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**TxDOT Best Practices Model and Implementation
Guide for Advance Planning Risk Analysis for
Transportation Projects**

Carlos H. Caldas
G. Edward Gibson
Tiendung Le

*Project 0-5478: Optimizing the Identification of Right-of-Way
Requirements during the Project Development
Process*

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Performing Organization: Center for Transportation Research The University of Texas at Austin 3208 Red River, Suite 200 Austin, Texas 78705-2650	Sponsoring Organization: Texas Department of Transportation Research and Technology Implementation Office P.O. Box 5080 Austin, Texas 78763-5080
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Chapter 1. What Is the APRA?

The APRA for transportation projects is a simple and easy-to-use tool for measuring the degree of scope development and identifying potential risks early in the project.

The Advance Planning Risk Analysis (APRA) for transportation projects is a powerful and easy-to-use tool that offers a method to measure project scope definition for completeness and identify potential risks early in the project. In other words, it helps optimize the identification of project requirements during the project development process across all major disciplines, including right-of-way, utilities, environmental, design, transportation planning and programming, and construction. It identifies and precisely describes each critical element of the project scope and allows a project team to quickly predict factors impacting project risk. It is intended to evaluate the completeness of the scope definition at any point prior to plans, specifications, and estimates (PS&E) development and construction.

The development and use of the APRA is closely associated with the project's life cycle. A diagram of the transportation project life cycle is created and illustrated in Figure 1.1. The diagram includes six phases and six phase gates. A *phase* is a period of time in which a number of relevant steps need to be conducted to complete a set of business tasks. A *phase gate* is an event that marks the substantial completion of a phase and/or the start of a new phase. This diagram was developed based on the Project Development Process Manual published by the Texas Department of Transportation (TxDOT) (5).

The APRA is intended to be used primarily during Advance Planning, which encompasses the project phases shown in Figure 1.1 up to Phase Gate 3 and includes Needs Assessment, Feasibility/Scoping, and Preliminary Design. Note that Advance Planning has many other terms associated with it, including front-end planning, pre-project planning, and programming. Understand that the term Advance Planning is used in this document, but it may be substituted with another term to accommodate your business process. The APRA can also be used during the entire Project Development Process, which includes all activities up to Phase Gate 4. More information concerning the timing and process is provided later in this document.

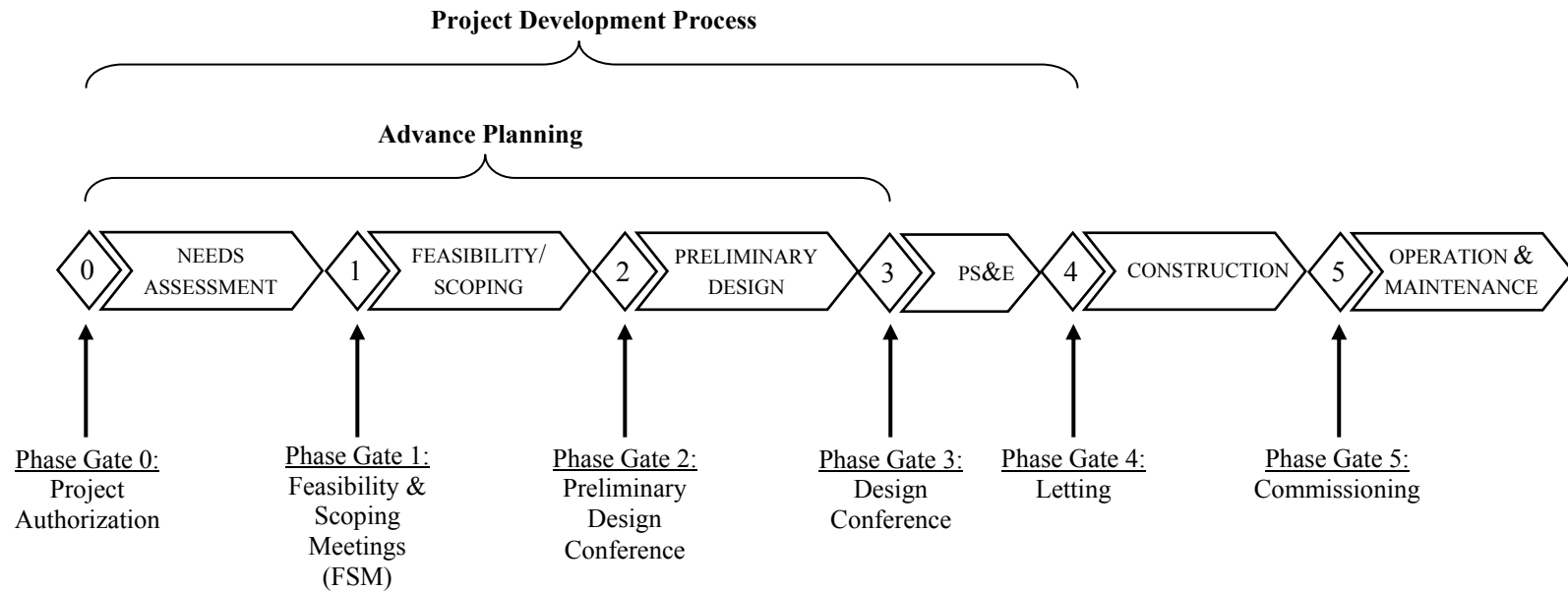


Figure 1.1: Project Life Cycle Diagram

The APRA offers a comprehensive checklist of 59 critical risk elements in an easy-to-use score sheet format. Each element is weighted based on its relative importance to the other elements. Because the APRA score relates to risk, those areas that need further work can easily be isolated. Applicable types of projects may include the following:

- Convert non-freeway to freeway
- Interchange (new or reconstruction)
- Widen freeway
- Bridge widening or rehabilitation
- Widen non-freeway
- Bridge replacement
- New location freeway
- Upgrade to standards-freeway
- New location non-freeway
- Upgrade to standards-non-freeway

1.2 Advance Planning Risk Analysis—APRA

The APRA consists of three main sections, each of which are broken down into a series of categories, which, in turn, are further broken down into elements, as shown pictorially in Figure 1.2. Details of how the APRA for transportation projects was developed as well as a summary of the overall research effort are given in a research report to the Texas Department of Transportation (2). A complete list of the APRA’s 3 sections, 12 categories, and 59 elements is given in Figure 1.3.

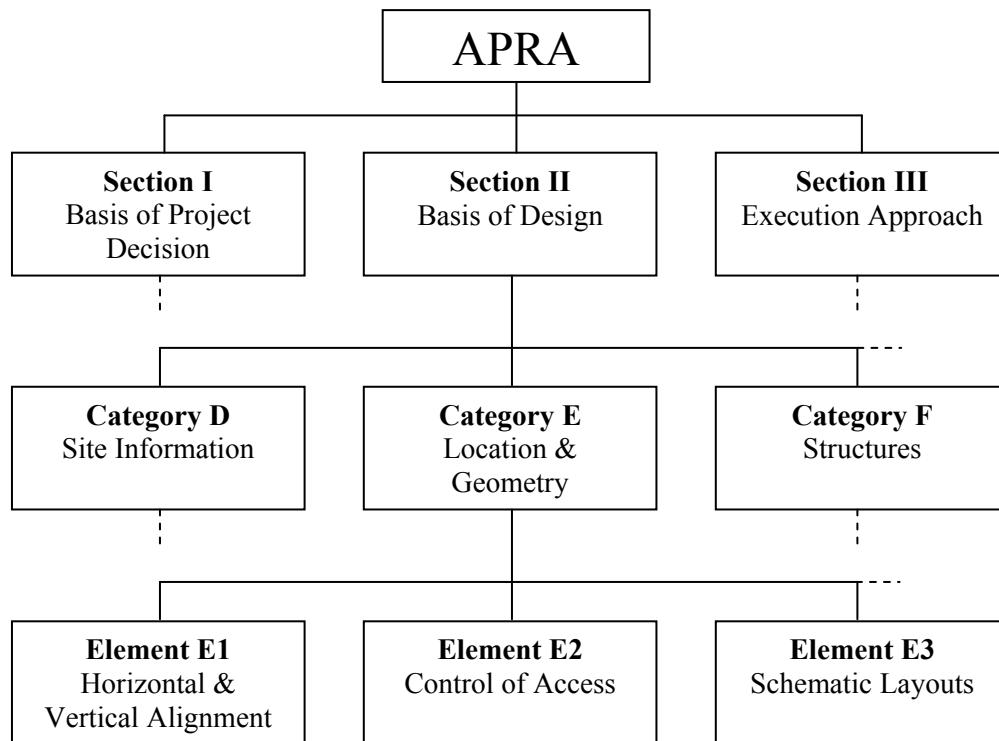


Figure 1.2: Partial APRA Hierarchy

<p>I. BASIS OF PROJECT DECISION</p> <p>A. Project Strategy</p> <ul style="list-style-type: none"> A1. Need & Purpose Documentation A2. Investment Studies & Alternatives Assessments A3. Programming & Funding Data A4. Key Team Member Coordination A5. Public Involvement <p>B. Owner/Operator Philosophies</p> <ul style="list-style-type: none"> B1. Design Philosophy B2. Operating Philosophy B3. Maintenance Philosophy B4. Future Expansion & Alteration Considerations <p>C. Project Requirements</p> <ul style="list-style-type: none"> C1. Functional Classification & Use C2. Evaluation of Compliance Requirements C3. Survey of Existing Environmental Conditions C4. Determination of Utility Impacts C5. Value Engineering <p>II. BASIS OF DESIGN</p> <p>D. Site Information</p> <ul style="list-style-type: none"> D1. Geotechnical Characteristics D2. Hydrological Characteristics D3. Surveys & Planimetrics D4. Permitting Requirements D5. Environmental Documentation D6. Property Descriptions D7. Ownership Determinations D8. Right-of-Way Mapping D9. Constraints Mapping D10. Right-of-Way Site Issues <p>E. Location & Geometry</p> <ul style="list-style-type: none"> E1. Horizontal & Vertical Alignment E2. Control of Access E3. Schematic Layouts E4. Cross-Sectional Elements <p>F. Structures</p> <ul style="list-style-type: none"> F1. Bridge Structure Elements F2. Hydraulic Structures F3. Miscellaneous Design Elements 	<p>G. Design Parameters</p> <ul style="list-style-type: none"> G1. Provisional Maintenance Requirements G2. Constructability <p>H. Installed Equipment</p> <ul style="list-style-type: none"> H1. Equipment List H2. Equipment Location Drawings H3. Equipment Utility Requirements <p>III. EXECUTION APPROACH</p> <p>I. Acquisition Strategy</p> <ul style="list-style-type: none"> I1. Long-Lead Parcel & Utility Adjustment Identification I2. Long-Lead/Critical Equipment & Materials Identification I3. Local Public Agencies Utilities Contracts & Agreements I4. Utility Agreement & Joint-Use Contracts I5. Project Delivery Method & Contracting Strategies I6. Design/Construction Plan & Approach I7. Procurement Procedures & Plans I8. Appraisal Requirements I9. Advance Acquisition Requirements <p>J. Deliverables</p> <ul style="list-style-type: none"> J1. CADD/Model Requirements J2. Documentation/Deliverables <p>K. Project Control</p> <ul style="list-style-type: none"> K1. Right-of-Way & Utilities Cost Estimates K2. Design & Construction Cost Estimates K3. Project Cost Control K4. Project Schedule Control K5. Project Quality Assurance & Control K6. Safety Procedures <p>L. Project Execution Plan</p> <ul style="list-style-type: none"> L1. Environmental Commitments & Mitigation L2. Interagency Coordination L3. Local Public Agency Contractual Agreements L4. Interagency Joint-Use Agreements L5. Preliminary Traffic Control Plan L6. Substantial Completion Requirements
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Figure 1.3: APRA Sections, Categories, and Elements

Chapter 2. Benefits of the APRA

Effective early project planning improves project performance in terms of both cost and schedule. Research has shown the importance of scope definition during the early stages of a project and its potential impact on project success. The APRA allows a project planning team to optimize the identification of the project requirements in all major disciplines (e.g., right-of-way, utilities, environmental, design, and planning and programming) by quantifying, rating, and assessing the level of scope development. It is to be used mainly during the advance planning period and the project development process, i.e., prior to beginning detailed design and construction.

A significant feature of the APRA is that it can be utilized to fit the needs of almost any individual transportation project, whether large or small. Elements that are not applicable to a specific project can be zeroed in upon, thus allowing for their elimination from the final scoring calculation.

The APRA is both quick and easy-to-use. It is a Best Practices tool that will provide numerous benefits to owner organizations such as state departments of transportation as well as the transportation industry as a whole. The APRA can be used as:

- A **checklist** that a project team can use for determining the necessary steps to follow in defining the project scope;
- A listing of **standardized scope definition terminology** throughout the transportation construction industry;
- An industry standard for rating the completeness of the project scope development to facilitate **risk analysis** and prediction of escalation, potential for disputes, etc.;
- A means to **monitor progress** at various stages during the advance planning phase and the project development process;
- A tool to aid in **communication and to promote alignment** between owners (e.g. Texas Department of Transportation), design contractors, and other stakeholders by highlighting poorly defined areas in the project scope;
- A means through which project team participants can **reconcile differences** using a common basis for project evaluation;
- A **training tool** for organizations and individuals throughout the industry; and
- A **benchmarking tool** for organizations such as TxDOT to use in evaluating the completion of scope development versus the performance of past projects, both within their organizations and without, in order to predict the probability of the success of future projects.

