

## INTRODUCTION

The Florida Department of Transportation District 4 Office is continually seeking improvements in their policies and procedures utilized to deliver quality transportation projects to its stakeholders. The following document addresses procedures to be utilized within the District for the purpose of providing the necessary guidance, consistency and quality in the establishment of stormwater management facilities for transportation ponds. The Florida Department of Transportation currently provides guidance for the selection of locations for stormwater management facilities. This guidance is outlined in the Department's "Stormwater Management Facility Handbook, dated January 1999 as published by the Department's Office of Design, Drainage Section in Tallahassee and as from time to time is updated. Although the current published guidelines represent a fairly comprehensive overview of the process, District 4 wanted to develop a more refined and detailed process that deals with the logistical and coordination challenges associated with what is known as "The Pond Siting Process".

"Pond Siting" consists of the methods and procedures utilized by the Florida Department of Transportation to document and justify the selection of a specific site for the construction of stormwater management facilities. The documentation produced by the pond siting procedures is utilized for the justification of any necessary right-of-way acquisition associated with meeting the stormwater management requirements of a proposed roadway project. This justification is required to satisfy the public necessity requirement in an eminent domain lawsuit.

The Pond Siting process in District 4 has traditionally been left to the responsibility of the District Drainage Office for coordination and oversight. This has lead to coordination issues and logistical problems in the past. From August 18<sup>th</sup> to 22<sup>nd</sup>, 2003 District 4 initiated a Value Engineering Study of the existing pond siting process to identify potential improvements. These procedures and the process outlined in this document incorporate several of the concepts outlined during the Value Engineering Study. In addition several enhancements have been included to provide in-depth guidance in addressing stormwater management facilities.

## GENERAL DRAINAGE DESIGN PROCESS OVERVIEW

The development of stormwater management facilities for a transportation project involves a significant amount of information, as well as extensive coordination among various individuals and agencies. Most major transportation projects are developed through the Project Development & Environment (PD&E) Study process. This process is utilized by the Florida Department of Transportation to document that proposed improvements to an existing corridor or the establishment of a new corridor is in compliance with the National Environmental Policy Act of 1969 as amended. The PD&E Study process incorporates the development of various alternatives for the proposed roadway improvements. As part of the development of these roadway alternatives various stormwater management schemes are considered. Some of these schemes include the following:

- ❑ **Exfiltration Trenches:** This type of system consists of a piped drainage system with sections of perforated pipe surrounded by a rock filled trench wrapped in filter fabric. Stormwater is typically exfiltrated into the ground through the porous stones utilizing the head differential between the water level in the trench and the ground water table. Stormwater storage capacity is attained within the trench voids and typically contained through the use of weirs in the trench system prior to the discharge point. Use of this type of system is typically seen in an urban environment, with soils containing a high hydraulic conductivity. This system does not typically require right-of-way acquisition for the construction of the stormwater management facilities. **Note: This type of system requires high maintenance and poses long-term functionality concerns.**

