey anticipations for content included in the ECAM.	Revisit the level of detail based on progress made and work to date. Focus on key areas of uncertainty. If applicable, revise level of detail needs. Provide draft outline of ECAM deliverable.

Example

An assessment of project area conditions found that a number of structures had been constructed in the existing right-of-way. This implementation consideration was identified as a significant constraint. Additional interpretation of project area information was used to identify opportunities within the project area for siting project improvements because of the restrictions identified for siting project improvements in the right-of-way. In this example, the identification of a significant constraint led to additional information interpretation that assisted the formulation of alternatives that were feasible to implement.

3. What Information Should Be Included in the Existing Conditions Analysis Memorandum and How Should It Be Presented?

Some recent experiences have illustrated a tendency among designers to compile and present too much information in the ECAM. Ideally the project's scope of work will address the components of the ECAM and the appropriate level of detail. Information presented in the ECAM should be efficient, give a clear sense of problem areas and pollutant sources, and be important for design. As a rule of thumb, information collected that is perceived as key reference material or that directly informs the opportunities and constraints should be included and presented in the hard copy of the ECAM. When providing information in the hard-copy ECAM there is an obvious desire to make that information presentable and informative; however, limiting the amount of information formally presented in the hard-copy ECAM reduces the resources needed to develop that information into a presentable format and the resources consumed when the ECAM is reproduced for submittal.

In general, information collected but not printed in the ECAM can be provided digitally with the ECAM. If information is provided digitally, it should be less rigorously developed from a presentation standpoint. The least pertinent information should remain in the project files and not be submitted with the ECAM. Alternatively, a list of information used to develop the ECAM could be provided with the ECAM for reference and reviewed upon request.

Examples

The following examples illustrate information that is typically not warranted in paper format with the ECAM. However, exceptions may apply.

- **Reference Information for the Study Area—**Permits (e.g., National Pollutant Discharge Elimination System [NPDES]) for stakeholders in the project area tend to be lengthy and only subsets of the information are relevant to project design. In this example, information interpretation is needed rather than compilation and presentation of information in the ECAM.

- **Certain Submittals Included in Table A1.2–Submittal Checklist for Existing Conditions Memorandum in Appendix A of the FEA—**As noted in the FEA, not all the submittals listed in the checklist need to be

submitted, and this decision is dependent on the project area. For example, if surveys do not identify sensitive environmental resources within or near the study area, this information does not need to be presented in the ECAM.

CONNECTIVITY OF IMPERVIOUS AREAS

INTRODUCTION

The current discussion in the FEA provides a narrative description of connectivity of impervious areas and the importance of this concept for water quality planning. In practice, this narrative description and the estimation of input parameters for the FEA spreadsheet have not been completely clear to all users. The purpose of this section is to clarify the concept and definition of connectivity of impervious areas.

CLARIFICATION

The concept of connectivity of impervious areas is used within the FEA to describe how the configuration of impervious surfaces will influence stormwater runoff and pollutant loading within a drainage catchment. Connectivity of impervious areas is used as a water quality planning tool in the FEA and is not meant for direct application in engineering design. Impervious-area connectivity relationships are used in the FEA hydrology spreadsheet to estimate runoff volumes and flow-duration characteristics, and for subsequent calculations of pollutant loads under existing conditions.

The FEA introduces and describes impervious-area connectivity using the terms "directly connected impervious area" and "other impervious area." Additional terminology and descriptions of connectivity of impervious areas are introduced within the FEA when describing the application of the FEA spreadsheets.

The following section clarifies the terminology used to describe impervious-area connectivity in the FEA. The revisions are made to better align this terminology with future methods and models under development that will eventually supersede the current FEA spreadsheets used to estimate pollutant loading.

The concept of impervious-area connectivity is defined using the following two terms:

- **Directly Connected Impervious Area (DCIA)**—Impervious surfaces draining to conveyance systems via a hydraulic connection; Area A in Figure 4.

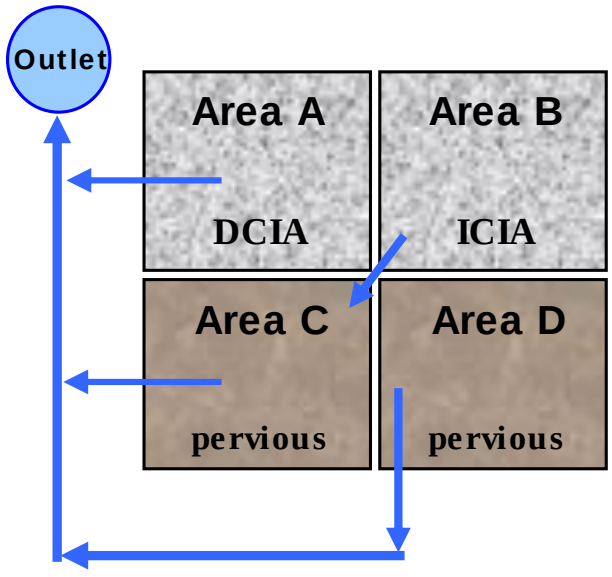


Figure 4. Simplified Depiction of Impervious-Area Connectivity

- **Indirectly Connected Impervious Area (ICIA)**—Impervious surfaces draining to pervious surfaces that promote infiltration, distribution and energy dissipation, or storage before overflow drains to a conveyance system; Area B in Figure 4.

Figure 4 illustrates a simplified representation of a drainage catchment with the total area separated into four distinct drainage functions. Area A represents the DCIA, illustrated with a direct hydraulic connection to the conveyance system. Area B represents the ICIA, illustrated by distribution to a pervious area before runoff enters the conveyance system. Area C is the pervious area receiving ICIA runoff. Area D is the pervious area functioning independently from the influence of impervious surfaces.

The reader should note that other guidance documents and various design manuals may use different terms synonymous with DCIA and ICIA. For example, a synonymous term used for DCIA is effective impervious area (EIA).

FREQUENTLY ASKED QUESTIONS

FREQUENTLY ASKED QUESTIONS

1. Why Is It Necessary to Consider Connectivity of Impervious Areas during Project Planning?

Impervious area alters a watershed's hydrologic function by changing physical processes associated with infiltration, runoff collection, and runoff routing. The typical result from modifications to these physical processes is an increase in surface runoff peak flows, total surface runoff volumes, and flow durations capable of producing erosion downstream. The changes in runoff characteristics may lead to any of the following water quality concerns: increased erosion in the drainage system of the study area, increased erosion in streams downstream of the study area, and increased delivery of pollutants collected on impervious surfaces.

The magnitude of change in runoff processes associated with impervious surfaces is controlled by two key physiographic characteristics within a drainage catchment: the density of impervious area and the connectivity of impervious areas. With regard to public stormwater management projects in the Tahoe Basin, connectivity of impervious areas is of primary importance because project design focuses on the retrofit of existing development. In this typical scenario, impervious-area density is relatively fixed and the opportunities for runoff improvements typically require a shift from DCIA toward more ICIA.