2.1 Who Should Use the APRA?

Any organization wishing to improve the overall performance on its transportation projects should use the APRA.

The APRA can benefit owners, designers, and constructors. Owners (e.g., state departments of transportation) can use it as an assessment tool for establishing a “comfort” level at which they are willing to move forward with projects. Designers and constructors can use it as a method of identifying poorly defined project scope elements. The APRA provides a means for all project participants to communicate and reconcile differences using an objective tool as a common basis for project scope evaluation.

Owners should use the tool as a formal checklist of items that need to be clearly defined and communicated to ensure that the design team fully understands the project’s business objectives and drivers. Initially, owners should focus on the Basis of Project Decision elements in Section I. An accurate definition of these items will provide the best feedback for the design team to help guide all future decisions. These items should be well-defined at Phase Gate 2. As the project passes through the other phases, the owners should participate in the APRA assessment sessions to ensure that the design and construction teams have correctly understood its requirements and is meeting the owner team’s expectations. This provides an opportunity for the owner stakeholders to question the design and construction teams for understanding and compliance. In some cases, this may be the only opportunity that the owner’s operations and other stakeholders have of talking directly with the design and construction teams’ members. Communication is essential to ensure the teams are proceeding to meet the expectations and requirements of the owner stakeholders.

Ultimately, the tool can help owners ensure that all critical elements and defining project requirements are identified and managed effectively through a continual process.

Contractors may become involved in projects at various points of the project development process and should use the APRA to organize their work. Contractors should use the APRA as an alignment tool to understand and participate in the development of the owner’s business objectives and drivers, facilitating the design team’s understanding of the elements defined in Section I, the Basis of Project Decision. The team will utilize this criterion to make decisions concerning cost, quality, and schedule as the project progresses through the scope definition stage and into execution. As advance planning progresses, the APRA helps the contractor clarify requirements outlined in Sections I and II of the APRA, and ensures the right input from key owner stakeholders representing such things as operations and maintenance, design, research and development, and business among others. The APRA also assists in coordination and execution planning in conjunction with the owner organization as outlined by the elements contained in Section III.

Contractors are often given a request for proposal (RFP) on a project that has had all or a portion of the project scope defined by the owner, or one in which the owner has utilized a third party design firm to develop the scope definition package. In these instances, it is imperative that the contractor perform an APRA as a risk analysis to determine the degree of definition and identify any potential weaknesses or areas of concern before responding to the RFP. The contractor should make every attempt to get as many of the project stakeholders as possible involved in the APRA assessment session to assure that the team is making the correct evaluations and assumptions before proceeding to the next stage.

Chapter 3. Instructions for Assessing a Project

Assessing a project is as easy as 1-2-3.

Individuals involved in the project development process should use the project score sheets shown in Appendices A and B when scoring a project. Note that two score sheets are provided—the first, in Appendix A, is simply an unweighted checklist. Appendix B contains the weighted values and allows an advance planning team to quantify the level of scope definition at any stage of the project on a 1000-point scale. The unweighted version should be used in the team scoring process to prevent bias in choosing the level of definition and in “targeting” a specific score. The team leader or facilitator can easily score the project during the weighting session using the score sheet in Appendix B.

3.1 When to Use APRA

APRA is a powerful tool that should be used at points throughout the project development process to ensure continued alignment, process checkups, and a sustained focus on the key project priorities. Value can be gained by utilizing this tool at various points in the project development process.

Project size, complexity, and duration will help determine the optimum times that the APRA tool should be used. To aid in the expanded use of this tool, Figure 3.1 illustrates four potential application points where APRA could be useful.

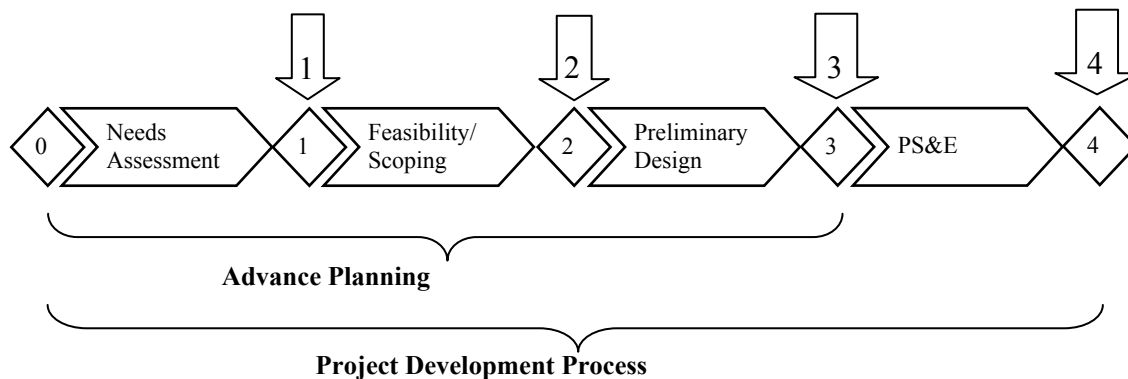


Figure 3.1: Employing the APRA, Application Points

Regardless of the timing of the APRA assessment, the same checklist/descriptions should be utilized and the evaluation should be conducted according to the following guidelines.

APRA 1 Review—This is a high level assessment of the project following Needs Assessment prior to Phase Gate 1 and is part of the decision-making criteria for proceeding to the next phase. This assessment is typically held for projects at the Feasibility and Scoping Meetings, which bring decision makers, resource personnel, stakeholders, and technical personnel together for brain storming to identify alternatives for addressing the identified need.

A Feasibility and Scoping Meeting is a corridor-oriented meeting in which broad issues related to purpose, need, and alternatives are discussed. The APRA 1 Review should focus on the following areas:

- Aligning the team with project objectives;
- Ensuring good communication among the decision makers and the project development team; and
- Highlighting stakeholder expectations to facilitate reasonable engineering estimates.

APRA 2 Review—This is a high level assessment of the project following the Feasibility/Scoping phase of the project prior to Phase Gate 2. This assessment is typically held at a Preliminary Design Conference (also known as Project Concept Conference), which is a route-oriented meeting. At this gate more detail is known about the proposed project, and a feasibility study will already have been prepared. The purpose of this meeting is to bring together the project development team to identify the various alternate route locations. APRA Section I, the Basis of Project Decision, should be well-defined (with a low relative APRA score) at this phase gate. For small or simple projects, this assessment may not be necessary. In addition, the APRA 2 Review should focus on the following areas:

- Aligning project objectives and stakeholders' needs;
- Identifying high priority project deliverables that need to be completed;
- Helping to eliminate late-project surprises;
- Facilitating communication across the project development team and stakeholders.

The assessment will highlight the areas that resources need to be focused upon during the next phase of the project development process.

APRA 3 Review—This is typically the assessment of the project before proceeding to the Plans, Specifications, and Estimates development phase, which is initiated by a Design Conference (Phase Gate 3). The APRA 3 assessment should be conducted for all projects. At this stage, risk issues have been identified and mitigation plans are in place or are being developed.

APRA 4 Review—This is typically the final assessment of the project at the end of the Plans, Specifications, and Estimates development phase, prior to letting. The assessment can be done as part of a Final Design and Initial Construction Coordination meeting. At this assessment, all risk elements are thoroughly reviewed again by all stakeholders to make sure the project is ready to proceed to letting. All major issues should have been resolved and any residual risk elements should be closely controlled by this point.

In addition to the four APRA reviews outlined, this tool can also be used at other points. For instance, it can be used early in Needs Assessment as a checklist to help organize work effort, or during the PS&E development phase (after Phase Gate 3) to monitor the progress of the PS&E development and to respond to any emerging issues during this phase.

As noted earlier, the APRA consists of 3 main sections that are broken down into 12 categories. The categories are further broken down into 59 elements. The elements are individually described in Appendix C, Element Descriptions. Elements should be rated numerically from 0 to 5. As indicated in the legend at the bottom of the score sheet, the scores range from 1—complete definition, to 5—incomplete or poor definition, with 0 used for Not

Applicable. The elements that are as well-defined as possible should receive a perfect definition level of “one.” Elements that are not completely defined should receive a “two,” “three,” “four,” or “five,” depending on their levels of definition as determined by the team. Those elements deemed not applicable for the project under consideration should receive a “zero,” so as not to affect the final score.

Figure 3.2 outlines a method of assessing the level of definition of an element at a given point in time. For those elements that are completely defined, no further work is needed during the project development process. For those elements with minor deficiencies, no further work is needed during the project development process, and the issue will not impact cost and schedule performance; however, the minor issues identified will need to be tracked and addressed as the project proceeds, especially as the project progresses into the PS&E development phase. For those elements that are assessed as having some or major deficiencies, or are incomplete, further mitigation will need to be performed during the project development process prior to moving through Phase Gate 4. Most of the deficiencies must, however, be addressed prior to Phase Gate 3 if the project requirements are to be identified and managed effectively.

The relative level of definition of an APRA element is also tied to its importance to the project at hand. The flexibility of the APRA allows the project team some leeway in assessing individual element definitions. For instance, if the issues missing from the scope documentation of a particular APRA element are integral to project success (and reduction of risk), the team can rate the issue perhaps at a definition level “three” or “four.” On a different project, the absence of definition of these same issues within an APRA element may not be of concern, and the team might decide to rate the element as a definition level “two.” As the old saying goes, “do not turn off your brain” when you are using this tool.

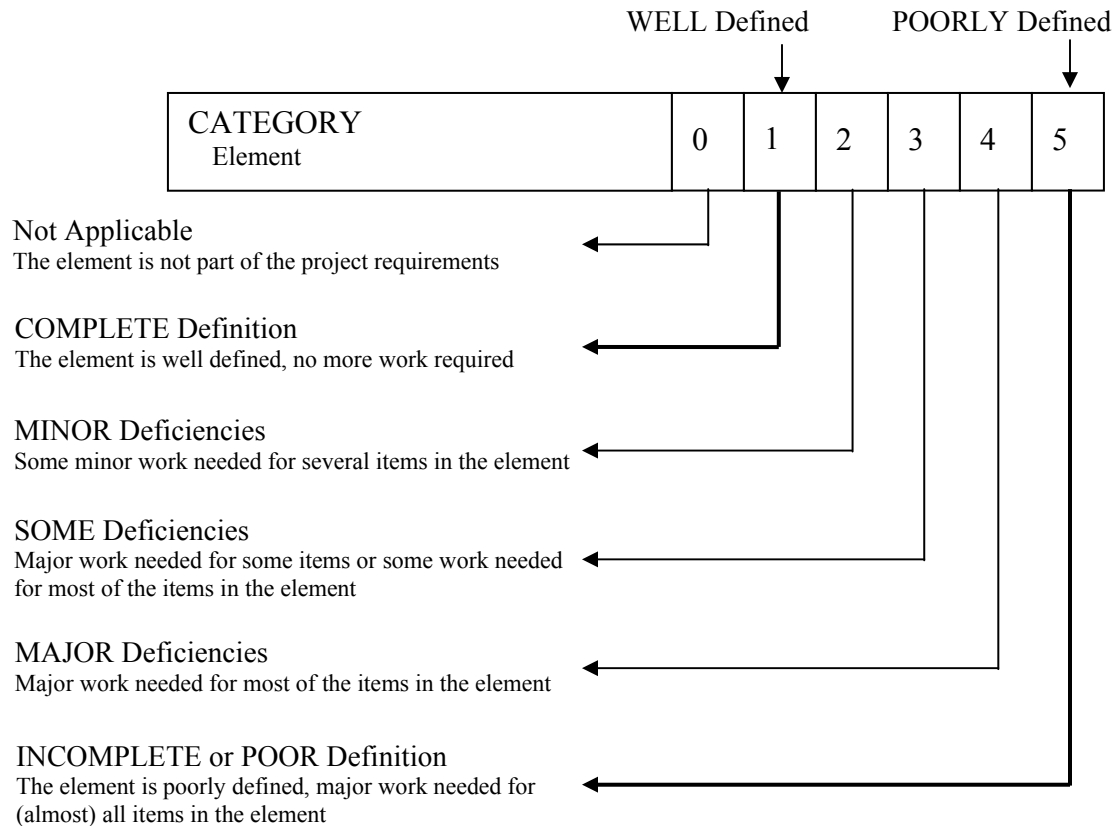


Figure 3.2: APRA Definition Levels versus Further Work Required

3.2 Assessing an APRA Element

To assess an element, first refer to the Project Assessment Sheet in Appendix A or B. Next, read its corresponding description in Appendix C. Some elements contain a list of items to be considered when evaluating their levels of definition. These lists may be used as checklists. All elements have six pre-assigned scores, one for each of the six possible levels of definition.

Choose only one definition level (0, 1, 2, 3, 4, or 5) for that element based on the perception of how well it has been addressed. The suggested method for making this determination is through open discussion among the project team members. One should ensure the understanding of the element issues by all participants and promote a common understanding of the work required to achieve complete definition. It is important to defer to the most knowledgeable team members (for example, on underground tank issues, defer to the assessment of the civil and environmental discipline leads), while respecting the concerns of the other team members. As the discussion unfolds, one should capture action items or “gaps.” An example action item (gap) list is given in Appendix E.