- ❑ **Swale systems:** This type of system consists of a series of swales sometimes referred to as linear ponds for the storage of stormwater. Two types of swale systems are typically utilized, dry retention and dry detention. These systems typically do not require additional right-of-way acquisition with their associated stormwater facilities being contained within the road right-of-way template. **Note: This type of system poses moderate maintenance concerns with mowing and standing water.**
- ❑ **Adjacent Property Stormwater Management Systems:** On several occasions proposed or existing residential subdivisions or commercial properties have been designed to accommodate adjacent roadway drainage into their respective stormwater management systems. This typically occurs as part of the municipal or county development process. These types of requirements are sometimes imposed and documented in the adjacent property's "Development Order" as mandated by the respective municipality or county issuing the permits for construction of the respective development. When this situation occurs the need for additional right-of-way for the roadway stormwater management system is typically reduced. However, storage and flowage easements may be required. If this has not been required by the County or Municipality in some instances the Department has been able to negotiate this with the developer of the adjacent property. **Note: This type of system poses low maintenance concerns, since maintenance is typically handled through maintenance agreements with the property owner assuming the maintenance responsibilities. The agreements however, must include language that if the property owner is not maintaining the facilities the Department has the legal right to enter onto their property, correct the situation and back charge the property owner.**
- ❑ **Isolated Stormwater Pond Systems (Positive Systems):** When additional right-of-way is necessary to accommodate the stormwater management requirements of a project; isolated ponds are required. These ponds can be constructed as either wet retention systems or wet detention ponds. Each system type has its advantages and disadvantages which can result in large right-of-way needs depending on the project parameters. These types of systems typically possess an outfall which allows for the control of the size of the right-of-way required for the pond. In addition to wet ponds this system can also be utilized as a dry pond similar to the swale system mentioned above. The key issue with the use of a dry system is to have adequate hydraulic conductivity of the soil and proper separation between the pond bottom and the seasonal high ground water table. **Note: This type of system poses a lower maintenance concern with the use of the wet ponds.**
- ❑ **Isolated Stormwater Pond Systems (Closed Basin Systems):** This type of system is similar to the positive system in the fact that right-of-way is required outside the roadway typical section. Thus additional right-of-way is required for the construction of isolated ponds. The only exception with this system is that the respective pond is located within a drainage basin that does not have a positive outfall (Landlocked areas). These types of systems typically are required to contain larger storm events and thus require more right-of-way to meet the needs of the project. **Note: This type of system poses a lower maintenance concern with the use of the wet ponds.**

Once it has been determined that the acquisition of right-of-way may be required to accommodate the proposed stormwater management facilities the process known as "Pond Siting" will commence. This process consists of a multi-discipline effort which supports the justification of the need to acquire right-of-way to meet the stormwater management needs of the project and the location thereof. The overall responsibility of the activities associated with the pond siting process lies with the PD&E Project Manager. It is his or her responsibility to coordinate the efforts of each of the disciplines associated with the pond siting process. Once the PD&E Study is completed and Initial Engineering commences the responsibility for Pond Siting shifts to the Roadway Project Manager.

This procedure will outline the activities associated with the pond siting process during the PD&E study and the creation of the initial pond siting report. Given the fact that sometimes there is a delay between the completion of the PD&E study and final design plans development, it may be necessary to re-evaluate the findings of the initial pond siting report. The oversight responsibilities of this re-evaluation will be that of the Roadway Project

Manager. It will also be his or her responsibility to oversee the ultimate coordination with the various individuals in delivering the final right-of-way requirements to the FDOT R/W office.

## POND SITING TEAM

In order to develop a more efficient and effective pond siting report a multi-disciplinary team is established during the PD&E process. This team is initially led by the PD&E Project Manager, who will be responsible to secure adequate participation and information from the members of the report team. The team's composition identified below provides broad based input to develop the most appropriate use of the right-of-way to be acquired for the pond site with the least environmental impact while being cost-effective. ***Note: Once the PD&E Study is completed the leadership (Project Management) responsibilities will change to the Design Project Manager. At this point the PD&E Project Manager's role will be minimized.***

It is the responsibility of the PD&E Project Manager to develop the Pond Siting team using the PD&E Consultant. The team will consist of individuals from various FDOT departments and Consultant Classifications, which are assigned. The following team members must be included in the decisions during the pond siting process:

- ❑ ***PD&E / Design Project Manager:*** Overall Project Management and coordination of the development of the pond siting report. He or she is responsible for considering all pertinent information provided by the various team members necessary for the final production and coordination of the pond siting report while maintaining consistency within the team. During the PD&E phase the PD&E Project Manager insures proper coordination for potential pond sites and documentation of the process. During the design Phase the Design Project Manager takes charge of the overall pond siting process and insures the coordination between all disciplines/area including right-of-way.
- ❑ ***Roadway Engineer (Roadway Design) / PD&E Design Liaison:*** This individual will be responsible for providing information pertaining to the various roadway alignments, typical sections and associated roadway design elements.
- ❑ ***Drainage Engineer (Drainage Office) / PD&E Drainage Liaison:*** This individual will be responsible for quantifying the drainage needs (Conceptual and Final) for the project, developing the initial pond sites to be considered by the team, identifying permitting requirements and implications and producing the actual pond siting report.
- ❑ ***Environmental Scientist (PL/EM Office):*** This individual will be responsible for identifying and evaluating impacts as identified in the National Environmental Policy Act of 1969 (NEPA) and associated amendments for compliance with NEPA guidelines. This individual will assist the Drainage Engineer in the identification of permitting requirements for the study alternatives. This individual will ensure that all Pond Siting activities are properly addressed in the required NEPA documents.
- ❑ ***Right-of-Way Appraiser / Land Planner (R/W Office):*** This individual will provide input on alternate pond sites based on land impact estimates as they relate to the acquisition. This individual will also be responsible for the production and review of the Right-of-way cost estimate report.
- ❑ ***Legal Counsel (District Legal Office):*** Legal Counsel from the District's legal office will be assigned as an advisor to the pond siting team to respond to legal issues affecting the decisions made during the development of the pond siting report. This individual will also provide a review and corresponding comments in reference to the pond siting report. This individual will have the added responsibility of reviewing any correspondence between property owners and FDOT or Consultant during the pond siting process.

- ❑ **Construction Engineer (District Construction Office):** This individual will provide constructibility and cost input for the development of the various pond sites.
- ❑ **Maintenance Engineer (Area Maintenance Office):** This individual will be responsible for the identification of potential maintenance concerns. In addition he or she will review and define the associated maintenance costs as well as identify maintenance features desired for the specific sites.

## POND SITING PROCESS

The Pond Siting process outlined in these guidelines consists of a fourteen step process. The initial eleven steps are performed during the PD&E Study phase, while the remaining steps occur during initial engineering in the Design phase. The following section outlines these steps and includes guidance as to typical tasks and requirements associated with each of these steps. All meetings of the team shall be open to the public and advertised accordingly. Meeting notes shall be prepared documenting meeting discussions.

### ACTIVITIES DURING DEVELOPMENT OF THE PD&E STUDY

- |         |                                                                        |
|---------|------------------------------------------------------------------------|
| Step 1  | Collect Initial Data / Drainage Kick-off Meeting / Conceptual Analysis |
| Step 2  | Pond Siting Kick-off Meeting                                           |
| Step 3  | Evaluation of Conceptual Options                                       |
| Step 4  | Team Meeting to Screen Alternatives                                    |
| Step 5  | Detailed Evaluation of Alternatives                                    |
| Step 6  | Team Meeting to Summarize Impacts and Analysis                         |
| Step 7  | Draft Pond Siting Report                                               |
| Step 8  | Team Meeting to Make Final Recommendations                             |
| Step 9  | Complete Pond Siting Report                                            |
| Step 10 | Hand-off Meeting between PD&E and Design                               |

### INITIAL ENGINEERING PHASE

- |         |                                                       |
|---------|-------------------------------------------------------|
| Step 11 | Re-Evaluation of Final Pond Siting Recommendations    |
| Step 12 | Meeting to Update Alternatives and Recommendations    |
| Step 13 | Detailed Re-Evaluation of Pond Sites                  |
| Step 14 | Prepare Re-Evaluation of Sites and Seek FHWA Approval |

### Step 1      **Collect Initial Data / Drainage Kick-off Meeting / Conceptual Analysis**

The initial step associated with the process consists of preliminary data acquisition, establishment of design parameters and the development of some conceptual drainage solutions. This is done to provide the pond siting team with a basis to begin from.

#### ❑ Assembly of Preliminary Roadway Data

The development of the roadway alternatives associated with a PD&E study coupled with the initial data acquisition provides the basis for identification of the project drainage needs. The PD&E Roadway Design Engineer assigned to the PD&E Study will provide the following information to the Drainage Engineer:

- o Existing Roadway Plans
- o Existing & Proposed Typical Sections
- o Proposed Alternative Alignments
- o Proposed Project Profiles and Proposed Low Point Elevation (Line & Grade – 15%)

- o Available Topographic Data and Aerial Photography (Include Local Data Sources)
- o Land Use Data for Corridor / GIS Data Base (Includes Existing and Proposed Developments)
- o Tax Maps and Land Owner Information (Can be provided as part of Public Involvement Research)
- o Existing and Proposed R/W Maps
- o Copies of any previous studies
- o Existing Agreements (JPA's, Easements and or Maintenance Agreements, etc.)