In much of the Tahoe Basin, drainage systems were poorly constructed, resulting in small-scale temporary storage and ponding of runoff. In many cases, this scenario may be problematic for the public and for water quality. Many typical controls for these problems involve construction of improved drainage systems that may inadvertently

increase connectivity of impervious areas. The challenge for planning and design of stormwater management projects in the Tahoe Basin is to address multiple project objectives while avoiding increases in DCIA.

Examples

The following examples illustrate the effects that increases in DCIA have on both peak runoff rates and total runoff volumes. The examples use a 20-acre drainage catchment with a constant infiltration rate of 1 inch per hour for pervious areas. The four scenarios listed below were modeled for a discrete precipitation event (peak-flow response example) and for a continuous hydrologic simulation (runoff-volume response example). The scenarios transition from a 100% pervious scenario to 30% impervious scenario with varying quantities of DCIA relative to ICIA:

- Scenario 1—100% pervious
- Scenario 2—70% pervious and 30% impervious (0% DCIA and 100% ICIA)
- Scenario 3—70% pervious and 30% impervious (50% DCIA and 50% ICIA)
- Scenario 4—70% pervious and 30% impervious (100% DCIA and 0% ICIA)

Peak-Flow Response

Figure 5 illustrates the simulated response of peak flows for each scenario using a discrete precipitation event with a relatively intense peak (as shown at the top of Figure 5). The runoff response illustrates that development of a pervious drainage catchment will significantly increase peak runoff rates during high-intensity precipitation events. Furthermore, the ratio of DCIA to ICIA plays a significant role in the magnitude of peak runoff rates. The net result of increasing DCIA is an increase in the peak velocity of runoff leaving the drainage catchment. This increase in runoff energy has more potential to scour and erode drainages and streambanks, resulting in increased delivery of pollutant loads to receiving water.

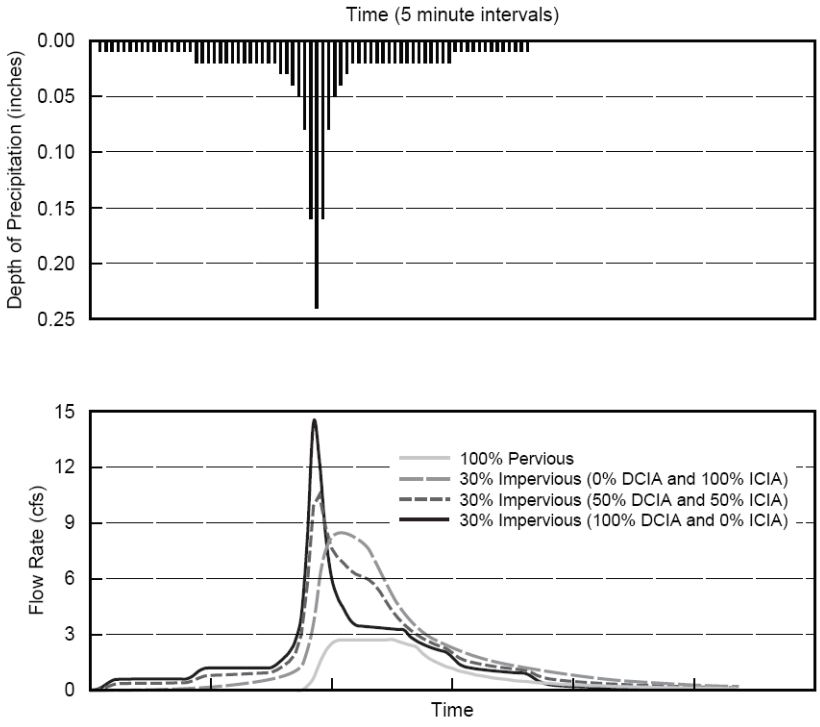


Figure 5. Simulated Response on Peak Flow Related to Connectivity of Impervious Areas

Runoff Volume Response

Figure 6 illustrates the simulated response of each scenario from a continuous hydrologic simulation (i.e., a simulation of roughly 25 years of hourly rainfall). The results from each scenario are presented as a runoff-yield coefficient, which is the average annual runoff divided by the average annual precipitation. For the 100% pervious scenario (Scenario 1), roughly 96%–97% of the precipitation (rain and snow) is infiltrated. For the 30% impervious–100% ICIA scenario (Scenario 2), only a slight increase in average annual runoff is simulated because the majority of precipitation in the Tahoe Basin is snowfall or low-intensity rainfall. Therefore, the majority of runoff occurs at rates small enough to allow infiltration from ICIA in pervious areas. As shown in Figure 6, the runoff-yield coefficient greatly increases as the ratio of DCIA to ICIA increases. The net result of increasing DCIA is an increase in the total runoff volume leaving the drainage catchment. This increase in runoff volume means that there is less filtration of runoff in soils and more transport of pollutants collected on impervious surfaces to receiving waters.

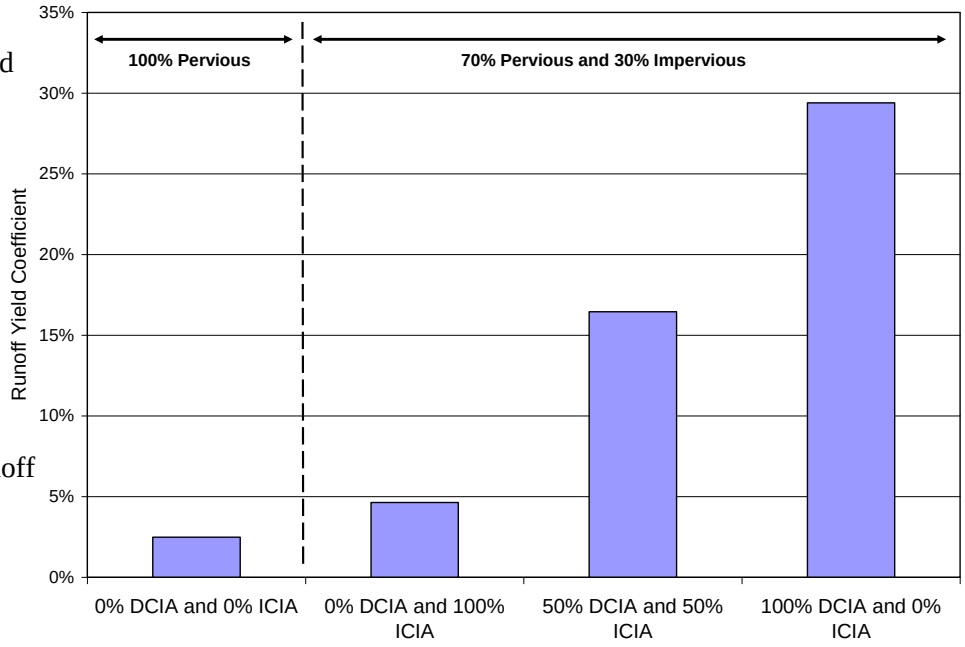


Figure 6. Simulated Response on Average Annual Runoff Volumes Related to Connectivity of Impervious Areas

2. What Is the Purpose of the Parameters K1 and K2 in the FEA Spreadsheet and How Are They Supposed to Be Used?

The parameters K1 and K2 (defined on page A-60 of the FEA document) are used as a tool to vary impervious-area connectivity and are applied in the FEA spreadsheet for computations of runoff. K1 and K2 provide simple adjustment parameters to limit the amount of time and resources expended to estimate impervious-area connectivity. Figure 7 illustrates a simplified example for a roof that partially drains to a driveway and then to a road. The spatial area of the roof could be defined in the current FEA method in one of the two following ways.