Once you have chosen the appropriate definition level for the element, write the value of the score that corresponds to the level of definition chosen in the “Score” column. Do this for each of the 59 elements in the Project Score Sheet. Be sure to assess each element.

Each of the element scores within a category should be added to produce a total score for that category. The scores for each of the categories within a section should then be added to

arrive at a section score. Finally, the three section scores should be added to achieve a total APRA score.

3.3 Assessment Example

Consider, for example, that you are a member of a project team responsible for developing the scope of work for the construction of a new 2-mile non-freeway roadway. Your team has identified the major milestones throughout the project development process at which you plan to use the APRA to evaluate the current level of “completeness” of the scope definition package. Assume that at the time of this particular evaluation the scope development effort is underway, but is not yet complete.

Your responsibility is to evaluate how well the project’s structures have been identified and defined to date. This information is covered in Category F of the APRA as shown here and consists of three elements: “F1, Bridge Structure Elements,” “F2, Hydraulic Structures,” and “F3, Miscellaneous Design Elements.” It is recommended to use the unweighted assessment sheet when evaluating a project in a team setting. Both unweighted and weighted versions are, however, given in this example to illustrate the scoring methodology.

CATEGORY Element	Definition Level					
	0	1	2	3	4	5
F. STRUCTURES						
F1. Bridge Structure Elements						
F2. Hydraulic Structures						
F3. Miscellaneous Design Elements						

Definition Levels:

0 = Not Applicable **2 = Minor Deficiencies** **4 = Major Deficiencies**
1 = Complete Definition **3 = Some Deficiencies** **5 = Incomplete or Poor Definition**

To fill out Category F, Structures, follow these steps:

- Step 1:** Read the description for each element in Appendix C. Some elements contain a list of items to be considered when evaluating their levels of definition. These lists may be used as checklists.
- Step 2:** Collect all the data that you may need to properly evaluate and select the definition level for each element in this category. This may require obtaining input from other individuals involved in the scope development effort.
- Step 3:** Select the definition level for each element as described and shown in the following example.

Element F1: Bridge structure locations, safety tolerances, access requirements, and clear roadway width have been well-defined. However, utilities attached to the bridge structures, maintenance of right-of-way as well as retaining walls and abutments have not been identified and addressed to your satisfaction.

You feel that this element has *some deficiencies* that should be addressed prior to the beginning of PS&E. **Definition Level = 3.**

Element F2: Your team decides that this element has been well done. However, you are not sure about the potential environmental impact of the open channel system and decide that the environmental people need to double check this issue. Therefore the team feels the element has *minor deficiencies*. **Definition Level = 2.**

Element F3: Although the team knows other miscellaneous design elements need to be considered, they have not yet been done. This element is therefore *incomplete or poorly defined*. **Definition Level = 5.**

CATEGORY Element	Definition Level					
	0	1	2	3	4	5
F. STRUCTURES						
F1. Bridge Structure Elements				X		
F2. Hydraulic Structures			X			
F3. Miscellaneous Design Elements						X

Definition Levels:

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

Be sure to capture action items/comments as the discussion progresses for reference in Step 6. This list is referred to as a “gap” list, in that it identifies those issues that need to be addressed to move the project forward and identifies gaps in the planning activities.

Step 4: For each element, **write the score that corresponds to its level of definition** in the “Score” column. If the team feels that any or all of the elements were **not applicable for this project, they would have had a definition level of “0” and have been zeroed out.** The weighted score sheet follows. Circle the chosen definition levels for the assessed elements.

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
F. STRUCTURES							
F1. Bridge Structure Elements	0	1	5	9	12	16	
F2. Hydraulic Structures	0	1	5	10	14	18	
F3. Miscellaneous Design Elements	0	1	4	8	11	14	
CATEGORY F TOTAL							

Step 5: Add the element scores to obtain a category score. Repeat this process for each element in the APRA. Add the category scores to obtain section scores. And finally, add the section scores to obtain a total APRA score.

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
F. STRUCTURES							
F1. Bridge Structure Elements	0	1	5	9	12	16	9
F2. Hydraulic Structures	0	1	5	10	14	18	5
F3. Miscellaneous Design Elements	0	1	4	8	11	14	14
CATEGORY F TOTAL							28

Step 6: Take Action. In this example, Category F has a total score of 28 (out of 48 total points) and probably needs more work. Use the gap list to identify issues that need additional attention.

3.4 Philosophy of Use

Ideally, the project team conducts an APRA evaluation at various points in the project. Experience has shown that the scoring process works best in a team environment with a neutral facilitator familiar with the process. The facilitator provides objective feedback to the team and controls the pace of team meetings. See Appendix D for details about facilitation. If this arrangement is not possible, an alternate approach is to have key individuals evaluate the project separately, then evaluate it together, ultimately agreeing on a final evaluation. Even using the APRA from an individual standpoint provides a method for project evaluation.

Experience has also shown that the APRA is best used as a tool to help project managers (project coordinators, project planners) organize and monitor the progress of the project development effort. In many cases, a planner may use the APRA prior to the existence of a team in order to understand major risk areas. Using the APRA early in the project's life cycle will usually lead to high APRA scores. This is normal and the completed score sheet gives a road map of areas that are weak in terms of definition.

The APRA provides an excellent tool to use in early project team meetings in that it provides a means for the team to align itself on the project and organize its work. The final APRA score is less important than the process used to arrive at that score. The APRA also can provide an effective means of handing off the project to other entities or helping maintain continuity as new project participants are added to the project.

If the organization (e.g. a TxDOT district) has advance planning procedures and execution standards and deliverables in place, many APRA elements may be partially defined when the project advances to the advance planning phase. An organization may want to standardize many of the APRA elements to improve the cycle time of planning activities.

APRA scores may change on a day-to-day or week-to-week basis as team members realize that some elements are not as well-defined as initially assumed. It is important to assess the elements honestly. The planning process is inherently iterative, and any changes that occur in assumptions or planning parameters need to be resolved with earlier planning decisions. The

target score may not be as important as the team’s progress over time in resolving issues that harbor risk.

The APRA was developed as a “point in time” tool with elements that are as independent as possible. Most of the elements constitute deliverables in the planning process. However, a close review of the elements shows an imbedded logic. Certain elements must first be defined well in order for others to be defined.

Figure 3.3 outlines the logic at the section level. In general, Section I elements must be well-defined prior to defining Section II and III elements. Note that this is not a critical-path-method-type logic in that certain elements are completed prior to the point when the next elements can start. Many times elements can be pursued concurrently. As information is gained downstream, elements already defined have to be revisited.

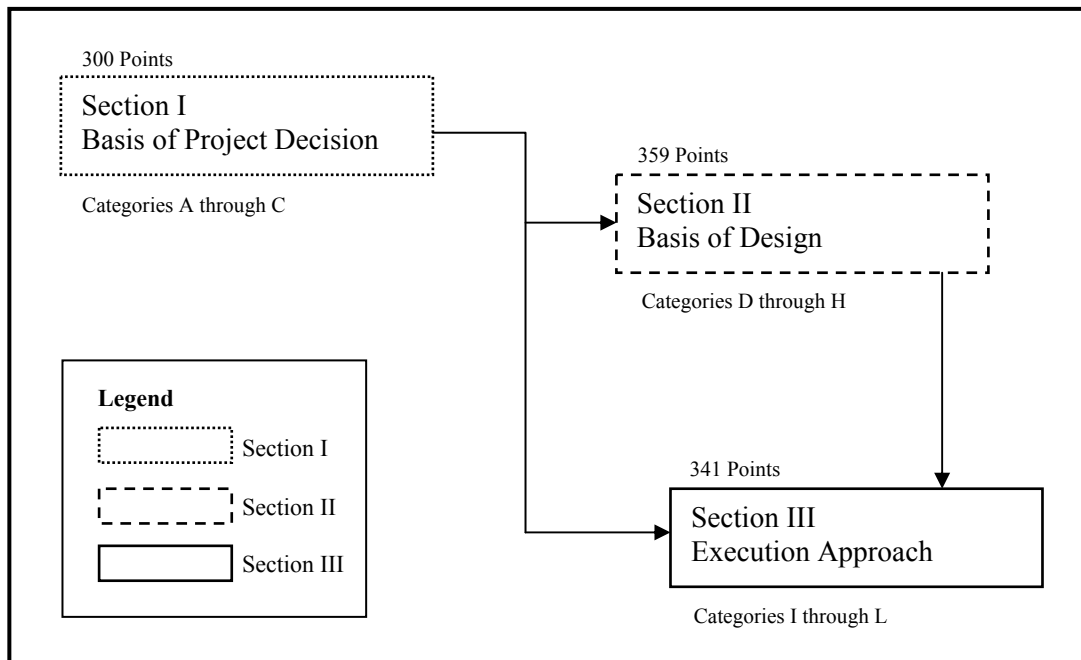


Figure 3.3: APRA Section Logic Flow Diagram

3.5 Use of APRA on Small or Renovation Projects

Small or renovation projects can also benefit from using the APRA, even if these projects are small, short in duration, and frequently performed. Many large organizations such as the Texas Department of Transportation have a number of these projects at any given time. Projects of these types may be driven by environmental regulations or by the need to keep a facility in repair or operation. Projects may also be focused on restoration of a roadway, or to facilitate relocation of a corridor.

On small or renovation projects, the requirements or scope may not encompass many of the elements contained in the entire APRA. In particular, some of the Basis of Project Decision elements found in Section I of the APRA may not be clearly defined. Although business planning is generally performed on an owner’s overall program of small projects, it may be difficult to determine if specific business decisions directly apply to one individual project. Customizing the APRA to reflect each individual project can be highly beneficial.

3.5.1 Normalizing the score

If an organization decides to create a scaled-down version of the APRA, it must be aware of the fact that this procedure will alter the maximum possible score from 1000 points to some lower number. Each time an element is deleted from the checklist, the maximum score for the project is reduced by that element's total weight. Further, not only will the maximum score be reduced, but the lowest possible score that can be achieved with complete definition also will drop from 70 points to some lower number.

When using the APRA on smaller projects, the team must also determine a new target score at which they feel comfortable authorizing a project for detailed design and construction. Through experience, each organization should develop an appropriate threshold range of scores for the particular phase of project development. This threshold is dependent upon the size, type, and complexity of the project.

For example, on a small 2-lane rural project, the APRA can be used effectively for this project with some modification. Note that some elements may be assigned a value of zero as not applicable for this type of project [e.g., Bridge Structure Elements (F1), Equipment List (H1), Equipment Location Drawings (H2), and Equipment Utility Requirements (H3)]. A "not applicable" element essentially provides no risk, or no potential negative impact to the project. Other elements may become more critical [e.g., Environmental Documentation (D5), Hydraulic Structures (F2)]. After the assessment, if the organization's scaled-down version has a maximum possible score of 800 [after certain elements are given a not applicable (definition level 0) in the score sheet], it may determine that a score of 200 (25% of the total applicable points) must be reached before authorizing its small projects for PS&E development.

A word of caution should be given here. Using the APRA for this purpose should be done carefully or else elements that are more important for small projects may be given less emphasis than required. The operative phrase for using the APRA in these situations is common sense. An experienced facilitator can help in this regard.

3.6 Implementation across the Organization

The first requirement for implementation of the APRA across any organization (i.e., using it on all projects) is the unwavering support of upper management. Upper management should create a procedure that lists the utilization of the APRA as a requirement prior to authorizing a project to proceed with right-of-way release.

There is some danger in too much focus on scoring. Some smaller, maintenance projects may be fully acceptable at a much higher APRA score as long as the project risks have been defined and a mitigation plan is in place to control the project. As stated before, **common sense should prevail when reviewing APRA results from a project**. Requiring teams to reach a specific score could result in a team artificially adjusting the score so that the project can be executed (to the detriment of the organization, project, and team participants). In most cases, it is more beneficial for the owner to have an APRA assessment along with identified risk issues (gap list) and corresponding mitigation steps. **Managers should focus on the high risk elements generated in the assessment session, not just the APRA score**. These are the issues that are of most concern as identified by the project team. **Focusing too much emphasis on the score can lead to use of the tool as an administrative exercise and not an effective risk management approach**.

The second requirement is a local champion. This person is an enthusiastic supporter of the application of this tool. He/she is in contact with other organizations using the APRA to gain

knowledge of its use and fosters the widespread application of the tool. This person is an advocate regarding the benefits that this tool and method will bring to the organization.

The third requirement is training. A number of facilitators should be trained by the champion or an outside training resource. The number of facilitators will vary by organization and the number of projects that require approval. The objective is to ensure that every project has access to a trained facilitator in a timely manner. The facilitator should NOT be a member of that project team. In many organizations, Project Managers are trained as facilitators for their peer's projects. In addition to a cadre of facilitators, all key members of the organization should be trained in how to participate in an APRA session and why their participation is important. In most cases, this is accomplished with just-in-time training. The trained facilitator will take the first 15 minutes or so of a session and brief the participants on the meeting's purpose and their role in making the session a success. Then the facilitator will take the opportunity to comment on specific behaviors as they progress through the assessment session. Soon all key members will be well-trained and know what to expect during an APRA assessment session.

If the APRA is implemented across an organization, its use should be monitored. The organization may wish to modify APRA element descriptions to add discussion concerning proprietary concerns, lessons learned, or specific terminology based on its business environment.

Chapter 4. What Does an APRA Score Mean?