☐ Hold Drainage / Permitting Kick-off Meeting with the District Drainage Office.

The PD&E Project Manager and Drainage Engineer shall meet with the District Drainage office to review the project scope, schedule, design criteria, special issues, identification of potential permit involvement, transfer of information in Drainage / Permit Offices possession (i.e. Prior Studies, Plans, Drainage Connection Permits, Drainage Inquiry Data Records, Permit Information, etc.). In addition the Pond Siting Process is to be reviewed and a Reviewer assigned from the Drainage Office.

☐ Develop Preliminary Drainage Report (Conceptual Only)

The Drainage Engineer begins his or her preliminary examination of the data and develops potential drainage concepts. This work can occur concurrent with the assembly of Preliminary roadway data task. However, the Drainage Engineer will ultimately need all the requested data before he/she can finish this preliminary report. Tasks associated with this effort include:

- o Establish Drainage Design Criteria (May include a Pre-Permit Application Meeting with Agencies). Criteria should include:
  - Permitting Criteria (Water Quality and Quantity as well as Discharge Limitations)
  - Rainfall Intensity for Critical Duration Events (Identify Design Storm Events)
  - Curve Numbers or Run-off Coefficients
  - Times of Concentration
  - Tailwater (Discharge Condition and stages) Criteria
- o Conduct a Review of Drainage Permit Files for Corridor and adjacent developments
- o **Determination of Drainage Basin Boundaries** - Use aerial contour maps, old construction plans, available surveys to identify the primary basins and general outfall locations. In addition identify high points on the profile to separate the primary basins. Field visits are needed for this determination.
- o Determination of Major Offsite Contributing Areas
- o Establishment of Floodplain Elevations and Potential for Encroachment
- o Identification of Outfall Locations (Verify if Closed Basin Criteria Applies)
- o Development of Generic Soils Information (Obtain from County Soil Conservation Survey or prior area geotechnical studies)
- o Establishment of Seasonal High Ground Water Elevations (SHGWT)
- o Water Quality / Water Quantity Design Estimates

☐ Identify Alternative Stormwater Management Options - (Consider Funding Available)

- o Existing Stormwater Management Facilities – Are these adequate to handle the proposed improvements (With or without modifications)?
- o Potential Exfiltration Trench Options
- o Dry Detention / Retention Systems
- o Wet Detention / Retention Systems

- ☐ Coordinate with R/W Office on Initial Pond Sites – The Drainage Engineer will coordinate with the R/W Office on some initial sites to take to the Kick-off meeting.
- ☐ Coordinate with local agencies for potential pond sites to be considered. In addition the Drainage Engineer shall discuss the area's stormwater management plan with the local agencies and how the potential ponds sites will impact or can be incorporated into the area plan.

## **Step 2            Pond Siting Kick-off Meeting**

The pond siting team is assembled by the PD&E Project Manager and a kick-off meeting is held. The team will consist of members from: Planning and Environmental Management, Roadway Design, Drainage, Survey, Right-of-Way, Maintenance, Construction, and other offices as deemed necessary. A representative from Legal will be on the team as an advisor only. By creating the team early on in the PD&E process, issues from every discipline will be identified at the start of the pond siting process. The intent of the pond siting team is to have alternatives evaluated with consideration to all potential aspects. This will allow for undesirable alternatives to be identified early on in the decision process so that they can be eliminated from further consideration, saving time and effort. (i.e. Fatal flaw analysis, etc.). During the Kick-off meeting the following issues need to be addressed:

- ☐ Verification of Pond Design Guidelines and Criteria (Includes District Preferences)
- ☐ Identify Potential Detention / Retention Pond Sites
  - o Assign Property ID No. to each Property to be considered. The R/W Office will provide these numbers.
- ☐ Identify Potential Joint Use Pond Sites (Public / Private)
- ☐ Assign Impact Analysis to Team Members

## **Step 3            Evaluation of Conceptual Options by the Individual Team Members**

This evaluation consists of a general review by the team to narrow down potential alternatives. This review will consist of the following:

- ☐ Identify Potential NEPA Impacts and Issues (By PL/EM Office or PD&E Consultant)
  - o Natural Resources - Threatened & Endangered Species and Wetlands
  - o Socio-cultural Resources (Historical and Archeological sites and 4f properties)
  - o Physical Impacts (Including Noise, Contamination, Air Quality, etc.)
- ☐ Identify Potential Relocations (By R/W Office).
- ☐ Identify Potential Development Issues (By R/W Office- Land Planner).
- ☐ Identify Potential Construction Issues (By Construction Office).
- ☐ Identify Potential Maintenance Issues (By Maintenance Office).
- ☐ Identify Potential R/W Requirements
  - o Computation of Area required. (By Drainage Office).
  - o Determination of Impacts to adjacent properties. (By R/W Office)
  - o Determination of Easement Needs (By R/W Office).
- ☐ Identify Potential R/W Costs and Damages (By R/W Office).
- ☐ Identify Potential Business Damages Issues (By R/W Office).
- ☐ Consider Other Social Impacts (Public Opinion) (By PL/EM and Drainage Office).

**Note: Issues to consider (By each member of the pond siting team) when evaluating right-of-way include:**

- o Utilize existing R/W whenever possible.
- o Avoid residential and commercial relocations, if possible.
- o Weigh the impacts of a partial R/W acquisition versus a whole acquisition of the property.
- o Minimize the number of parcels required for pond construction along the corridor.
- o Look at each pond location and how it sits on the site. Also consider the impacts to the remainder parcel and its viability for development. How will it function for its current or future use?
- o Utilize vacant land whenever possible and economical. Properties which are fully or partially developed significantly increase the cost of the acquisition particularly when business damages are considered. However, if the use of vacant land will still require partial property acquisition of developed land, this may weigh against the use of said partial vacant land and require the acquisition of the entire property. Land may be vacant because owner is having a hard time permitting proposed improvements. Need to establish why a property is vacant, or if the property owner has plans for its development.
- o Always consider the development potential of a property.
- o Look at access management issues and how the remainder site will operate. Also consider how maintenance will access the pond site.
- o Avoid land locking the property.
- o Avoid pond sites being directly located on State Road frontage, if possible.
- o Avoid public and historic facilities,
- o Adherence to avoidance and minimization of existing wetland systems and wildlife habitat. When placing ponds near wetlands check the potential draw down effects on the wetlands. The South Florida Water Management District (SFWMD) Basis of Review has guidance on how to estimate and address this issue.
- o Avoid placing ponds on or adjacent to contaminated sites. For example, there are various regulatory requirements to ensure proper separation between contaminated or hazardous waste sites to ensure the potentially polluted water does not leach into a projects drainage swales or ponds. If by some chance ponds must be located near a contaminated site, there are physical measures that can be considered to restrict such flow (Clay core, ditch liner, etc.).
- o Avoid Floodplain Impacts.
- o Minimize Utility Relocations and review requirements for utility access for maintenance purposes.
- o Identify if proposed pond sites are candidates for advanced acquisition. If so, the R/W Office must have an increased role and the advanced R/W process identified in the project schedule.

**Note: Maintenance Issues for Pond Sites include:**

- o Ponds shall provide a minimum 20-foot wide maintenance berm.
- o To compensate for grading irregularities, 1 foot of freeboard is required above the maximum design stage.
- o Ponds having slopes steeper than 1:4 shall have a fence to prevent unauthorized entry.