- Method 1: DCIP = Half of Roof Area; ICIP = Half of Roof Area; and K1 = 1 or
- Method 2: ICIP = Roof Area; and K1 = 0.5 where DCIP is calculated as (1 – K1)*ICIP

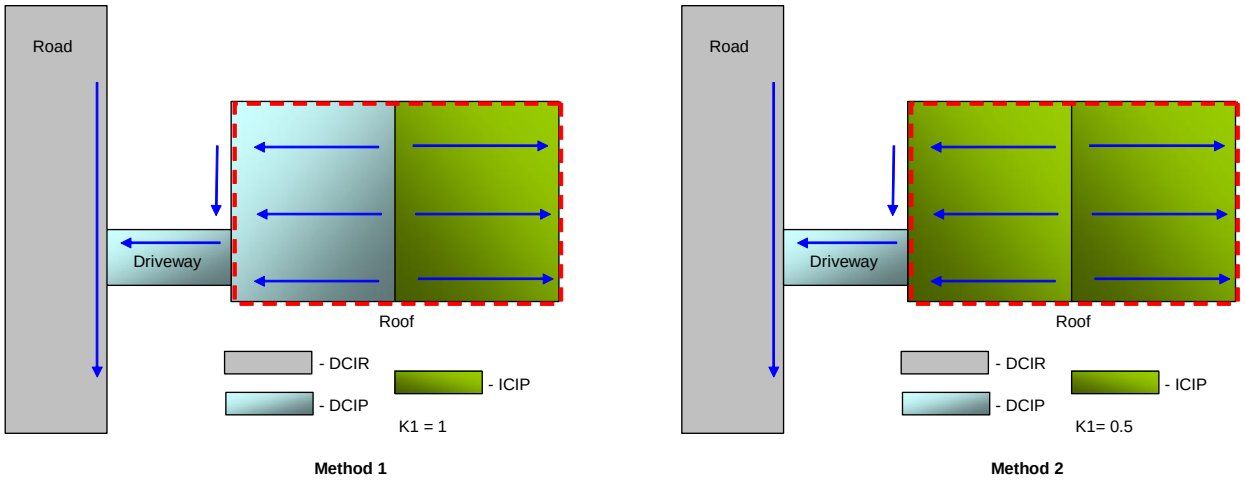


Figure 7. Illustration of K1 Assumptions

Assumptions for Method 1 and Method 2 above are functionally equivalent. The inclusion of K1 is intended as a simplification to avoid, for example, tabulating the connectivity of impervious areas for individual roofs in a project area. Instead, the designer can simply tabulate all roof areas within the project area as ICIP, then use professional judgment and limited field inspection to account for the total area of all roofs that partially drain to pervious area (i.e., specify a K1 for the sum of all roofs).

Note that the equations for calculating runoff shown at the top of page A-60 in the existing FEA document are incorrect. The following text and equations replace the text and equations at the top of page A-60 and may provide additional clarification to the reader regarding the use of K1 and K2 in the FEA spreadsheet.

Precipitation excess that contributes to runoff (R) is calculated using the following formula:

If MI(K1*ICIP + K2*ICIR + Pervious) < L*Pervious*

$R = MI*[DCIP + DCIR + (1-K1)*ICIP + (1-K2)*ICIR]$

Else

$R = MI*[DCIP + DCIR + ICIP + ICIR + Pervious] - L*Pervious$

MI is a variable that represents moisture input rather than precipitation. This variable is computed as:

$MI = P - XSWE$

Where P = precipitation depth in the interval

XSWE = change in snow water equivalent (SWE) in the interval

3. What Is the Appropriate Level of Effort for Estimating Impervious Area Connectivity?

The intent of the FEA is not to require overly cumbersome techniques for estimating DCIA and ICIA. Quantifying DCIA and ICIA can be somewhat subjective. The amount of time allocated for this effort should be limited to that needed to be confident that the quantification of impervious-area connectivity is reasonably accurate.

Figure 8 provides example photos of DCIA and ICIA. As a general rule of thumb, if runoff from an impervious surface would collect and be conveyed in a drainage system, the impervious surface should be considered DCIA. If the runoff from an impervious surface would disperse across a pervious surface or pond up, the impervious surface should be considered ICIA. Designers are encouraged to review connectivity of impervious areas during storm events.

Examples of ICIA

Note that runoff from impervious surfaces would likely pond and/or disperse in pervious areas.

ICIA

ICIA

Examples of DCIA

Note that runoff would likely collect and convey along the road shoulder.

DCIA

DCIA

Figure 8. Example Photos of DCIA and ICIA

Resources allocated for field review of impervious-area connectivity should be commensurate with the goals and objectives of the project. For example, if the goal is to assess the performance of public improvements associated with the project, the resources allocated to quantifying DCIA and ICIA should be focused at a spatial scale of a block rather than the parcel scale shown in some of the photos in Figure 8. If a project goal is to incorporate and encourage private-sector implementation of BMPs with the public project improvements, then a more detailed assessment of impervious-area connectivity may be warranted at the parcel scale.

DEVELOPING THE RECOMMENDED ALTERNATIVE TO THE 30% DESIGN

INTRODUCTION

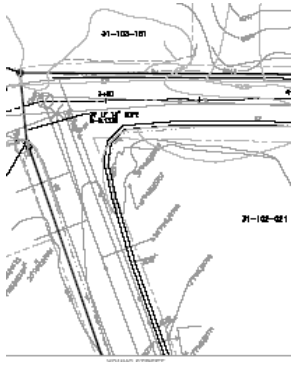
In most cases, carrying constraints and design issues through the selection of a recommended alternative is necessary to avoid an excessive commitment of time and resources in the evaluation of alternatives that will eventually be dropped. The FEA recommends a step, referred to as "Developing the Recommended Alternative," to investigate and resolve design issues and the remaining constraints associated with the recommended alternative. The end product from developing the recommended alternative is the preliminary design, which is referred to in the FEA as a 30% design. The intent of developing the recommended alternative to a 30% design is to further reduce the possibility that unforeseen obstacles or constraints will be discovered later in the construction document process, leading to delays, redesign, or permitting difficulties.

In certain experiences with the FEA, review agencies have expressed concern that the 30% design produced from the Development of the Recommended Alternative step did not reflect the concepts or elements included in the recommended alternative. The intent of this section is to explain the typical causes for this issue and highlight measures to reduce potential changes to the recommended alternative during its development to a 30% design.