A low APRA score represents a project scope that is well-defined and, in general, corresponds to an increased probability for project success. Higher scores signify that certain elements within the project scope lack adequate definition.

To evaluate the quality of the tool, it has been tested on 16 projects in 10 districts in Texas. For each of these projects, those who have been involved in the development, design and construction of the project were invited to an assessment meeting. Nine of the 16 projects were already completed and thus were scored after the fact. Seven of them were scored in actual project time. The participants were asked to evaluate each element of the APRA with the facilitation of a researcher. At the end of each meeting, the participants were asked to fill out an exit questionnaire to assess their opinion of how helpful the method is.

Results from the evaluation revealed that all of the twenty eight participants agreed that the APRA method can help the project team identify the critical risk elements that need to be managed during advance planning and the project development process. Twenty three of them agreed that the method can help improve the advance planning process. These results show not only the helpfulness of the method but also the initial acceptance of the method from the users.

Observations during the assessment meetings have shown that the APRA can provide a forum for the project team to communicate about the issues across the whole team, which is of particular importance since coordination in transportation projects is intensive and critical. It also can provide a chance for the team to reconcile the different perspectives on different issues and how to approach them.

The project total score would be approximately 70, 300, 550, 775, and 1000 points if all elements had the definition levels of 1, 2, 3, 4, and 5, respectively. At the beginning of the project development process, during the Needs Assessment phase, the project score can be close to 1000 points. As the project progresses into later phases, the project score should get lower. The lowest possible score of a project without non-applicable elements is 70, which is the case when all of the elements have a definition level of 1.

Scoring is a subject process and each organization is unique. Thus, an organization may wish to keep its own database of APRA scores for various project sizes and types. As more projects are completed and scored using the APRA, its ability to predict the probability of success on future projects should improve. The APRA may serve as a gauge to assist the organization in deciding whether or not to authorize the development of PS&E and ultimately the construction of a project. The organization may also wish to use the database as an external benchmark for measurement against the practices of other industry leaders.

4.1 Analyzing APRA Scores—What to Look For

The APRA is of little value unless the user takes action based on the analysis and uses the assessment to identify and mitigate risk for the project. Among the potential uses when analyzing the APRA score are the following:

- Tracking project progress during the project development process, using the APRA score as a macro-evaluation tool. Individual elements, categories, and sections can be tracked as well.
- Comparing project-to-project scores over time to identify trends in developing scope definition within your organization.
- Comparing different types of projects (e.g., urban vs. rural; bridge vs. intersection; or new vs. renovation) can allow you to determine your threshold APRA scores for those projects and identify critical success factors from that analysis. The APRA also can be used to compare projects for organizations or different project sizes with the same organization.
- Looking at weak areas of your project at a section, category, or element level. For example, if you have any element that has a definition level of 3, 4, or 5, you should either further define this element or develop a risk mitigation strategy. This provides an effective method of risk analysis since each element, category, and section is weighted relative to the other in terms of potential risk exposure. The identification of the project's weak areas is critical as the project team continues its progress toward execution and should provide the path forward of action items for the project team.
- Another method of evaluation is to look at the score of each Section or Category as a percentage of its maximum score in order to focus attention on critical items for the project. For example, if your score for Section I, Basis of Project Decision, is 150 points, then it is 50 percent of its potential maximum score (300). The elements in this Section need much work.
- Note that the total score is divided fairly evenly among the sections. This implies that attention should be paid to all sections even though at different phases of the project different sections may have different levels of definition.
- Sometimes, project teams are pressured to develop a scope of work in a short period of time. To streamline the process, the team could focus on the top 10 elements, as listed in Figure 4.1. See Appendix C for a description of each of the top 10 elements.

1. Determination of Utility Impacts (C4)
2. Programming & Funding Data (A3)
3. Survey of Existing Environmental Conditions (C3)
4. Investment Studies & Alternatives Assessments (A2)
5. Long-Lead Parcel & Utility Adjustment Identification (I1)
6. Schematic Layouts (E3)
7. Design Philosophy (B1)
8. Need & Purpose Documentation (A1)
9. Public Involvement (A5)
10. Environmental Documentation (D5)

TOTAL POINTS = 250/1000

Figure 4.1: Ten Most Highly Ranked APRA Elements

Chapter 5. Concluding Remarks

The APRA can benefit owners, developers, designers, and contractors. Facility owners, developers, and lending institutions can use it as an assessment tool for establishing a comfort level at which they are willing to move forward on projects. Designers and contractors can use it as a means of negotiating with owners in identifying poorly defined critical risk elements. The APRA provides a forum for all project participants to communicate and reconcile differences using an objective tool as a common basis for project scope evaluation. It also provides excellent input into the detailed design process and a solid baseline for design management.

Anyone who wishes to improve the overall performance on their transportation projects should use the APRA.

5.1 How to Improve Performance on Future Projects

The following suggestions are offered to individuals or organizations who adopt the APRA with the desire to improve performance with their transportation projects:

- **Commit to advance planning.** Effective planning in the early stages of transportation projects can greatly enhance cost, schedule, and operational performance while minimizing the possibility of financial failures and disasters.
- **Gain and maintain project team alignment** by using the APRA throughout the advance planning phase and the project development process. Discussions around the scope definition checklists are particularly effective in helping with team alignment.
- **Adjust the APRA as necessary to meet the specific needs of your project.** The APRA was designed so that certain elements considered not applicable on a particular project can be zeroed out, thus eliminating them from the final scoring calculation.
- **Use the APRA to improve advance planning.** Build your own internal database of projects that are scored using the APRA. Compute APRA scores at the various times during scope development and compare versus project success. Based upon the relationship between APRA scores and project success, establish your own basis for the level of scope definition that you feel is acceptable for moving forward from phase to phase.
- **Use caution when beginning detailed design of projects with high APRA scores.** The higher the APRA score, the less defined the project scope, thus there is more likelihood that the project will have poor performance.

The APRA can effectively be used to optimize the identification of project requirements during the project development process. However, the APRA alone will not ensure process optimization and successful projects. When combined with sound business planning, alignment, and good project execution, it can greatly improve the identification process and the probability of meeting or exceeding project objectives.

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2. Caldas, C. H., Gibson, G. E., and Le, T. *Optimizing the Identification of Right-of-Way Requirements during the Project Development Process Report*. Report 0-5478-1 to Texas Department of Transportation, Austin, Texas, October 2007.
3. Construction Industry Institute. *Project Definition Rating Index, Industrial Projects*. Second Edition, Implementation Resource 113-2, the Construction Industry Institute, Austin, Texas, 2006.
4. Construction Industry Institute. *Project Definition Rating Index, Building Projects*. Second Edition, Implementation Resource 155-2, the Construction Industry Institute, Austin, Texas, 2006.
5. Texas Department of Transportation. *Project Development Process Manual*. Design Division, Texas Department of Transportation, Austin, Texas, 2003.

Appendix A. Project Score Sheet (Unweighted)

SECTION I - BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. PROJECT STRATEGY							
A1. Need & Purpose Documentation							
A2. Investment Studies & Alternatives Assessments							
A3. Programming & Funding Data							
A4. Key Team Member Coordination							
A5. Public Involvement							
CATEGORY A TOTAL							
B. OWNER/OPERATOR PHILOSOPHIES							
B1. Design Philosophy							
B2. Operating Philosophy							
B3. Maintenance Philosophy							
B4. Future Expansion & Alteration Considerations							
CATEGORY B TOTAL							
C. PROJECT REQUIREMENTS							
C1. Functional Classification & Use							
C2. Evaluation of Compliance Requirements							
C3. Survey of Existing Environmental Conditions							
C4. Determination of Utility Impacts							
C5. Value Engineering							
CATEGORY C TOTAL							

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION II - BASIS OF DESIGN							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
D. SITE INFORMATION							
D1. Geotechnical Characteristics							
D2. Hydrological Characteristics							
D3. Surveys & Planimetrics							
D4. Permitting Requirements							
D5. Environmental Documentation							
D6. Property Descriptions							
D7. Ownership Determinations							
D8. Right-of-Way Mapping							
D9. Constraints Mapping							
D10. Right-of-Way Site Issues							
CATEGORY D TOTAL							
E. LOCATION & GEOMETRY							
E1. Horizontal & Vertical Alignment							
E2. Control of Access							
E3. Schematic Layouts							
E4. Cross-Sectional Elements							
CATEGORY E TOTAL							
F. STRUCTURES							
F1. Bridge Structure Elements							
F2. Hydraulic Structures							
F3. Miscellaneous Design Elements							
CATEGORY F TOTAL							
G. DESIGN PARAMETERS							
G1. Provisional Maintenance Requirements							
G2. Constructability							
CATEGORY G TOTAL							

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION II - BASIS OF DESIGN (continued)							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
H. INSTALLED EQUIPMENT							
H1. Equipment List							
H2. Equipment Location Drawings							
H3. Equipment Utility Requirements							
CATEGORY H TOTAL							

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

SECTION III - EXECUTION APPROACH							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
I. ACQUISITION STRATEGY							
I1. Long-Lead Parcel & Utility Adjustment Identification							
I2. Long-Lead/Critical Equipment & Materials Identification							
I3. Local Public Agencies Utilities Contracts & Agreements							
I4. Utility Agreement & Joint-Use Contracts							
I5. Project Delivery Method & Contracting Strategies							
I6. Design/Construction Plan & Approach							
I7. Procurement Procedures & Plans							
I8. Appraisal Requirements							
I9. Advance Acquisition Requirements							
CATEGORY I TOTAL							
J. DELIVERABLES							
J1. CADD/Model Requirements							
J2. Documentation/Deliverables							
CATEGORY J TOTAL							
K. PROJECT CONTROL							
K1. Right-of-Way & Utilities Cost Estimates							
K2. Design & Construction Cost Estimates							
K3. Project Cost Control							
K4. Project Schedule Control							
K5. Project Quality Assurance & Control							
K6. Safety Procedures							
CATEGORY K TOTAL							

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION III - EXECUTION APPROACH (continued)							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
L. PROJECT EXECUTION PLAN							
L1. Environmental Commitments & Mitigation							
L2. Interagency Coordination							
L3. Local Public Agency Contractual Agreements							
L4. Interagency Joint-Use Agreements							
L5. Preliminary Traffic Control Plan							
L6. Substantial Completion Requirements							
CATEGORY L TOTAL							

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

Appendix B. Project Score Sheet (Weighted)

SECTION I - BASIS OF PROJECT DECISION							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
A. PROJECT STRATEGY							
A1. Need & Purpose Documentation	0	1	7	12	18	23	
A2. Investment Studies & Alternatives Assessments	0	2	8	14	19	25	
A3. Programming & Funding Data	0	2	9	16	23	30	
A4. Key Team Member Coordination	0	1	6	11	16	21	
A5. Public Involvement	0	2	7	13	18	23	
CATEGORY A TOTAL							
B. OWNER/OPERATOR PHILOSOPHIES							
B1. Design Philosophy	0	1	7	12	18	23	
B2. Operating Philosophy	0	1	5	10	14	18	
B3. Maintenance Philosophy	0	1	5	9	12	16	
B4. Future Expansion & Alteration Considerations	0	2	6	11	15	19	
CATEGORY B TOTAL							
C. PROJECT REQUIREMENTS							
C1. Functional Classification & Use	0	1	5	8	12	15	
C2. Evaluation of Compliance Requirements	0	1	6	10	15	19	
C3. Survey of Existing Environmental Conditions	0	2	8	14	20	26	
C4. Determination of Utility Impacts	0	2	9	16	23	30	
C5. Value Engineering	0	1	4	7	9	12	
CATEGORY C TOTAL							
Section I Maximum Score = 300				SECTION I TOTAL			

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION II - BASIS OF DESIGN							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
D. SITE INFORMATION							
D1. Geotechnical Characteristics	0	1	5	9	12	16	
D2. Hydrological Characteristics	0	1	5	10	14	18	
D3. Surveys & Planimetrics	0	1	5	10	14	18	
D4. Permitting Requirements	0	1	5	9	13	17	
D5. Environmental Documentation	0	2	7	12	17	22	
D6. Property Descriptions	0	1	5	8	12	15	
D7. Ownership Determinations	0	1	4	7	10	13	
D8. Right-of-Way Mapping	0	1	5	9	12	16	
D9. Constraints Mapping	0	1	6	10	15	19	
D10. Right-of-Way Site Issues	0	1	6	10	15	19	
CATEGORY D TOTAL							
E. LOCATION & GEOMETRY							
E1. Horizontal & Vertical Alignment	0	1	6	11	15	20	
E2. Control of Access	0	1	5	9	13	17	
E3. Schematic Layouts	0	2	8	13	19	24	
E4. Cross-Sectional Elements	0	1	5	10	14	18	
CATEGORY E TOTAL							
F. STRUCTURES							
F1. Bridge Structure Elements	0	1	5	9	12	16	
F2. Hydraulic Structures	0	1	5	10	14	18	
F3. Miscellaneous Design Elements	0	1	4	8	11	14	
CATEGORY F TOTAL							
G. DESIGN PARAMETERS							
G1. Provisional Maintenance Requirements	0	1	4	6	9	11	
G2. Constructability	0	1	5	10	14	18	
CATEGORY G TOTAL							