**Note: Fatal Flaw Screening Review – The following provides a quick checklist to narrow down alternatives:**

- o Exfiltration systems can be considered when hydraulic conductivity is greater than  $1.0 \times 10^{-5}$ .
- o For Dry Retention Systems ground water tables need to be low. The minimum distance from bottom of swale to the SHGWT is 2.0 for adequate cover (Verify this assumption with Geotechnical Engineer Recommendations).
- o Check Wellfield Protection Zone Cone of Influence and allowable treatment facilities within wellfield contours.
- o Review aerials for potentially available vacant land.

- o Review USGS Quadrangle Maps and Survey data for adequate slope to pond locations. Required piping system depths of 12 foot or deeper cuts are not recommended.
- o Conduct a Desktop Environmental Review of GIS Data sets to identify potential NEPA issues. In the event that the GIS data reveals the potential for impacts; Ground Truthing (Field Review to verify conditions) is required.
- o Review Land Use Data and Land Use plans for potential developments that may eliminate potential sites.
- o Avoid placement of either exfiltration trench or dry retention / detention swales adjacent to a contaminated plume. The idea is not to shift the plume through exfiltration or infiltration from the drainage system.

#### **Step 4            Team Meeting to Screen Alternatives**

In order to create more consistency in the development of a pond siting report, an evaluation matrix will be utilized for comparison of alternative pond sites. The use of evaluation matrices are widely accepted in the realm of PD&E studies to aid in documenting and evaluating alternatives. For the evaluation of stormwater management ponds several standardized factors (and the corresponding matrix format) need to be considered, such as reflected in the tables on pages 9 through 11 of this procedure:

Each pond siting team has the option of customizing the matrix reflected above to satisfy the particularities of their associated project site. If any of the standard factors above are eliminated, the team is to document the report to reflect why the factor is not relevant to the evaluation. This can be done within the matrix description area. If the team decides that one specific factor has a significant bearing on the project, they can decide to weight the factors accordingly with the appropriate documentation in the report. For consistency, the team should use a ranking for each factor with the weighting decided upon by the entire group.

- ☐ Conduct Qualitative Evaluation of All Alternatives.
- ☐ Prepare Qualitative Matrix Evaluation.
- ☐ Select a minimum of Three Alternatives per Basin for Further Evaluation.
- ☐ Assign refinement of Selected Alternatives to Drainage / Design Team Members.
- ☐ Provide Selected Alternatives to Team Members for Detailed Evaluation.
- ☐ Proceed to evaluate ponds for NEPA compliance and inclusion into the PD&E Study.