CLARIFICATION

The 30% design is the endpoint of the FEA process and the beginning of preparation of construction documents. Nomenclature between agencies will vary, but a 30% design in the FEA is the preliminary design stage at which substantial changes should not be expected in the further development of final plans.

Table 2 illustrates the recommended level of detail for a 30% design compared to a recommended alternative based on the status of implementation considerations, project components, details, drawings/plans, and reports submitted. The "level of detail" columns in Table 2 are provided for each topic as guidance to allow the reader to compare and contrast a recommended alternative with a 30% design. Additionally, examples of the level of detail are provided and can be compared between the recommended alternative and the 30% design for each topic. Note that Table 2 only provides a simplified means to compare and contrast a recommended alternative and a 30% design. A thorough project delivery process would define specific deliverables in a scope of work as the endpoint of the 30% design.

Table 2 Comparison Between a Recommended Alternative and a 30% Design				
Topic	**Recommended Alternative**		**30% Design**	
	Level of Detail	**Examples**	**Level of Detail**	**Examples**
Status of Implementation Considerations	May include unresolved but identified design issues or constraints. Steps for resolution and potential implications are clearly communicated.	Acquisitions pending; potholing for utilities pending; resolution of permitting or funding issues pending.	Major design issues and constraints addressed.	Acquisitions have very high likelihood of success.
Status of Project Components	Components are located in general terms; detailed configuration or exact alignment may be pending.	Detention basin shown on a parcel but layout is pending (e.g., no inlet/outlet, no configuration to avoid large trees)	Components of project are sized and specific locations or alignments are confirmed (i.e., constructability of project is fairly certain).	Configuration of detention basin and storage volume developed; storm drain alignment avoids major utility conflicts.
Status of Details	Not developed.	Not applicable.	Key details and typical sections developed for water quality components.	Details for energy dissipation structures; typical detention basin design proposed for the project; typical swale design.
Status of Drawings/Plans	Conceptual in nature. May be prepared on a single sheet displaying overall plan view.		Conventional engineering drawing sheets. May only be plan view and may be at a reduced scale. Likely will not include profiles, call-outs, stationing, labeling, detailed topography, etc.	
Reports Submitted	Content should include a description of the recommended alternative, rationale for selection, comparison to goals and objectives, identification of implementation considerations pending resolution, and description of next steps.		Submittal of a design report is optional but may be included if significant work was needed to resolve constraints or design issues, or to communicate necessary modifications to the recommended alternative.	

An additional point of clarification within the current FEA document is that the terms "recommended alternative" and "preferred alternative" are synonymous. The FEA document uses both terms. The full FEA revision should select and use a single term when describing this step in the FEA process.

FREQUENTLY ASKED QUESTIONS AND LESSONS LEARNED

FREQUENTLY ASKED QUESTIONS

1. What Is the Appropriate Level of Detail for Selecting a Recommended Alternative?

At a minimum, the recommended alternative should be developed to a level of detail that identifies constraints, communicates associated risks, and defines the steps necessary to resolve constraints during the development of the recommended alternative. To accomplish this level of detail, designers must interpret information in the steps leading up to the selection of a recommended alternative (i.e., the formulation and evaluation of alternatives).

During the formulation of alternatives, a screening procedure similar to the method shown in Appendix B-3 of the FEA should be applied when siting key elements (e.g., detention basins). Uncertainties and potential constraints identified from the screening procedure should be used to formulate the alternative or should be carried to the evaluating alternatives step. At this point, it is the responsibility of the project designer/manager to determine the level of detail needed to evaluate the alternative. As a rule of thumb, if a constraint has the potential to fundamentally alter the water quality performance of an alternative, it should be evaluated or, at a minimum, highlighted as a significant implementation consideration for the alternative.

Review agencies should be informed of the implementation considerations or risks of each alternative and should use this information along with other important factors (e.g., water quality benefit, costs) to make an informed selection of the recommended alternative. The implications of developing the recommended alternative should be understood. In this process, the development of the recommended alternative may lead to a 30% design that is different than the recommended alternative. However, the need for the deviation from the recommended alternative will have been anticipated as a risk associated with its selection.

Example

During the formulation of alternatives for a project, the implementation considerations associated with the siting of a key detention basin were not identified and were not carried to the evaluating alternatives step. The formulated alternative was selected as the recommended alternative without an evaluation of implementation considerations for the detention basin. During the detailed design process, the detention basin had to be eliminated because of site constraints identified from seasonally high groundwater. This modification caused a problem for certain review agencies because the alternative was selected based on the presumed level of water quality improvement that the detention basin would have provided.

In this example experience, the selection of a recommended alternative occurred where the implementation considerations or risks were not clearly known or communicated. As the recommended alternative was developed, constraints were realized that required modifications to the design. The modifications were viewed by review agencies as unanticipated changes to the recommended alternative that fundamentally altered the water quality strategy of the project. Consequently, the ability of the revised design to meet the project's goals and objectives were questioned. The net result of the described scenario has been project delay, further project redesign, and a high level of frustration among members of the design team and review agencies.

2. How Can You Ensure that the 30% Design Reflects the Recommended Alternative?

When this question arises, it typically signifies that issues have occurred related to the identification, communication, and resolution of constraints during the FEA process. It should be noted that the intent of the FEA is not to ensure that a 30% design is exactly the same as the recommended alternative, but to ensure that it reflects the fundamental intent and strategy associated with the alternative to the fullest extent possible. The intent of developing the recommended alternative to the 30% design level is to further reduce the possibility that unforeseen obstacles or constraints will be discovered later in the construction document process, leading to delays, redesign, or permitting difficulties.

Table 3 highlights components of the FEA that should be used to identify and resolve constraints. Table 3 displays the major steps in the FEA process after an existing conditions analysis is finalized. For each step in Table 3, the following is described: key points from the current FEA, lessons learned and examples of specific issues that have occurred, and suggested measures to avoid or resolve specific issues in the future.

Lessons learned about developing the recommended alternative to the 30% design are summarized in Table 3, below.