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION II - BASIS OF DESIGN (continued)								
CATEGORY Element	Definition Level						Score	
	0	1	2	3	4	5		
H. INSTALLED EQUIPMENT								
H1. Equipment List	0	1	3	5	7	9		
H2. Equipment Location Drawings	0	1	3	5	6	8		
H3. Equipment Utility Requirements	0	1	4	7	10	13		
CATEGORY H TOTAL								
Section II Maximum Score = 359				SECTION II TOTAL				

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION III - EXECUTION APPROACH							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
I. ACQUISITION STRATEGY							
11. Long-Lead Parcel & Utility Adjustment Identification	0	2	8	13	19	24	
12. Long-Lead/Critical Equipment & Materials Identification	0	1	4	7	9	12	
13. Local Public Agencies Utilities Contracts & Agreements	0	1	6	10	15	19	
14. Utility Agreement & Joint-Use Contracts	0	1	6	11	15	20	
15. Project Delivery Method & Contracting Strategies	0	1	4	7	10	13	
16. Design/Construction Plan & Approach	0	1	4	8	11	14	
17. Procurement Procedures & Plans	0	1	3	6	8	10	
18. Appraisal Requirements	0	1	4	8	11	14	
19. Advance Acquisition Requirements	0	1	4	6	9	11	
CATEGORY I TOTAL							
J. DELIVERABLES							
J1. CADD/Model Requirements	0	1	3	6	8	10	
J2. Documentation/Deliverables	0	1	4	7	10	13	
CATEGORY J TOTAL							
K. PROJECT CONTROL							
K1. Right-of-Way & Utilities Cost Estimates	0	2	7	12	16	21	
K2. Design & Construction Cost Estimates	0	2	7	12	16	21	
K3. Project Cost Control	0	1	5	9	13	17	
K4. Project Schedule Control	0	1	5	9	12	16	
K5. Project Quality Assurance & Control	0	1	3	6	8	10	
K6. Safety Procedures	0	1	4	7	10	13	
CATEGORY K TOTAL							

Definition Levels

0 = Not Applicable

1 = Complete Definition

2 = Minor Deficiencies

3 = Some Deficiencies

4 = Major Deficiencies

5 = Incomplete or Poor Definition

SECTION III - EXECUTION APPROACH (continued)							
CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
L. PROJECT EXECUTION PLAN							
L1. Environmental Commitments & Mitigation	0	1	5	8	12	15	
L2. Interagency Coordination	0	1	5	8	12	15	
L3. Local Public Agency Contractual Agreements	0	1	5	8	12	15	
L4. Interagency Joint-Use Agreements	0	1	4	8	11	14	
L5. Preliminary Traffic Control Plan	0	1	4	7	10	13	
L6. Substantial Completion Requirements	0	1	4	6	9	11	
CATEGORY L TOTAL							
Section III Maximum Score = 341				SECTION III TOTAL			

Definition Levels

0 = Not Applicable

2 = Minor Deficiencies

4 = Major Deficiencies

1 = Complete Definition

3 = Some Deficiencies

5 = Incomplete or Poor Definition

Appendix C. Element Descriptions

The following descriptions have been developed to help generate a clear understanding of the terms used in the Project Score Sheet. Some descriptions include checklists to clarify concepts and facilitate ideas when scoring each element. Note that these checklists are not all-inclusive and the user may supplement these lists when necessary. Moreover, for specific information regarding certain processes and tasks during the Project Development Process, a listing of Texas Department of Transportation requirements is included for many of the element descriptions.

The descriptions are listed in the same order as they appear in the Project Score Sheet. They are organized in a hierarchy by section, category, and element. The Project Score Sheet consists of three main sections, each of which is a series of categories that have elements. Scoring is performed by evaluating the levels of definition of the elements. The sections, categories, and elements are organized as follows:

SECTION I—BASIS OF PROJECT DECISION

This section consists of information necessary for understanding the project objectives. The completeness of this section determines the degree to which the project team will be able to achieve unification in meeting the project's business objectives.

Categories:

- A—Project Strategy
- B—Owner Philosophies
- C—Project Requirements

SECTION II—BASIS OF DESIGN

This section consists of geotechnical, hydrological, environmental, structural, and other technical design elements that should be evaluated to fully understand impacts on the acquisition of right-of-way. Similarly, this section includes a number of right-of-way requirements prior to acquisition, occurring simultaneously with preliminary design.

Categories:

- D—Site Information
- E—Location & Geometry
- F—Structures
- G—Design Parameters
- H—Installed Equipment

SECTION III—EXECUTION APPROACH

This section consists of elements that should be evaluated to fully understand the requirements of the owner's execution strategy and approaches for detailed design, R/W acquisition, utility adjustments, and construction.

Categories:

I—Acquisition Strategy

J—Deliverables

K—Project Control

L—Project Execution Plan

The following pages contain detailed descriptions for each element in the APRA.

SECTION I—BASIS OF PROJECT DECISION

A. PROJECT STRATEGY

A.1. Need & Purpose Documentation

The need for a project may be identified in many ways, including suggestions from maintenance supervisors, area engineers, transportation planners, local elected officials, developers, and the public. This process typically includes site visits, seeking input from individuals with relevant knowledge. Documentation should result in assessing the need and purpose of a potential project based on factual evidence of current and future conditions. This documentation must consider how the project will address previously determined problems and inefficiencies, in language that is understandable to the general public. It will eventually serve as the basis for identifying, comparing, and selecting alternatives. Issues may include:

- Project scope and definition
- Community concerns and critical issues
- Consultation with local public officials regarding supportive legislation
- Multi-modal alternatives and inter-modal relationships
- Current operational/maintenance inefficiencies and high costs
- Current and future economic development needs
- Adjacent properties and transportation facilities
- Site visits and interviews
- Capacity improvement needs:
 - Existing levels of service
 - Traffic modeling of future travel demands
 - Trend analysis and forecasted growth
- Safety improvement needs:
 - Accident frequency and severity
 - Conformance with current geometric standards
 - Pavement and bridge structure conditions
- Other

TxDOT Requirements:

- “Need & Purpose Statement”

A.2. Investment Studies & Alternatives Assessments

Various studies address possible alternatives when the solution is unknown. In some cases, these studies may show that the project is not economically justifiable—or that it has so many environmental impacts that it is not viable. Early determination of these findings will avoid unnecessary expenditure of funds on preliminary engineering and related costs. These studies may take the form of feasibility/route studies or major investment studies. Issues of concern during study processes include:

- Stakeholder activity responsibilities
- Consultant reviews and selection
- Route requirement determinations
- Corridor selection and major alternatives

- Preliminary surveys:
 - Population densities
 - Trends in land use and development
 - Travel patterns
 - Travel trends
 - Directional distribution and volumes
 - Economic, social, and environmental conditions
- Existing traffic data at governmental levels (e.g., city, county, state)
- Alternative profile layouts and preliminary mapping
- Multi-modal alternatives and inter-modal connections
- Toll lane and high occupancy vehicle lane inclusions
- Railroad corridor preservation
- Preliminary public involvement
- Major investment study needs
- Transportation Planning:
 - Short-term
 - Medium-term
 - Long-term
- Other

TxDOT Deliverables and Processes:

- “Request for Feasibility Study” preparation, execution, and approval*
- Unified planning work program (UPWP)*
- Statewide transportation implementation plan (STIP)*
- Long-range transportation plan (LRTP)*

A.3. Programming & Funding Data

Authorization of projects within local, governing transportation plans is a typical requirement prior to executing funding agreements. As part of the authorization process, relatively accurate cost estimates must be prepared, assessing funding directed towards preliminary engineering, construction, right-of-way acquisition, utility adjustment, maintenance, and other project expenses. As such, strategic measures must be in place for determining the sources, levels, and forms of funding available to the project, as it competes against others for limited funds. Issues to consider include:

- Initial construction cost estimates
- Initial right-of-way cost estimates
- Cost drivers, such as:
 - Utility adjustment costs
 - Environmental/mitigations costs
 - Significant traffic control costs
- Cost-benefit analysis
- Sources and forms of funding:
 - Local government entities
 - State and federal agencies
 - Private entities
- Breakdown of funding participation
- Congruity with local transportation programs
- Economically disadvantageous community funding
- Level of local level community support

- Unusual funding scenarios
- Other

TxDOT Deliverables and Processes:

- “Programming Assessment Study” preparation and execution
- Design and Construction Information System (DCIS) estimate update
- Financial Management Information System (FMIS) estimate update
- “Long Range Project” status execution under Unified Transportation Plan (UTP)
- “Advanced Funding Agreement” preparation and execution

A.4. Key Team Member Coordination

Establishing a positive alliance among all project team members facilitates the potential for an efficient, successful outcome—particularly if this alliance is achieved early during the planning process. Infrastructure projects typically involve many different team members existing in both the public and private sectors. All key team members must be informed of project decisions and given the opportunity to attend project planning meetings, in order to minimize the impacts on sequential activities. Key team members may include:

- Right-of-way planning
- Traffic planning and programming
- Design engineering
- Environmental planning
- Construction engineering
- Operations and maintenance
- Consultants
- Local governmental authorities:
 - Local/state government officials
 - Local public agencies
 - Environmental resource agencies
 - Budgeting officers
- Federal authorities (e.g., Federal Highway Administration (FHWA) and Federal Transit Administration (FTA))
- Other

TxDOT Meetings:

- Feasibility Scoping Meeting
- Project Concept Conference
- Project Design Conference
- Utility Coordination Meetings

A.5. Public Involvement

Public involvement is an integral part of project development. Every project has to afford some level of public involvement to inform the public of project scope issues and to measure public attitudes regarding the development process. The level of public involvement is dependent upon a number of social, economic, and environmental factors, along with the type and complexity of the project. Public involvement efforts may include meetings with key stakeholders, including affected property owners, public meetings, and public hearings. Issues to consider include:

- Policy determinations regarding public involvement
- Notification procedures and responsibilities
- Identification of key stakeholders
- Identification of utility providers
- Types of public involvement:
 - Meetings with affected property owners
 - Public meetings
 - Public hearings
- Local support and/or opposition
- Public involvement strategies after project approval
- Press releases and notices
- Available website content
- Other

TxDOT Deliverables and Processes:

- Incorporate into “Draft Environmental Impact Statement” (DEIS)
- Incorporate into “Final Environmental Impact Statement” (FEIS)
- Written summary of proceedings
- “Opportunity for Public Hearing” notice
- “Public Hearing” notice

B. OWNER/OPERATOR PHILOSOPHIES

B.1. Design Philosophy

A list of general design principles should be developed to achieve a completed project that fulfills a functional requirement and also assimilates into the existing roadway infrastructure. Issues to consider include:

- Design life
- Safety requirements
- Multimodal Requirements
- Aesthetics requirements
- Compatibility with long-range transportation goals
- Environmental sustainability
- Access management
- Geometric/traffic speed
- Community image
- Other

B.2. Operating Philosophy

A list of general design principles should be developed to preserve the level of service desired and sufficient transportation capacity over an extended period of time. This particularly focuses on developing strategic operations plans to prevent sub-optimal capacity-related problems. Issues to consider include:

- Daily level of service requirements
- Directional volume and lane change requirements

- Operating timetables
- Technological needs assessment
- Future improvement schedule
- Flexibility to change layout
- The owner/operator of the facility
- Traffic control plans and detour availability
- Utilities location (e.g., in median, under pavement)
- Other

B.3. Maintenance Philosophy

A list of general design principles should be developed to lay out guidelines to maintain adequate roadway operations and safety over an extended period of time. Furthermore, a specific traffic control plan should be in place for the project corridor, if traffic operations interface simultaneously with maintenance operations. Issues to consider include:

- Scheduled shut-down frequencies and durations
- Traffic monitoring requirements
- Equipment access needs and provisions
- Traffic control plans and detour availability
- Environmental conservation programs
- Selection of materials for design and construction
- Other

B.4. Future Expansion & Alteration Considerations

The possibility of expansion and/or alteration of this transportation facility and site should be evaluated. These considerations consist of a list of items that will facilitate the potential expansion or evolution of facility use. Issues to consider may include:

- Regional transportation plans
- Statewide transportation plans
- Interface with future urban development sites
- Expected population densities along corridor
- Availability for added capacity and widening:
 - Vertical added capacity
 - Horizontal added capacity
- Availability for interchanges, access ramps, and frontages
- Pending and future traffic regulations
- Corridor preservation (i.e., sloped to grade, with potential for retaining walls in the future)
- Other

C. PROJECT REQUIREMENTS

C.1. Functional Classification & Use

An essential step in the design process is to determine the functions that the facility is to serve. The two major functions to consider in classifying a roadway are access and mobility. In added capacity projects, a distinction must be made as to the existing and prescribed classification.