| FACTOR                              | DESCRIPTION / ISSUES TO CONSIDER                                                                                                                                                                                                                                                                                                                                                                                                               | COST<br>\$ | WEIGHTED VALUE                                                                                                                                                                                                                            |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brief Description of Alternative    | Provide a detailed description of the pond site.                                                                                                                                                                                                                                                                                                                                                                                               | N/A        | N/A                                                                                                                                                                                                                                       |
| Parcel Number                       | Identify the Parcel Number in conjunction with the Right of Way office.                                                                                                                                                                                                                                                                                                                                                                        | N/A        | N/A                                                                                                                                                                                                                                       |
| Parcel Size (Acres)                 | Provide the total area for the required R/W acquisition. The total area is to include the area to meet the water quality / quantity storage requirements as well as maintenance berm width, slopes, perimeter drainage / conveyance ditch area and maintenance access drive for access to pond sites.                                                                                                                                          | N/A        | N/A                                                                                                                                                                                                                                       |
| Right-of-Way (Zoning)               | Describe the Right-of-Way implications of the parcel in question. For example the parcel could be currently under a proposed plan for improvement (Rezoning Request); the site may currently be located on a commercial site with an active business. Consideration should also be given to existing and proposed zoning.                                                                                                                      | N/A        | No Zoning Problems with Site add 5 points per acre. If there are potential zoning issues add zero points.                                                                                                                                 |
| Land Use                            | Identify the current and/or proposed land use, which could affect the acquisition costs of the parcel. For example a partial R/W take of a property could have a significant impact on the remainder's use.                                                                                                                                                                                                                                    | N/A        | N/A, but costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                       |
| Right-of-Way Costs                  | Identify Right-of-Way Costs associated with the acquisition of the parcel.                                                                                                                                                                                                                                                                                                                                                                     | \$         | N/A, but costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                       |
| Drainage Considerations             | Include a description of the system and corresponding outfall location and parameters. Considerations should be given to such items as whether or not the pond is located in the center of the basin; in the low area within the basin; adjacent to the outfall location, and piping needs / costs, etc. Also consider site elevations and the corresponding need to elevate (build-up) the perimeter berm.                                    | \$         | Meets FDOT's needs – points TBD by Team<br>Meets most needs – points TBD by Team<br>Other issues between sites will be dependent on costs associated with the construction of a facility at each particular site.                         |
| Flood Zone FEMA                     | Identify the Flood Zone and associated impacts / benefits of constructing the pond within the respective flood zone. The perimeter berm will affect flood zone storage, while the pond will enhance said storage. When Right-of-way is acquired within a low lying area the construction of the roadway template may affect adjacent properties ability to utilize that area for storage. An evaluation of the floodplain impacts is in order. | N/A        | Meets FDOT's needs – points TBD by Team<br>Meets most needs – points TBD by Team<br>Other issues between sites will be dependent on the benefit to the floodplain associated with the construction of a facility at each particular site. |
| Contamination - Hazardous Materials | Identify if the parcel is contaminated. This will limit the ability to utilize the site. Consideration of this parcel must include the costs associated with the clean-up of the site.                                                                                                                                                                                                                                                         | N/A        | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                            |
| Utilities                           | Identification of existing and proposed facilities which are located within or adjacent to the parcel. The cost of relocating these facilities must be included in the consideration of the parcel in question.                                                                                                                                                                                                                                | \$         | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                            |

|                                                                       |                                                                                                                                                                                                                                                                               |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Threatened & Endangered Species (TES) and associated Mitigation Costs | Identify TES as Threatened, Endangered, or Significant. Identify the anticipated mitigation costs.                                                                                                                                                                            | N/A | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Noise                                                                 | Identify noise impacts and corresponding noise abatement which may impact the location and placement of pond sites.                                                                                                                                                           | N/A | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wetlands / Protected Uplands and associated Mitigation Costs          | High values indicate known habitat or historic presence such as Rookery Area. Medium values may be indicative of relatively undisturbed, natural, or stable habitat types. Low values may indicate disturbed low habitats. Identify the cost of mitigating for these impacts. | \$  | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cultural Resources Involvement and associated Costs                   | Identify the presence of cultural resources including archeological and historical resources which could affect the suitability of the site in question and associated costs.                                                                                                 | N/A | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Section 4(f)                                                          | Identify the presence of 4F properties which could affect the suitability of the site in question and associated costs.                                                                                                                                                       | N/A | N/A, but additional costs requirements will need to be added to the overall site costs and weighted value applied accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Public Wellfield                                                      | The proximity to a wellfield site will have a direct impact on the type of drainage facility which can be placed on the corresponding parcel.                                                                                                                                 | N/A | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Construction                                                          | Identify access for construction and associated impacts which may affect construction costs, such as amount of drainage piping required to reach pond.                                                                                                                        | N/A | No set weighted value is applicable for this item; however requirements for items identified may have a direct impact on the construction cost need. This needs to be considered and added to the overall costs associated with utilizing this site.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Maintenance                                                           | Identify the costs of maintaining a facility at this parcel location. Potential for Maintenance Agreements with others. Consider access costs to the pond site.                                                                                                               | \$  | <p>In conjunction with District Maintenance staff needs to establish yearly maintenance costs per acre of pond area. This cost would be looked at as a yearly cost say over a twenty year period and brought to present value for inclusion in the overall cost item below. Establish a cost for:</p> <p>Wet Detention Maint. Cost per Acre \$ _____<br/> Dry Pond Maint. Cost per Acre \$ _____<br/> Dry Linear Swale Cost per Acre \$ _____<br/> Offsite Pond Maintenance by others \$ 0.00</p> <p>At the commencement of establishing each pond siting study the PD&amp;E Project Manager shall check with the Maintenance Office for the most current maintenance costs.</p> |