Table 3
Lessons Learned in Developing a Recommended Alternative

Major Steps in the FEA	Key Points from Current FEA Guidance	Lessons Learned	Suggested Measures
Alternatives Formulation	• Identify a sufficient range of approaches, potential benefits, and costs to develop consensus on the design approach • Identifying constraints and the steps needed to resolve constraints	Potential constraints associated with siting major elements/BMPs aren't identified or communicated Example – detention basin sited on parcel too steep for storage	• Apply screening process in Appendix B-3 of the FEA when siting major elements/BMPs • Experienced designer should field review major elements of each formulated alternative for general feasibility
Alternatives Evaluation	• Level of detail at this stage of analysis may be preliminary for components of alternatives with few implementation considerations. • Some elements may require detailed design work to adequately identify constraints and design criteria	Potential constraints are not evaluated (possibly because they weren't identified), or the timing for resolution is not communicated Example – infiltration galleries sited in locations where subsequent evaluation during design identified high groundwater	• Apply Appendix C-4 (Implementation Considerations) to each alternative • Begin resolving constraints or update steps needed to resolve constraints
Selection of Recommended Alternative	• Major constraints and design issues are identified, but likely not all have been fully resolved • Uncertainty and implementation considerations should be clearly stated • May be necessary to carry constraints at this stage to avoid overly detailed investigations of alternatives	Risks associated with recommended alternative are not clearly communicated Example – Private property owner of key parcel is considering, but has not committed to sell parcel. Significance of obtaining the parcel not communicated.	• Implementation Considerations (Appendix C-4) should be used as a selection criteria • Risk or uncertainty should be communicated, as well as potential implications of next steps • Selection should be linked to the goals and objectives of the project
Develop	• Resolve remaining design issues and constraints • Focus on design issues rather than preparation of construction documents •Additional time and resources may be required depending upon project complexity	Recommended alternative altered without TAC's knowledge in order to produce design that is constructible Example – detention basins removed because of failed acquisition or site constraints realized (i.e. steep slopes)	• Designer should clearly communicate the steps needed to develop recommended alternative to the TAC • If significant work, or modifications to recommended alternative are required, a design report may be necessary
30% Design	• End-point of FEA process and the beginning of the contract document preparation phase. • 30% design meeting is optional, and typically not needed if the 30% design reflects the recommended alternative.	Conflicting perceptions of a "30% Design" lead to disagreements regarding completeness of deliverable	• Complete typical components for 30% design as described in interim FEA guidance document – or complete based on specific scope of work for project

MANAGING UNCERTAINTIES WITHIN THE SWQIC PROJECT DELIVERY PROCESS (PDP)

The purpose of this section is to provide guidance for effectively managing various uncertainties that can change the milestone delivery deadlines of an Erosion Control/Water Quality Project within the Tahoe Basin. There are various uncertainties within the SWQIC PDP which have caused certain project delivery delays, and in some cases actual project derailment. Most of the uncertainties we face within the Tahoe PDP are similar to those faced in other regions, however the one most common uncertainty that leads to potential project delivery changes is Tahoe's very short construction season, which affects most of the other uncertainties. Within this section, we provide a list of types of uncertainties, with suggestions on how they can be managed and relevant anecdotes related to some. The uncertainties described in the section include:

- Acquisition/CTC License Agreements/USFS Special Use Permits
- Environmental Documentation
- Utility Conflicts
- Weather and Associated Grading Restrictions
- Using Nevada/California Conservation Corps.
- Permitting and Regulatory Requirements
- Contracts
- Working with the Public

This list represents the majority of the categorical uncertainties that have been observed within the Tahoe PDP over the last four years. There are various solutions to these uncertainties discussed within this document that can be applied within the Tahoe PDP for Erosion Control/Water Quality Projects. However, some solutions may only be available to certain agencies based upon agency-specific written policies.

TOPIC: Acquisitions, USFS Special Use Permits and CTC License Agreements	
DESCRIPTION: When planning erosion control projects acquisitions are many times desirable or necessary to construct improvements. Typically, acquisitions fall into one of three categories; full take, easement, or temporary construction easements. Full take acquisitions can be more expensive, especially if the property has a buildable IPES score or an existing structure. Extreme caution should be exercised when evaluating the need for this type of acquisition. Easements are typically more palatable to a property owner since they only cover a portion of the property. However, owners are often concerned about the "cloud" an easement may present to their title. Easement valuation is very subjective and can vary considerably even between appraisers. Obtaining easements can often be delayed due to this subjective valuation process and an owner's disagreement with the proposed value. Temporary Construction Easements are used when only access to construct or maintain an improvement is required. These are for a shorter period of time, and owners are usually receptive to them. In some cases property owners are compensated for this type of easement. Methods of compensation vary considerably.	
Issues/Opportunities	Solutions/Recommendations
If the acquisitions can't be obtained, it may not be possible to construct the improvements of the preferred alternative.	Avoid the need for acquisitions if possible, but if it will significantly improve the project pursue it. Projects should be designed to minimize the need for acquisitions by using available public lands and Right-Of-Way for improvements.
At this time (2008), acquisition funding is available from the California Tahoe Conservancy (CTC) for California EIP projects; however, this funding is limited. Nevada Division of State Lands and the US Forest Service currently do not have funding available for acquisitions.	Project implementers should explore all potential options for funding acquisitions for their project. Other sources of funding may exist for acquisitions, depending on the particular project, such as California Dept. of Water Resources Flood Corridor Protection Grant Program. In some cases easements may be obtained without direct acquisition costs (e.g. where a shared facility is proposed that benefits both private and public interests. Construction/maintenance costs are attributed to each party as appropriate.)
While a property owner may indicate a willingness to cooperate in an acquisition, there is no firm commitment from them until the acquisition value is accepted and transaction documents are signed. If there are outstanding acquisitions at the point when a grantee is seeking site improvement funds from the CTC, site improvement funding may be withheld. This is to avoid the situation where site improvement funding is committed to a project that is not moving forward because of unsuccessful acquisitions. The California Tahoe Conservancy has recently adopted a policy to first award acquisition funding, and then when the acquisitions are completed award site improvement funding. Other funding agencies may	Grantees should consider developing a TAC-accepted back-up plan for how to work around acquisitions without compromising project effectiveness. The Conservancy will most likely find that acceptable for the award of site improvement funding but encourage the grantee to continue pursuing the acquisition(s).

have different policies.	
What do I need to do to utilize land owned by the U.S. Forest Service for my Erosion Control/Stormwater Quality Improvement project?	A special use permit is needed/available if project improvements will be made on a FS parcel(s) and there is a fee for this permit. In most cases when more that 25% of a parcel will be used by a project improvement, the FS will quit claim the parcel to the project owner. Improvements within the ROW of a FS parcel do not require a SUP.
What do I need to do to utilize land owned by the California Tahoe Conservancy for my Erosion Control/Stormwater Quality Improvement project?	If you want to utilize CTC land for your project you will need a License Agreement. There is no charge, but you need to make your request for an LA well in advance of your anticipated construction date because the CTC Board of Directors must approve the request at a regularly scheduled CTC board meeting. This request is usually included with site improvement grant applications so that both items can be handled at the same time. Because it may be difficult to know which CTC parcels you may need at the time when you are submitting your site improvement grant application, it is recommended that you request authorization to have License Agreements issued for all CTC parcels within your project area. In the end you may only need License Agreements for a few of them, but as final design progresses you know that you are eligible for all of them and can plan accordingly.
What do I need to do to utilize land owned by the Nevada Division of State Lands for my Erosion Control/Stormwater Quality Improvement project?	An application must be submitted to the Nevada Division of State Lands to authorize the use of State parcels. Applicants will apply for either a Temporary Right-of-Entry permit for situations when only construction access is needed or a Temporary Right of Entry and a permanent easement in cases where permanent improvements are proposed on State property.
CEQA must be completed to receive acquisition funding from the California Tahoe Conservancy.	Get CEQA done as early in the project planning process as possible. CEQA documents should be prepared and circulated as soon as a preferred alternative has been selected. Occasionally, a categorical exemption can be used for acquisition funding; however, this method is for fairly specific purposes and should not be relied upon for most acquisitions.
Acquisitions can be very expensive in the inflated real estate market of Lake Tahoe and funding is limited at this time. At the CTC, acquisition funding comes from the same pot of monies that planning and site improvement funds come from.	Make sure that the acquisition is worth it. Easements are much cheaper (thousands of dollars) than a full-take acquisition (hundreds of thousands of dollars). Make sure that funding used for acquisitions doesn't cause a shortfall for planning or site improvements for your project or other erosion control (EC) projects your jurisdiction is working on.
Designing improvements without knowing if you can get the acquisition.	After the preferred alternative is selected, get CEQA done as early as possible so that an acquisition grant can be awarded and to ensure acquisitions are pursued before the design process is very far along. While CEQA/acquisitions are being finalized it may be worthwhile to focus on design work in parts of the project area where there are not outstanding acquisition issues. Another approach would be to postpone the design process entirely until the acquisitions are completed. **Note: If a parcel is**