Important in this classification is whether the facility is on or off the state system. Classification often determines funding requirements and allocation. Functional types to consider include:

- Principal arterial roads (freeways):
 - Urban freeway
 - Rural freeway
- Minor arterial roads:
 - Urban frontage road
 - Rural frontage road
- Collector roads:
 - Urban multi-lane
 - Rural multi-lane
- Local roads and streets:
 - Urban street
 - Suburban street
 - Rural one-lane
- Bike and pedestrian trails
- Other

C.2. Evaluation of Compliance Requirements

Project planning requires adherence to various local, regional, and statewide plans for efficient and comprehensive tracking. As part of project development, applicable requirements must be determined and complied with. Issues to consider for compliance include:

- Regional transportation plans
- Statewide transportation plans
- Local master plans and documentation
- Related investment studies and reports
- Local entity input:
 - Municipal departments
 - Chambers of commerce
 - Public utilities
 - Public housing
 - Railroads
 - Ports and harbors
 - Transit authorities
 - Governmental councils
- Other

TxDOT Transportation Plans:

- Texas Transportation Plan (TTP)*
- Metropolitan Transportation Plan (MTP)*
- Coastal Zone Management Plan (CZMP)*
- Transportation Improvement Program (TIP)*
- Statewide Transportation Improvement Program (STIP)*
- Unified Transportation Program (UTP)*

C.3. Survey of Existing Environmental Conditions

A preliminary survey consists of fieldwork and data acquisition from a variety of sources, including previous surveys, geographic information systems, and resource agency databases. Identifying problematic issues at an early stage in the project development process enables adequate time to address and mitigate these concerns. Issues to consider include:

- Natural resource surveys:
 - Endangered species
 - Wetland status
 - Bodies of water
 - Existing and potential park system land
 - Permit needs
- Cultural resource surveys:
 - Historical preservation
 - Existence of cemeteries
 - Archaeological sites
- Air quality surveys:
 - Mobile source pollutants
 - Air quality analysis
 - Congestion mitigation-air quality
- Noise surveys:
 - Evaluation of need for abatement
- Hazardous materials:
 - Existing land use
 - Superfund and regulatory agency database review
 - Underground storage tanks
 - Site visits
 - Local inhabitant interviews
- Socioeconomic Impacts
- Other

C.4. Determination of Utility Impacts

Infrastructure projects often necessitate the adjustment of utilities to accommodate the design and construction of proposed transportation facilities. Failure to mitigate utility conflicts in the design process or to relocate facilities in a timely manner can result in unwarranted delays and increased project costs. Issues to consider include:

- Field verification of existing utilities facilities
- Field verification with proposed alignment
- Necessary utility facility repair and modernization
- Action plans for utility adjustments
- Physical constraints to utility placement
- Schedule impact of utility relocations and adjustments
- Determination of utility location in state right-of-way
- Local ordinances or industry standards
- Safety clearances requirements
- Other

TxDOT Requirements:

In Texas, public utilities have been granted the right to occupy State right-of-way. These rights are extended, provided that utility use will not interfere with safety of the traveling public nor the State's ability to construct and maintain highways.

- Utility Accommodation Rules (UAR) compliance*
- Texas Administrative Code, Environmental, 290.44 (TAC) compliance*

C.5. Value Engineering

Value Engineering (VE) studies may be used to assess a project's overall effectiveness or how well the project meets identified needs. VE is another tool that may be used in alternative selection. Study findings may show that redesign of an alternative is needed, in which case schematics may require revisions. VE is designed to gather expertise and experience of individuals to produce the most effective solution to the transportation need. Issues to consider include:

- Policy requirements and processes
- Team member and team leader identification
- Strategic resource collection and studies:
 - Redundancy factors
 - Over capacity factors
 - Life-cycle and replacement costs
 - Environmental clearance impacts
 - Other
- Report preparation and recommendations
- Session attendance requirements
- Approved response submittals
- Planning document revisions
- Other

SECTION II—BASIS OF DESIGN

D. SITE INFORMATION

D.1. Geotechnical Characteristics

Geotechnical and soil test evaluations of the project corridor should be developed. Issues to consider include:

- General site descriptions (e.g., terrain, spoil removals, areas of hazardous waste)
- Soil composition and strata structure
- Potential soil expansion considerations
- Soil densities and compaction requirements
- Seismic requirements
- Foundation requirements:
 - Allowable bearing capacities
 - Pier/pile capacities
- Water table
- Groundwater flow rates and directions
- Soil percolation rate and conductivity
- Existing contamination
- Karst formations
- Man-made/abandoned facilities
- Soil treatment and remediation needs
- Boring tests and test pits
- Other

D.2. Hydrological Characteristics

Hydraulic information should be reviewed and analyzed at a high level prior to selection of alternatives and detailed design. This information is necessary for determining hydraulic structural requirements and detention facilities, as well as preliminary right-of-way requirements. Issues to consider include:

- Drainage basin characteristics:
 - Size, shape, and orientation
 - Slope of terrain
 - Watershed development potential
 - Geology
 - Surface infiltration
 - Antecedent moisture condition
 - Storage potential (e.g., overbank, wetlands, ponds, reservoirs, channels)
- Flood plain characteristics
- Soil types and characteristics
- Ground cover and erosion concerns, including scour susceptibility
- Meteorological characteristics:
 - Precipitation types and amounts
 - Peak flow rates

- Hydrographs
- Special precipitation concerns
- Storm water runoff control
- Potential impacts of future development
- Other

D.3. Surveys & Planimetrics

Once it has been determined that a corridor needs to be studied, a reconnaissance of the corridor is conducted. This includes a study of the entire area. The study facilitates the development of one or more routes or corridors in sufficient detail to enable appropriate officials to recommend which will provide the optimum location. Issues to consider include:

- Right-of-entry requirements
- Surveying consultant requirements
- Current aerial photographic displays
- Existing right-of-way maps/inventory
- Preliminary survey, including recovery of existing monumentation
- Topography (contours)
- Existing structure locations
- Grid ticks and centerlines
- Geotechnical summaries
- Utility information
- Affected area maps
- Special property owner concerns
- Other

US Requirements:

- Use of Subsurface Utility Engineering (SUE)*

D.4. Permitting Requirements

Permitting usually begins concurrently with surveys and continues throughout project construction. Personnel responsibilities should be specific to each permit and clearly delineated. In many cases, permits must be obtained before further approval of project development activities and site access. Issues to consider include:

- Waterway permits
- Wetland permits
- Flora and fauna permits
- Resource agency permits
- Historic and cultural association permits
- Pollutant and emissions permits
- Approved points of discharge permits
- Grading and erosion permits
- Local jurisdictional permits
- Other

US Requirements may include:

- U.S. Army Corps of Engineers (USACE) and U.S. Coast Guard (USCG) permits*

- Clean Water Act Section 404 requirements*
- Endangered Species Act requirements*

D.5. Environmental Documentation

Project environmental classification drives the type of environmental documentation that is required. Environmental documentation should provide a brief summary of the results of analysis and coordination, as well as information about of the social, economic, and environmental impacts of a project. This includes a determination of what decision should be made on a project's construction, location, and design. In addition, the document should describe early interagency coordination and preliminary public involvement, including estimates of time required for milestones.

Types of environmental documentation in the U.S. include:

- Environmental Assessments (EA)*
- Environmental Impact Statements (EIS)*
- Categorical Exclusions (CE)*
- Potential Outcomes*
 - Findings of No Significant Impact (FONSI)*
 - Notice of Intent (NOI)*
 - Record of Decision (ROD)*
 - Categorical Exclusion (CE)*
- Section 4F Documentation (e.g., parks and recreation areas, refuges, cultural resources, and other sites)*
- Other*

Note: As defined in the U. S. National Environmental Policy Act (NEPA), three levels of environmental analysis exist. At the first level, an undertaking may be categorically excluded (CE) from a detailed environmental analysis if it meets certain criteria which a federal agency has previously determined as having no significant environmental impact. At the second level of analysis, a federal agency prepares a written Environmental Assessment (EA) to determine whether or not a federal undertaking would significantly affect the environment. If this is not the case, the agency issues a Finding of No Significant Impact (FONSI). An Environmental Impact Statement (EIS) is a more detailed evaluation of the proposed action and alternatives. A Notice of Intent (NOI) announces an agency's decision to prepare an EIS for a particular action and must be published in the Federal Register. The public, other federal agencies and outside parties may provide input into the preparation of an EIS and then comment on the draft EIS when it is completed. Following the Final EIS, the agency will prepare a Record of Decision (ROD).

D.6. Property Descriptions

In contrast to right-of-way maps being internal documents, property descriptions are prepared as exhibits for the conveyance of property interests that will be affected. The property descriptions reflect a boundary survey and include metes and bounds descriptions, as well as parcel plat determinations. Property descriptions should be summarized from survey information into an appropriate documentation form that can be logged into project information systems. Information needed includes:

- Type of property or businesses affected
- Historical data used in preparing the survey
- Parcel plats
- Parcel size and area
- Control reference point data
- Centerline station ties
- Control of access lines
- County lines
- City limit lines
- Other

D.7. Ownership Determinations

Right-of-way ownership descriptions and title determinations should be produced and made available to complement draft schematics. Property ownership along the proposed routes can be determined in the following ways:

- Review of existing right-of-way maps from previous projects
- On-site canvas of the proposed affected properties
- Appraisal maps and records
- Abstractor's indices
- Real property records
- Other

D.8. Right-of-Way Mapping

A right-of-way map is a compilation of internal data, property descriptions (which includes field notes and parcel plats), appraisal information, and improvements related to the transportation project. Right-of-way maps are recognized as internal plans and management documents, with significant impact on the project development process. Preparation of these maps normally begins after obtaining schematic design approval. Issues to consider include:

- Parcel numbers and priority
- Existing site information:
 - Improvements within right-of-way
 - Utility locations
 - Record ownership data of adjacent properties
 - Existing boundaries and limits
 - Existing drainage channels and easements
- Design information:
 - Access control lines
 - Configuration of roadway
 - Hydraulics
 - Frontage roads
 - Connecting Ramps
- Parcel information:
 - Property owner name
 - Parcel title requirements
 - Parcel number
 - Parent tract
 - Type of conveyance, if known (e.g., donation, negotiation, condemnation)

- Station to station limits and offset
- Area in acres and/or square feet
- Area of uneconomic remainders
- Property lines
- Bearing and distance to control points
- Property descriptions
- Other

D.9. Constraints Mapping

Environmental constraints should be incorporated into preliminary right-of-way maps and schematics. This makes it easier to track the project alternatives across potential hazardous environmental locations. Issues to consider include:

- Landfill and superfund records
- Underground storage tank locations
- Wetlands identification
- Floodway identification
- Endangered species locations
- Public park space
- Cultural resources
- Historical landmarks
- Stockpiles and production sites
- Outfall locations
- Oil and gas well piping
- Poly-chlorinated biphenyls (PCB) transformers
- Other

D.10. Right-of-Way Site Issues

Certain issues may cause difficulties in right-of-way acquisition. These issues need to be identified for the proposed parcels and a determination should be made as to their impact. Issues to consider include:

- Hazardous material exposure
- Railroad interests
- Special use properties (e.g., government use, alcohol sales, cemeteries, pet cemeteries, etc.)
- Beautification and signage
- Land use impacts
- Socioeconomic impacts
- Economic development/speculation
- Legal (lawyer) activity in area
- Title curative issues
- Federal properties
- Number of partial takings
- Splitting of parcels
- Cultural issues
- Other

E. LOCATION & GEOMETRY

E.1. Horizontal & Vertical Alignment

Due to the near permanent nature of roadway alignment once a transportation facility is constructed, it is important that the proper alignment be selected considering design speed, existing and future roadside development, subsurface conditions, topography, etc. Issues to consider include:

- Curve radius
- Super-elevation
- Crossover grades and profiles
- Sight distances and roadway contours
- Other

E.2. Control of Access

Maintaining access to specific portions of the highway is developed with the preliminary design. Furthermore, the preliminary design needs to address the concerns of controlled access limits to and from adjacent property. Simultaneously, right-of-way personnel can look into access deeds and restrictions required for the proposed design. Issues to consider include:

- Entrance/exit locations and length
- Access deed restrictions
- Safety access and turnarounds
- Special required lanes:
 - Bike and pedestrian lanes
 - High Occupancy Vehicle (HOV)/High Occupancy Toll (HOT) lanes
 - Truck-only lanes
 - Crossover lanes
- Frontage road requirements
- Controlled access systems
- Split-parcel access requirements
- Driveway access requirements
- Other

E.3. Schematic Layouts

The submission of schematic layouts should include basic information necessary for the proper review and evaluation of the proposed improvement. The schematic is essential for use in public meetings and coordinating design features. Issues to consider include:

- General project information (e.g., boundary limits, speed, classification)
- Location of interchanges, main lanes, frontages, ramps
- Signing schematic
- Profiles and alignments
- Added capacity analysis
- Tentative right-of-way limits
- Geometrics
- Location of retaining and noise abatement walls
- Projected traffic volumes

- Control of access lines
- Interstate access justification
- Median location and width
- Auxiliary lanes
- Existing structures and removal of improvements
- Other

TxDOT Requirements:

- Schematics must be approved by the Federal Highway Administration (FHWA) if involving Federal funding.*

E.4. Cross-Sectional Elements

Typical highway cross-sections are an important design element related to cost and schedule of the proposed project. The width of the right-of-way will be controlled by the proposed design. Examination of the typical cross-section will indicate those elements of design affecting the width of proposed right-of-way and utility adjustments among other factors. Issues to consider include:

- Pavement cross slopes
- Number and width of lanes
- Width of median
- Width of shoulder
- Cross drainage structures
- Horizontal clearances to obstructions
- Extent of side slopes and ditches
- Extent of berm area
- Frontage roads and ramp radii
- Sidewalks and pedestrian elements
- Noise abatement walls
- Other

F. STRUCTURES

F.1. Bridge Structure Elements

Bridge requirements along the extent of right-of-way for a project are often necessary. As a result, right-of-way requirements must take into account the impacts of bridge design on the affected corridor. Foundations and clearance requirements should be addressed along with the following:

- Bridge structure locations
- Safety tolerances:
 - Maximum height clearances
 - Maximum loads and capacities
 - Other
- Clear roadway width
- Utilities attached to bridge structures
- Turnarounds
- Access requirements

- Maintenance of right-of-way
- Retaining walls and abutments
- Vertical and horizontal alignment
- Other

F.2. Hydraulic Structures

In analyzing or designing drainage facilities, the investment of time, expense, concentration, and completeness should be influenced by the relative importance of the facility. Some of the basic components inherent in the design or analysis of any highway drainage facility include data, surveys of existing characteristics, estimates of future characteristics, engineering design criteria, discharge estimates, structure requirements and constraints, and receiving facilities. Issues to consider include:

- Open channels and outfall structures:
 - Right-of-way impact
 - Environmental impact
- Storm drain systems
- Culverts
- Irrigation controls
- Street cleaning requirements
- Special required easements
- Other

F.3. Miscellaneous Design Elements

In addition to typical roadway design elements, the following features may require design consideration and the acquisition of additional right-of-way. These items should be identified and listed. Items may include:

- Longitudinal barriers
- Fencing
- Noise abatement walls
- Historical markers
- Rest areas and stops
- Extended shoulders for service
- Truck weigh stations
- Hazardous material traps
- Pedestrian separations and ramps
- Parking
- Traffic control operations
- Signage, delineation, roadway markings
- Emergency median openings and widths
- Runaway vehicle lanes
- Truck and bus facilities
- Other

G. DESIGN PARAMETERS

G.1. Provisional Maintenance Requirements

Everything constructed or placed in the highway right-of-way must be maintained. This would include items such as roadway structures, drainage structures, traffic control devices, vegetation, and other highway related items. The roadway alignment and cross-sections should provide accommodation for maintenance equipment off the paved areas to service these items when necessary. Placement of utilities should be considered in terms of impact on maintenance. To the extent practical, utilization of desirable design criteria recommended regarding maximum roadway side-slope ratios and ditch profile grades will reduce maintenance and make required maintenance operation easier to accomplish. Items to consider include:

- Extent of berm areas
- Elevated and subsurface roadways
- Route accessibility
- Route detour options
- Retaining walls
- Technology support structures
- Access gates or ramps
- Surfaces finishes (paint, hot-dip galvanized, etc.)
- Types of vegetation
- Other

G.2. Constructability

Constructability is the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives. Maximum benefits occur when people with construction knowledge and experience become involved at the very beginning of a project. A structured approach for constructability analysis should be in place. Provisions should be made to provide this on an ongoing basis. This would include examining design options and details of construction that minimize construction costs while maintaining standards of safety, quality, and schedule. Elements of constructability during advance planning include:

- Constructability program in existence
- Construction knowledge/experience used in project planning
- Early construction involvement in contracting strategy development
- Developing a construction-sensitive project schedule
- Developing site layouts for efficient construction
- Early identification of project team participants for constructability analysis
- Construction easements for right-of-way planning
- Usage of advanced information technologies
- Other

H. INSTALLED EQUIPMENT

H.1. Equipment List

Project-specific installed equipment should be defined and listed. Items may include:

- Electronic signage
- Highway traffic signals
- Temporary traffic control zone devices
- Traffic control devices:
 - Low-volume roads
 - For school areas
 - Highway-rail or transit grade crossings
 - Bicycles
 - Highway-light rail transit grade crossings
- Intelligent transportation systems devices:
 - Cameras
 - Loop detectors
 - Sensors
 - Monitors
- Rest area requirements
- Toll equipment
- Other

H.2. Equipment Location Drawings

Equipment location/arrangement preliminary drawings identify the location of each item of installed equipment in a project. Issues to consider include:

- Location, including coordinates
- Coordination of location among all equipment
- Setbacks
- Traffic interface
- Elevation views of equipment, if possible
- Visibility of equipment
- Structural or foundation requirements for equipment
- Other

H.3. Equipment Utility Requirements

This evaluation should consist of a tabulated list of utility requirements for all major installed equipment items, including:

- Power:
 - Hard line
 - Solar
- Water
- Sewage
- Communications
- Fuel
- Other

SECTION III—EXECUTION APPROACH

I. ACQUISITION STRATEGY

I.1. Long-Lead Parcel & Utility Adjustment Identification

Right-of-way acquisition and utility adjustment are always on the critical path of a highway project if they are one of the tasks required. It is important to identify and focus on all parcels, but especially those that might cause delay (as identified in element D.10.). A strategy must be developed to address these problematic parcels and/or utility adjustments. Issues to consider include:

- Prioritization of parcels for acquisition and utilities for adjustment
- Defining responsible party for parcel acquisition and utility adjustment
- Appraisal performance
- Title commitment review
- Relocation of displacees
- Abatement and removal of improvements
- Other

I.2. Long-Lead/Critical Equipment & Materials Identification

Installed equipment and material items with long lead times may impact the design and construction schedule. These items should be identified and tracked. A strategy should be developed to expedite these items if possible. Examples may include:

- Toll equipment
- Electronic information boards
- Bridge structural components
- Pre-cast elements
- Other

I.3. Local Public Agencies Utilities Contracts & Agreements

Contractual agreements with Local Public Agencies (LPA) participants may be required. The execution of contractual agreements establishes responsibilities for the acquisition of right-of-way, adjustment of utilities and cost sharing between the LPA(s) and the Department of Transportation (DOT). The type of contract to be used is determined by whether the LPA desires to administer right-of-way activities and payments or defer those responsibilities to the DOT. Issues to consider include:

- Cost participation and work responsibilities between the DOT and LPAs
- Prerequisites to secure right-of-way project release on non-federal-aid projects
- Request for determination of eligibility
- Other

TxDOT Requirements:

- ROW-RM-37, Contractual Agreement for Right of Way Procurement*
- ROW-RM-129, Agreement to Contribute Funds*

I.4. Utility Agreement & Joint-Use Contracts

Prioritizing utility agreements may be essential to insure that the concurrent review and approval processes are coordinated and efficient. The utility agreements and joint-use contracts effectively enable the utility to share space on public right-of-way and complete utility adjustments. Issues to consider include:

- Utility agreements, plans, and estimates
- Supporting documentation
- Transmittal memo from district to division
- Other

TxDOT Requirements:

- Form ROW-U-1A, ROW-U-1B, or ROW-U-1C, appropriate property interest document*
- Form ROW-U-48, statement covering contract work*
- Form ROW-U-JUAA, Joint-use acknowledgement*
- Form ROW-U-40, signature authority*
- District and division approval processes*

I.5. Project Delivery Method & Contracting Strategies

The methods of project design and construction delivery, including fee structure should be identified. Types of project delivery methods and contract strategies to consider include:

- Owner self-performed
- Comprehensive development agreement (CDA) concession
- Designer and constructor qualification selection process
- Selected methods (e.g., design/build, construction management (CM) at risk, competitive sealed proposal, bridging, design-bid-build)
- Fee arrangement (e.g., lump sum, cost-plus, negotiated)
- Design/build scope package considerations
- Other

I.6. Design/Construction Plan & Approach

This is a documented plan identifying the specific approach to be used in designing and constructing the project. It should include items such as:

- Responsibility matrix
- Subcontracting strategy
- Work week plan/schedule
- Organizational structure
- Work Breakdown Structure (WBS)
- Sequencing with parcel acquisition
- Construction sequencing of events

- Site logistics plan
- Safety requirements/program
- Identification of critical activities that have potential impact on facilities (i.e., existing facilities, traffic flows, utility shut downs and tie-ins)
- Quality assurance/quality control (QA/QC) plan
- Design and approvals sequencing of events
- Integration of design, right-of-way acquisition, utility adjustment, and construction
- Equipment procurement and staging
- Contractor meeting/ reporting schedule
- Partnering or strategic alliances
- Alternative dispute resolution
- Furnishings, equipment, and built-ins responsibility
- Other

I.7. Procurement Procedures & Plans

Procurement procedures and plans include specific guidelines, special requirements, or methodologies for accomplishing the purchasing, expediting, and delivery of equipment and materials required for the project. Issues to consider include:

- The party performing procurement
- Listing of approved vendors, if applicable
- Client or contractor purchase orders
- Reimbursement terms and conditions
- Guidelines for supplier alliances, single source, or competitive bids
- Guidelines for engineering/construction contracts
- Responsibility for owner-purchased items, including:
 - Financial
 - Shop inspection
 - Expediting
- Tax strategy, including:
 - Depreciation capture
 - Local sales and use tax treatment
 - Investment tax credits
- Definition of source inspection requirements and responsibilities
- Definition of traffic/insurance responsibilities
- Definition of procurement status reporting requirements
- Additional/special owner accounting requirements
- Definition of spare parts requirements
- Local regulations (e.g., tax restrictions, tax advantages)
- Incentive/penalty strategy for contracts
- Storage
- Operating manual requirements and training
- Restricted distribution of construction documents for security and anti-terrorism reasons
- Other

I.8. Appraisal Requirements

Acquisition cannot begin until a formal right-of-way release is obtained. An early step in acquisition is to determine the value of parcels for reimbursement. Ensuring appraisal occurs in a timely manner is essential. Appraisal requirements include:

- Pre-appraisal contacts
- Determination of number of appraisers required
- Determination of appraisal assignments
- Use of contract appraisers
- Prioritization of parcel appraisals, if required
- Other

I.9. Advance Acquisition Requirements

Advance acquisition is defined as right-of-way acquisition that occurs before normal release for acquiring right-of-way is given on a transportation project. Advance acquisition requirements need to be identified and addressed as soon as possible in the project. Although this process bypasses detailed environmental scoping, consideration for environmental effects should be made in determining parcels for advance acquisition. Examples of advance acquisition include the following:

- Hardship acquisition of a parcel at the property owner's request
- Protective buying to prevent imminent parcel development that would materially increase right-of-way costs
- Donation of land for right-of-way purposes for no consideration
- Other

J. DELIVERABLES

J.1. CADD/Model Requirements

Computer Aided Drafting and Design (CADD) requirements should be defined. Evaluation criteria should include:

- Application software preference (e.g., 2D or 3D CADD, application service provider (ASP)), including licensing requirements
- Geographical Information System (GIS) requirements
- Configuration and administration of servers and systems documentation defined
- Compatibility requirements of information systems (e.g. design information system, construction information system)
- Owner/contractor standard symbols, file formats and details
- Handling of life cycle facility data including asset information, models, and electronic documents
- Information technology infrastructure to support electronic modeling systems, including uninterruptible power systems (UPS) and disaster recovery
- Security and auditing requirements defined
- Physical model requirements

- Other

TxDOT Requirements:

- Use of Microstation in design*
- Use of Statewide TxDOT Computer-Aided Drawing (CAD) Standard Plan Files (e.g., Bridge, Maintenance, Roadway, Traffic Standards)*
- TxDOT Geopak Data Files*

J.2. Documentation/Deliverables

The following items should be included in a list of deliverables:

- Field surveying books
- Estimates
- Required submissions and/or approvals
- Drawings
- Project correspondence
- Permits
- Project data books (quantity, format, contents, and completion date)
- Equipment folders (quantity, format, contents, and completion date)
- Design calculations (quantity, format, contents, and completion date)
- Procuring documents
- As-built documents
- Quality assurance documents
- Updated information systems and databases
- Other

TxDOT Requirements:

- Updated Design and Construction Information System (DCIS)*
- Updated Financial Information Management Systems (FIMS)*
- Updated Right of Way Information System (ROWIS)*
- PS&E Submission:*
 - PS&E Submission Data Sheet*
 - Supporting Papers Checklists (e.g. ROW and utilities certificates, review plans prints, contract time determination summary)*
 - PS&E Checklists (pre-submission checklist and PS&E checklist for either district review projects or division review projects)*

K. PROJECT CONTROL

K.1. Right-of-Way & Utilities Cost Estimates

The cost estimates will be prepared by the utility and submitted in support of the utility agreement and plans required for the proposed work. An agreement assembly should include estimates covering only the work for clearing transportation project construction. Right-of-way costs are defined as those instances where there is an interest in land acquired. Replacement right-of-way may be defined as the land and interests in land acquired outside existing highway

right-of-way for or by the utility. Right-of-way costs incurred by a utility before issuance of the right-of-way project release may not be eligible for reimbursement. Right-of-way costs incurred after release may be reimbursed, if otherwise found eligible. Issues to consider include:

- Cost of right-of-way
- Cost of utility adjustment
- Salaries and expenses of utility employees engaged in the valuation and negotiation
- Amounts paid to independent fee appraisers for appraisal of the right-of-way
- Recording costs
- Deed fees
- Costs normally paid that are incidental to land acquisition
- Payment of property damages and losses to improvements
- Other

K.2. Design & Construction Cost Estimates

The project cost estimates should address all costs (excluding right-of-way acquisition and utility adjustment costs that are addressed in element K.1.) necessary for completion of the project. These cost estimates may include the following:

- Construction contract estimate
- Professional fees
- Administrative costs
- Contingencies
- Cost escalation for elements outside the project cost estimates
- Startup costs including installation
- Capitalized overhead
- Safety items
- Site-specific insurance requirements
- Incentives
- Miscellaneous expenses including but not limited to:
 - Specialty consultants
 - Inspection and testing services
 - Bidding costs
 - Site clearance
 - Environmental impact mitigation measures
 - Local authority permit fees
 - Sureties
- Taxes:
 - Depreciation schedule
 - Capitalized/expensed
 - Tax incentives
 - Contractors' sales tax
- Utility costs during construction (if paid by owner)
- Interest on borrowed funds (cost of money)
- Site surveys, soils tests
- Availability of construction laydown and storage at site or in remote or rented facilities
- Other