	proposed for just water spreading or minor restoration and qualifies as an environmentally sensitive land (Stream Environment Zone), it may be possible for the CTC's acquisition program to purchase it separately from the EC project. This conserves funding for the EC project and doesn't require CEQA or an acquisition grant.

TOPIC: Environmental Analysis and Documentation	
DESCRIPTION: Projects in the Lake Tahoe Basin are unique in that that they are potentially subject to three separate but similar environmental review processes: CEQA review in California, NEPA review for projects on federal land or that use federal funding, and TRPA environmental review for most development projects in the Basin.	
Issues/Opportunities	Solutions/Recommendations
Lack of expertise in all three environmental review processes	The CEQA, NEPA and TRPA environmental review processes are similar, but differ in subtle ways relating to both process and content. Consulting firms may have expertise in one or two of these processes, but rarely have expertise in all three. Clear guidance from the regulatory agencies, and open communication among the agencies and with the implementer and contractor, is essential. TRPA Code Chapter 5 and Rules of Procedure Article VI state TRPA environmental review document requirements. CEQA requirements are listed on the CA Office of Planning and Research website. Each federal agency has its own NEPA requirements and should be contacted individually. A guidance memo describing USFS NEPA review was distributed in July 2008 – USFS NEPA requirements vary depending on the USFS decision space related to the project (i.e., that portion of the project over which the USFS has discretionary review authority), and whether USFS funds, property, or both are being used for the project. Contact the USFS for more details regarding NEPA review for projects involving the USFS.
Bad fit, or inconsistencies in requirements among the three review processes	Occasionally a particular type of analysis will seem clearly appropriate under one type of environmental review, but raise some awkwardness under one or both of the others. For example, CEQA has clear case law regarding tiering, and the production of programmatic and subsequent environmental documents. The tiering process can be less clear and more awkward under NEPA and/or TRPA regulations. The consultant preparing the document must be very familiar with the regulatory requirements of all three review processes, to help guide the implementer through the process and to produce a legally defensible document. Regulatory and funding agency staff should be familiar with their own agency's processes, to provide proper guidance.
Level of environmental review	The question of whether a particular project can be adequately analyzed with an Initial Study and Mitigated Negative Declaration/Environmental Assessment and FONSI/Initial Environmental Checklist and FONSE, or needs to go to an EIR/EIS/EIS is sometimes difficult. This is especially true for water quality improvement projects, where the purpose of the project is a net environmental benefit, but which may have potentially significant construction impacts, or may cause significant public outcry. Stream restoration projects for example require careful environmental analysis, as the potential to make a bad water quality condition worse is always present. A water quality improvement project could also have an adverse affect on other natural resources, thereby requiring more in-depth environmental analysis. The Initial Study and Initial Environmental Checklist can be used as tools to help determine whether a higher level of environmental review is necessary. The level of environmental review should be decided by the lead agency(ies) in consultation with the TAC as a whole, based on a clear understanding of the details of the project and its potential environmental effects. Consultation with legal counsel may be necessary. Secondary

	considerations might include political considerations of public resistance, and financial and scheduling considerations, but the TAC must be clear that the final decision must be supported by the potential environmental impacts of the proposed project.
Contracting issues	Typically one consulting firm prepares the environmental document that will meet the requirements of all necessary environmental review regulations. The selection of the consulting firm must be consistent with the contracting procedures of the lead agency for CEQA, the lead federal agency, and TRPA. These contracting procedures, including publishing an RFP and selecting a consultant, can be time consuming. If there is any chance at all that a project may require an EIR/EIS/EIS, the implementing agency must at project initiation build time into the schedule to ensure compliance with these contract selection requirements.
Public opposition	Litigation based on the environmental review document is a common way for members of the public to try and stop a project from being implemented. Early, frequent, and meaningful engagement of neighbors and stakeholders can be an effective way to diffuse public opposition; however, occasionally public opposition is such that litigation is inevitable. The implementing agency must decide if it has the willingness and the recourses to defend the environmental document (and by extension the project) in litigation, and if implementing the project is worth the commitment of those resources. Frank conversations among agency counsel and TAC members is essential.
Finding of Overriding Considerations for Temporary work in flowing streams	When a stream restoration project involves significant work in a flowing stream, there is a high likelihood of a temporary discharge during the work. This temporary discharge must be disclosed and described in the environmental document . This is a situation where there may be a significant unavoidable adverse impact, and the lead agency may need to make a finding of overriding considerations, citing long-term water quality benefits that require a short-term discharge.

TOPIC: Utility Conflicts	
DESCRIPTION: Utility conflicts can stall projects and result in large unexpected expenditures. This section is intended to help you avoid utility conflicts and more easily deal with them if they do arise.	
Issues/Opportunities	Solutions/Recommendations
Expense of moving utilities	Similar to acquisitions, always have a contingency plan to avoid them if it is not feasible to move them.
Inaccurate utility mapping	Coordinate potholing with utility companies/agencies early in the design process and preferably during the grading season. In areas where it is known that utility data is suspect, extensive potholing or insuring that a utility representative is on site during construction should be considered to avoid schedule delays and increased costs during construction.
Damaging utilities	Involve utility companies/agencies during the TAC planning process and construction process so that utility conflicts can be relocated in advance of ECP improvements (Ex. EDOT's method with SPPCO and SW Gas).
Funding utility potholing and relocations	The California legislature enacted AB270 in July 2005. This legislation limits the ability of the Conservancy to provide soil erosion funds for public utility relocation costs. The Lake Tahoe Restoration Act allows for funding through the USFS SNPLMA EC program to cover 2/3 of the costs of public utility relocation (local PUDs, GIDs?). It is advisable that California grantees and PUDs seek funding for these costs through SNPLMA. Investor owned utilities (SW Gas, SPPCO, AT&T, etc.) are responsible for the cost of relocating their utilities.
Coordinating utility and road maintenance/upgrades with EC projects	When planning an EC project, communicate with the local utilities to find out what maintenance activities are planned in the near future within the project area. It may be possible to install EC and utility improvements at the same time which decreases costs and reduces the number of times the road is cut and repaired. For example, NTPUD and Placer County recently were able to coordinate on the Beaver Street project to install storm drain infrastructure, curb and gutter, underground utilities, and repave the entire street.
TRPA permits for utility relocation associated with water quality and erosion control projects	To avoid the need for two separate permits from TRPA, be sure to include utility relocation plans and water quality and erosion control project plans as one package when submitting project applications. This will enable TRPA to issue one permit that covers both the utility relocation and the water quality and erosion control plan improvements.

TOPIC: Weather and Associated Grading Restrictions	
DESCRIPTION: In the Tahoe Basin, implementers deal with various types of weather conditions that can slow, delay or temporarily halt the implementation of water quality projects. In addition, the Tahoe Regional Planning Agency (TRPA) and Lahontan Water Board set regulatory restrictions on when ground disturbance can occur (May 1 through October 15th of each year). Although weather conditions cannot be controlled, understanding the potential for project delays and identifying alternate solutions early should make project delivery a smoother process.	
Issues/Opportunities	Solutions/Recommendations
Project was halted because proper BMPs were not in place during a storm event and a significant erosion event has occurred.	Implementers should ensure that the contractor has sufficient BMPs in place at the start of construction and that BMPs are maintained/replaced as needed to maintain their effectiveness as erosion control. The implementer should modify or increase BMPs being utilized if it is found that BMP placement, selection or quantity is not sufficient based on particular site conditions. All modifications to BMPs should be approved by the permitting agencies and meet all other regulatory requirements.
Thunderstorms during the building season temporarily halt construction. This delay results in additional costs to the project.	Are there any non-grading activities that can be completed by the contractor during these periods? Does the contractor have other jobs outside the basin which can utilize the crews temporarily to avoid extra costs to the project? Can the contractor expand hours of construction during the normal work week or over the weekend? What are the additional costs? What are the impacts to the public (noise, access and traffic delays)? Do the expanded hours meet regulatory requirements?
An early start or extended construction season is needed to get a water quality project completed within the construction season. Weather patterns indicate mild weather which could permit grading either prior to the start of the TRPA grading season (May 1st) or following the end of the TRPA grading season (October 15th).	Some exceptions to the grading season can be allowed by TRPA for water quality, public health and safety reasons. The Lahontan Water Board may grant a variance to the grading season, for water quality reasons. In cases where an early construction start or an extended construction season (beyond the October 15th TRPA grading season deadline) to protect water quality. Requests should be submitted to TRPA and to Lahontan Water Board which include all information required to review the grading exception (see www.trpa.org). Requests are reviewed on a case-by-case basis and implementers should not expect or plan on receiving grading season exceptions as part of project schedules.
An early winter may prevent late season surveys from being completed.	No solutions identified.

Early season snow fall (prior to the end of the TRPA building season) delays or halts construction.	When construction is planned to extend into October of the building season, the weather conditions should be monitored carefully to anticipate potential precipitation events that could delay or halt the project. The contractor must winterize the site for the season in a quick and efficient manner to avoid erosion of the project site and to protect finished or uncompleted infrastructure, vegetation/seed and disturbed areas.
Spring runoff that occurs late in the season (after May 1st) will result in wet soils, which delays the commencement of construction activities.	If the project can be completed within one construction season, the project construction period can be extended with no additional costs to the project. If the delay causes the project to extend into another year of construction, additional costs will result.

TOPIC: Using CCC and NCC Crews	
DESCRIPTION: In the Tahoe Basin, Nevada Conservation Corps (NCC) and California Conservation Corps (CCC) crews can be utilized to assist with the implementation of projects. To our knowledge NCC crews have not been utilized for the implementation of water quality projects. However, these crews have been used for aspen habitat regeneration projects, trail building projects and forest health projects on the NV side of the Tahoe Basin. It has been discussed previously that utilization of these crews could substantially lower project implementation costs for some components of water quality projects. The CCCs have been used by each of the jurisdictions on the California side of the Lake Tahoe Basin for erosion control/water quality improvement projects, although it has been for different purposes and with varying results. The Conservancy is currently working on a revegetation guidance document that will provide extensive recommendations for how to utilize CCC labor. As discussed below, it is a requirement of all CTC site improvement grant contracts that CCC labor be utilized.	
Issues/Opportunities	Solutions/Recommendations
There is a limited season to employ the crews since most workers are college students. The field season generally runs from the end of May to the 3rd week in August.	Identify project components that can be completed within one field season to avoid the need to contract unfinished work to others. A crew supervisor is necessary to keep the project on schedule. The crew supervisor will also eliminate the need to provide constant oversight of crew work.
Often the crews are comprised of new individuals each year and so are inexperienced in the work detail. Crews will have to be trained each year.	Identify work for smaller crews (5-6 individuals); smaller crews will require less training and oversight. Ensure that crew work identified can be completed within one field season to avoid training a new crew to finish work from a previous season.
CCC Crews getting pulled away for emergencies such as fires	Have CCC crews do work that is not time sensitive or that will not delay the project if they are pulled away for an emergency. This is not an issue for NCC crews.
CCC crews can't provide a performance bond	The CCC will work with you to develop performance specifications and in the past has been excellent about honoring them
State Contracting Code issues	Remove aspects of the project from the construction plans that the CCCs/NCCs can do before the project goes out to bid so that the contractors are not "bidding" against them.
CTC requirement that the CCCs are used for implementation	Plan for this from the beginning by identifying potential pieces of work for the CCCs and communicated with them to ensure that they can do the work.