K.3. Project Cost Control

Procedures for controlling project cost need to be outlined and responsibility assigned. These may include cost control requirements such as:

- Financial (client/regulatory)
- Phasing or area sub-accounting
- Capital versus non-capital expenditures
- Report requirements
- Payment schedules and procedures
- Cash flow projections/draw down analysis
- Cost code scheme/strategy
- Costs for each project phase
- Periodic control check estimates
- Change order management procedure, including scope control and interface with information systems
- Costs pertaining to right-of-way acquisition and utility adjustment during project execution
- Other

K.4. Project Schedule Control

The project schedule is created to show progress and ensure that the project is completed on time. The schedule is necessary for design and construction of the facility. A schedule format should be decided on at the beginning of the project. Typical items included in a project schedule are listed below:

- Milestones
- Required submissions and/or approvals
- Required documentation/responsible party
- Baseline schedule versus progress-to-date schedule
- Critical path activities, including field surveys
- Contingency or “float time”
- Permitting or regulatory approvals
- Activation and commissioning
- Liquidated damages/incentives
- Unusual schedule considerations
- The owner must also identify how special project issues will be scheduled. These items may include:
 - Selection, procurement, and installation of equipment
 - Stages of the project that must be handled differently than the rest of the project
 - Tie-ins, service interruptions, and road closures
- Other

K.5. Project Quality Assurance & Control

Quality assurance and quality control procedures need to be established. Responsibility for approvals needs to be developed. Electronic media requirements should be outlined. These issues may include:

- Administration of contracted professional services
- Responsibility during design and construction
- Testing of materials and workmanship
- Quality management system requirements (e.g. ISO 9000)
- Environmental quality control
- Submittals
- Inspection reporting requirements
- Progress photos
- Reviewing changes and modifications
- Communication documents (e.g., Requests for Information, Requests for Qualifications)
- Lessons-learned feedback
- Other

U.S. Requirements:

- Environmental quality control as outlined in U. S. National Environmental Policy Act (NEPA)*

TxDOT Requirements:

- Administration of contracted Right of Way Acquisition Professional Services (ROWAPS)*

K.6. Safety Procedures

Safety procedures and responsibilities must be identified for design consideration and construction. Safety issues to be addressed may include:

- Staging area for material handling
- Environmental safety procedures, including hazardous material handling
- Right-of-way needs for safe construction
- Right-of-way requirements for design safety
- Safety in utility adjustment
- Interaction with the public
- Working at elevations/fall hazards
- Evacuation plans and procedures
- Drug testing
- First aid stations
- Accident reporting and investigation
- Pre-task planning
- Safety for motorists
- Safety orientation and planning
- Safety incentives
- Contractor requirements
- Other special or unusual safety issues

L. PROJECT EXECUTION PLAN

L.1. Environmental Commitments & Mitigation

Environmental commitments determine what a project's involved parties can and cannot do to protect the environment. Environmental commitments begin at the earliest phase of project development, although completion of commitments may not occur until the operation and maintenance phase of a project. Because there is a substantial time gap between the beginning and end of a commitment, it is imperative that commitments are communicated from environmental clearance through detailed design, pre-bid conference, project letting, maintenance, and operation. Issues to consider include:

- Avoidance commitments
- Compensation commitments
- Enhancements commitments
- Minimization commitments
- Habitat mitigation
- Water quality facilities management
- Wetland mitigation
- Storm water management plans
- Cultural resources mitigation
- Noise abatement remediation
- Hazardous materials abatement locations
- Environmental remediation plans
- Other

L.2. Interagency Coordination

Early coordination with appropriate resource agencies, local governmental entities, and the public plays a vital role in project planning and environmental development of proposed projects. Both the districts and divisions are responsible for interagency coordination during project planning and development. Coordination is initiated at the regional and statewide levels. Coordination agencies to consider may include:

- State historic preservation offices
- Natural resource conservation services
- Environmental protection agencies
- Fish and wildlife services
- International boundary and water commissions
- Federal emergency management agencies
- Offices of habitat conservation
- Law enforcement agencies
- Immigration agencies
- Parks and wildlife agencies
- Other

U.S. & TxDOT-Related Agency Coordination:

- Metropolitan Planning Organization (MPO)*
- Texas Commission on Environmental Quality (TCEQ)*

- Coastal Coordination Council (CCC)*
- Environmental Protection Agency (EPA)*
- Federal Emergency Management Agency (FEMA)*

L.3. Local Public Agency Contractual Agreements

To establish acquisition and funding responsibilities and requirements of the Department of Transportation (DOT) and a Local Public Agency (LPA), an agreement must be entered into before a project is released for right-of-way acquisition. Issues to consider include:

- Master agreement governing local transportation project advance funding agreements
- Reimbursement to the LPA for negotiated parcels
- Local project advance funding agreement
- Other

TxDOT Requirements:

- Master Advance Funding Agreement (MAFA)*
- Local Public Agency Funding Agreement (LPFA)*

L.4. Interagency Joint-Use Agreements

There are various agencies, districts, and commercial interests that the Department of Transportation must execute agreements with in order to jointly use certain right-of-ways or for utility adjustments. Joint-use agreements may include:

- Railroad agencies
- Flood control district
- Utility companies
- Municipal utility districts (MUDs)
- Roadway utility districts (RUDs)
- Other

U.S. joint-use agreements may include:

- Corps of Engineers*

L.5. Preliminary Traffic Control Plan

Traffic control plans should clearly show provisions for safe and efficient operation of all modes of transportation during construction and safety of construction workers and inspection personnel. A preliminary traffic control plan that is compliant with the U. S. and state Department of Transportation Manual of Uniform Traffic Control Devices (MUTCD) should be developed. Issues to consider include:

- A detour plan
- Appropriate signs, markings, and barricades per the traffic control plan
- Safety equipment, such as:
 - Barrels
 - Signage
 - Flagmen

- Positive barriers
- Vertical panels
- Clear zone protection devices, such as:
 - Concrete traffic barriers
 - Metal beam guard fencing
 - Appropriate end treatments
 - Other appropriate warning devices
- Other

L.6. Substantial Completion Requirements

Substantial Completion (SC) is the point in time when the facilities are ready to be used for their intended purposes. Preliminary requirements for substantial completion need to be determined to assist the planning and design efforts. The following may need to be addressed:

- Specific requirements for SC responsibilities developed and documented
- Warranty, permitting, insurance, and tax implication considerations
- Commissioning
- Technology start-up support on-site, including information technology and systems
- Equipment/systems startup and testing
- Occupancy phasing
- Final code inspection
- Calibration
- Verification
- Documentation
- Training requirements for all systems
- Community acceptance
- Landscape requirements
- Punchlist completion plan and schedule
- Substantial completion certificate
- Other

Appendix D. Facilitation Instructions

From observation, an external facilitator (a person who is not directly involved with the project), has proven to be an essential ingredient in ensuring that the APRA assessment session is effective. The facilitator can be a person from internal to the organization, or an outside consultant, be he/she should be experienced in advance planning of the type of project under consideration and also should have excellent facilitation skills. The following issues should be addressed by the facilitator for to prepare for and conduct the APRA assessment.

Pre-meeting Activities

The facilitator should establish a meeting with the Project Manager/Engineer to receive a briefing on the nature and purpose of the project to be evaluated. The objective of this meeting is to learn enough about the project to ask intelligent/probing questions of the project team members while conducting the session. Many times, the “open ended” discussions concerning key elements provides the most value when conducting an APRA assessment. Therefore, it is the responsibility of the facilitator to ask the types of questions that will result in an open discussion. Gaining some insight prior to the assessment helps in this regard.

This meeting also serves as a good time to preview the APRA elements to see if some of them do not apply to the project at hand. This is especially true for small and renovation projects. In some cases, it is obvious that some of the elements do not apply and these can be removed in advance to save the team time in the assessment.

The facilitator should inform the Project Manager that this is her/his opportunity to *listen* to the team members to see how well they understand the scope of work. The project manager should work with the facilitator to probe the project team to ensure clear two-way understanding of scope requirements and expectations. If the project manager dominates the discussion, and subsequent scoring, the rest of the design team will quickly “clam up” and fall in line. This will result in an APRA assessment that reflects the understanding of the project manager, not the team members.

The facilitator should remind the project manager that the APRA assessment session is an opportunity to team build and align the team members on the critical requirements for the project. Experience has shown that serving food (perhaps lunch or breakfast) can help to increase participation as well as interaction between team members.

The facilitator and project manager should discuss the key stakeholders who should attend the session. Ensure that all key stakeholders are in attendance. Reducing the number of attendees will make the session go more efficiently, but this may compromise the true value of the APRA assessment. Work with the project manager to send out meeting notices in time for the major stakeholders to be able to attend.

Logistics

The facilitator should ensure that the facilities are large enough to accommodate the key project stakeholders in comfort. One method of assessment is to utilize a computer projector to keep score as assessment progresses. Therefore, a room with a screen, computer, and projector is a plus. The APRA can be conducted manually as well. When conducting manually, each participant will require a copy of the score sheet and Element Definitions so they can follow along.

An assessment session takes approximately 2 to 4 hours per project. An inexperienced team, or a very complex project, may well take the full four hours. As teams within an organization get accustomed to the APRA sessions, the time will drop to around two hours. However, it is the discussion occurring during the assessment session that is perhaps its most important benefit. Do not allow an artificial time limit to restrain the open communications between team members.

The session can be conducted over an extended lunch period. In this situation, it is best to start with a short lunch period as an ice breaker, then conduct the session. The facilitator should ensure that the room is set up in advance.

- Make sure the computer, projector, and programs are functioning.
- Set up the notes and Action Items pages
- Make sure all participants have the proper handouts
- When using the automated APRA Scoring Program, make sure the operator is skilled. Lack of computer skills and preparation can lead to ineffectiveness.
- Ensure the programs are loaded and working prior to the session.
- Identify a scribe to capture actions on a flip chart as the session progresses.

Participants

Suggested attendees of the assessment session may include:

- District engineer
- Transportation planning and development director
- District design engineer
- Area engineer
- Construction engineer
- Maintenance engineer
- Environmental coordinator
- Traffic engineer
- Right-of-way administrator

- Utility coordinator
- Contractors if possible.

It is important that all assessment session participants come prepared to actively engage in the assessment. Typically this can be facilitated by sending the APRA assessment sheets and element descriptions out ahead of time with a pre-reading assignment. Expectations of participants include:

- All should be prepared to discuss their understanding and concerns of the elements that apply to them.
- Design/engineering should be prepared to explain what they are doing in regards to each APRA element.
- The district engineer should voice expectations/requirements, and question the design team to ensure understanding.
- Roles and responsibilities during the assessment session should include:
 - The project manager should assist the facilitator to probe the team members for answers and insight.
 - The facilitator will ensure that everyone has an opportunity to voice their opinions and concerns.

Conducting the Session

- Facilitator should provide the team members with a short overview of the APRA.
- The facilitator or project manager should define the purpose of the assessment session.
- The project manager should give a quick update of the project and its status, including progress supporting the estimates and plans.
- The facilitator should explain the scoring mechanism (definition levels 0, 1, 2, 3, 4, and 5), and explain that the evaluation is not a democratic exercise; rather it is a consensus activity.
- The facilitator should explain that certain elements may apply more to certain team members or stakeholders. Make sure that these key stakeholders have the greatest say in deciding on level of definition.
- The facilitator should keep the session moving and not allowing the participants to “bog down.” Many times the participants want to “solve the problem” during the assessment session. Do not allow this to happen. Remember, the session is to perform a detailed assessment only, and actions can be performed later.

- The facilitator should always challenge assumptions and continue to ask the question, “is the material in writing?”

Assessment Session Objectives

1. Capture the degree of definition for each element.
2. Capture significant comments from open discussions.
3. Capture Action Items, assign responsibility and due dates (either at the end of the session, or shortly thereafter).
4. Ensure that the team understands the notes captured and agrees with the path forward.
5. Create alignment among the session attendees.

Roles and Responsibilities/Expectations

- Post session activities: The facilitator should ensure that the APRA notes, action items, and score card are published within 48 hours of the sessions. The ideal target is 24 hours.
- The facilitator should stay engaged with the team if possible to ensure that all Action Items are completed as required to support the scope definition process.
- The project manager should ensure that the actions are addressed.

Small Project Considerations

- Small or renovation projects may have several elements that do not apply.
- As previously mentioned, the facilitator and project manager can meet ahead of time to identify some of these elements.
- Assigning a zero to a significant number of APRA elements can greatly affect the score. It is best to use the normalized score in this case. In this case, less significant elements can have a more significant impact on the overall score. Be careful in interpretation of this score.

Appendix E. Example Action List

Project title/date:						
(Sorted in order of APRA element)						
Item #	APRA Element(s)	Level of Definition	APRA Element Score	Item Description	Date Completed	Responsible
1	A1	1	1	Need & purpose document to be sent to team	August 15, 200x	Bill Campbell
2	A5	4	18	Public hearings are to be organized	Ongoing	John Smith
3	F2	2	5	Environmental impact of the open channel system to be double checked	Ongoing	Jennifer Thomas