TOPIC: Permitting and Regulatory Requirements	
DESCRIPTION: Projects in the Lake Tahoe Basin may be subject to regulatory review from more than one regulatory agency. Potential permitting requirements include: a development permit and possibly a tree removal permit from TRPA; a construction stormwater permit from the Lahontan Regional Water Quality Control Board or Nevada Division of Environmental Protection; a special use permit from the USFS; a Section 404 permit from the Army Corps of Engineers; 401 certification from Lahontan; a Streambed Alteration Agreement from the California Department of Fish and Game or a Work in Waterways permit form the Nevada Division of Environmental Protection; endangered species consultations with the federal Fish and Wildlife Service, the National Marine Fisheries Service, the California Department of Fish and Game, and/or the Nevada Division of Environmental Protection; and/or Permits to Construct from the local Air Quality Management Districts.	
Issues/Opportunities	Solutions/Recommendations
Lack of familiarity with all permitting requirements, especially permitting requirements that may be unique to the Tahoe area, such as scenic and backshore regulations	Clear guidance from the regulatory agencies, and open communication among the agencies and with the implementer and contractor, is essential. All applicable regulatory agencies should participate in the Technical Advisory Committee (TAC) and guide the planning of the project as a project proponent to ensure that their agency will be able to permit it. All necessary regulatory applications and permits should be clearly shown in the initial Project Schedule. This should be reviewed and approved by the TAC at the Kickoff meeting.
Time delays resulting from multi-agency reviews	Implementers and consultants must understand that the project delivery process for development projects in the Tahoe Basin will take longer than development elsewhere, especially if multiple regulatory agencies require review. Realistic project schedules, good communication skills, and good project management skills are essential for the implementer's project manager. Project schedules should be carefully reviewed at TAC meetings by the regulatory (and other) agencies to ensure that all requirements are being met to reduce the chances of unexpected delays.
Perceived late hits from regulatory agencies that jeopardize the schedule or budget for the project	Project implementers have a responsibility to submit all information necessary for an expeditious regulatory review. This includes TAC meeting minutes, to all TAC members (including those not in attendance) throughout the project development process. Regulatory agencies have the responsibility to comment early and often on development of the project plans. Agency staff should submit comments in writing, and alert the implementer to issues that are of concern to the agency as soon as possible. Project implementers have the responsibility to take agency concerns seriously, and take those concerns into account in project design, communicating with agency staff to ensure that issues of concern are resolved. Project implementers also must understand that major changes (e.g. excavations below five feet, scenic impacts, land coverage changes, backshore boundary impacts, etc.) to project design late in the process could cause delays or even derail the project as regulatory agencies review those changes. Design should be in accordance with the TAC approved preferred alternative. If there have been changes the implementer needs to clearly communicate why so that the TAC can weigh in on whether they support those changes.

Disagreement between project implementer and regulating agency regarding project review requirements	Project schedules and budgets can be crunched, especially as the beginning of the construction season approaches. Under time or budgetary constraints, some project implementers seek to "shortcut" the permitting process with the argument that, since this is a project that will produce a net environmental benefit, rigorous environmental review and regulatory scrutiny is not necessary. Implementers must understand that agency regulations apply to all projects – private development projects and public environmental improvement projects – equally. Both legal requirements and good professional practice require agency staff to hold water quality improvement projects to the same rigorous standard of review as other projects. Furthermore, even though the goal of the project is a net environmental benefit, construction impacts and even some operating impacts from water quality improvement projects could cause serious environmental damage if implemented improperly. Implementers and regulatory agencies both need to play fair in the project development process, with implementers understanding the legal obligations of agency staff and agency staff clearly communicating agency obligations. If disagreements cannot be resolved informally through staff communication, utilization of the SWQIC conflict resolution procedure should be considered.
When does my project require a USFS Special Use Permits (SUP)?	A special use permit is needed/available if project improvements will be made on a FS parcel(s) and there is a fee for this permit. In most cases when more that 25% of a parcel will be used by a project improvement, the FS will quit claim the parcel to the project owner. Improvements within the ROW of a FS parcel do not require a SUP. Like other LTBMU NEPA decisions, the preferred alternative design must be 25 to 30% complete in order for a SUP to be committed. .

TOPIC: Contracts	
DESCRIPTION: Contracts for surveying, engineering and construction are typical for the implementation of most water quality improvement projects. Project issues that affect these contracts may surface that are outside the control of the implementer or the contractor; it is important to plan for and understand how the impacts of these issues may be avoided or minimized. It is expected that many of the issues outlined below have been encountered by most project implementers. Documenting a full range of solutions/recommendations to these issues is critical and will provide a good source of solutions for entities around the basin for future projects.	
Issues/Opportunities	Solutions/Recommendations
Contractor encounters groundwater or another condition (e.g. inexcavatable rock) that was not anticipated by the implementer or by the contractor during the bid process. This condition has caused project delays, additional work items and additional cost.	If all subsurface exploration info and studies indicated no groundwater and rock anomalies in the Project area, yet at time of construction there is a groundwater seep or rock anomaly encountered, then make sure there are provisions within the Contract Specifications – Special Provisions that provide a rock clause and a dewatering clause bid item which allows for this contingency. The bid items can contain language which defines the scope of work for these unforeseen items and provides estimates quantities (i.e. 50 CY of Rock Removal, or 50 CY of unsuitable soil)
Although some work was completed to investigate the location of utilities, an unmarked utility/unknown utility line is located during construction that requires relocation or a modification to the project.	Have an unforeseen utility bid item within the Contract Documents – Special Provisions which provides enough verbiage for this contingency. The bid item can contain language about each utility type, the technical specs for the remedy, and an estimated quantity for each type (i.e. 100 linear feet of 6" stl water line relocation.). Refer to the Utility Conflicts white paper for additional considerations.
Issues regarding revegetation can result when the contractor, engineer and technical advisory committee have different understandings of implementation methods and measures of success.	This should be spelled out in the Contract Specifications. Also, there should be a specific meeting between the Contractor (and subs) and the Soil/Revegetation specialist before construction commences to ensure all understand the specifications.
How does the timing of contracts affect the timely implementation of projects?	Schedule contracting negotiations in your PDP. Set dates that initiate all contracting processes well ahead of when the work needs to commence to allow for unforeseen delays. (i.e. Grant Contracts, Professional Service Contracts etc..)

TOPIC: Working With the Public	
DESCRIPTION: Building good rapport with the public is critically important to the success of erosion control project (ECP) during the planning, construction, and operational phases. Single individuals have caused multi-year delays in projects, which most likely could have been avoided with better communication and responsiveness to needs expressed by the public.	
Issues/Opportunities	Solutions/Recommendations
Environmental Documents challenged by the public	Try to avoid having your environmental document challenged by addressing any concerns voiced by public during the planning process, before the document is released for comment. Clearly document attendees of public meetings and any communication with the public to demonstrate that the public has been included in the planning process in the event that your document is challenged. This may help to avoid issues or litigation as the project proceeds towards construction. Ensure that your environmental document fully discloses expected or potential impacts, and identifies mitigation measures that are clearly attainable and that address concerns voiced by the public during the planning process. Providing an honest and open forum for the public to voice their concerns should be your top priority. If you are thorough with this task and write a technically correct document your project will get fair consideration for implementation.
Identify your allies in the community	There are always residents who want to do something extra to support environmental improvements. Officially recognizing them may win you a supporting voice in the community that can help to avoid issues such as challenges to your CEQA document. For example, the California Tahoe Conservancy has a land-steward program that residents can participate in to look after Conservancy-owned parcels near their home.
Private Best Management Practices (BMPs)	Although BMPs are required on every property by the TRPA, compliance basin-wide is less than 25%. Collaborating with the Conservation District(s) to provide assistance to private landowners will help them better understand the overall goals of the ECP which increases the chances that they will support it.
Acquisitions	Building the support you will need for successful acquisitions early in the planning process should be a top priority. See acquisitions topic in the managing uncertainties section for additional details.