|                                              |                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aesthetics                                   | Identify the need for landscape buffers, fencing, variable pond shapes, etc.                                        | N/A | No set weighted value is applicable for this item, however requirements for fencing, landscaping, littoral shelves, etc. which have a direct impact on the area required to physically set the pond needs to be considered. This in combination with the actual costs associated with the placement of plants, fencing etc. will need to be added to the overall costs of utilizing the specific site. |
| Public Opinion / Adjacent Residency Concerns | Identify possible impacts to current or proposed land use (i.e. Schools may dedicate a dry pond versus a wet pond). | N/A | N/A, but can affect the type of system selected for a specific site.                                                                                                                                                                                                                                                                                                                                   |
| Other                                        | Joint Use potential.                                                                                                | N/A | If the ability to utilize joint use ponds is available assume a weighted value of 10 per acre-ft of available storage. Otherwise utilize 0 for this value.                                                                                                                                                                                                                                             |
| Total Applicable Costs                       | Identify the total cost of the parcel including cost identified from all issues above.                              | \$  | Overall costs vary significantly between rural and urban locations. This value should be utilized when comparing final costs between alternative pond locations. Engineering Judgement will need to be considered and an acceptable cost modifier applied as agreed to be the team members. Utilize 1 point per 5% differential in cost between alternative sites.                                     |
| Comments, Advantages, Disadvantages, etc.    | Include a detailed description of the Advantages and Disadvantages associated with the parcel in question.          | N/A | N/A                                                                                                                                                                                                                                                                                                                                                                                                    |

### **Step 5 Detailed Evaluation of Alternatives**

Repeat Step 3 on the selected alternatives. Each Office should provide a detailed evaluation of these alternatives with regards to their issues.

- ☐ Team Members Conduct Field Reviews as Deemed Necessary. The extent of the field review should include the verification of all NEPA Impacts to assess the viability of a potential pond site. At a minimum a Level I Assessment would be appropriate. A Level I assessment includes the following:
  - o Desktop Review Environmental Evaluation of Corridor utilizing D-4 PD&E Study database, available GIS layers from the Florida Geographic Data Library and other sources.
  - o Review should include:
    - Natural Resources - Threatened & Endangered Species and Wetlands
    - Socio-cultural Resources (Historical and Archeological sites and 4f properties)
    - Physical Impacts (Including Noise, Contamination, Air Quality, etc.)
- ☐ Submit Alternatives for Inclusion in Public Workshop – All alternatives identified in Step 4 will be shown with the exceptions of any alternative eliminated by this detailed evaluation step.

### **Step 6 Team Meeting to Summarize Impacts and Analysis**

During the PD&E Public Involvement process, reasonable efforts must be made to inform the public/affected property owners of the potential impacts to the community/properties of the proposed improvements. As such, properties identified for potential acquisition for retention/detention ponds should be presented to the public in the same manner as acquisition for geometric requirements. This information would assist in informing the public of the entire magnitude of the right-of-way needs. Although the proposed right-of-way acquisition is displayed, the public would be clearly informed that all proposals are preliminary, and subject to change, as the project develops.

- ☐ Review Comments Generated from Public Workshop
- ☐ Update Weighted Matrix of Alternatives Evaluated (See Step 4)
- ☐ Assign Refinement of Selected Alternatives to Drainage / Design Team Members
- ☐ Refine Alternatives for Final Evaluation
- ☐ Provide Updated Alternatives to Team Members for Re-Evaluation
- ☐ Finalize Weighted Matrix of Alternative Pond Site (See Step 4)

Note: Two significant considerations may arise at this time, which are when to stop the evaluation, and what type of report (i.e. depth) should be written. For example: 1) Projects with a significant time lag from PD&E to Design may go on the shelf with as many alternatives as possible and a very preliminary matrix; versus 2) Projects going straight from PD&E to Design will have a great deal of detail and a limited number of pond sites established.

This will need to be identified at the time the scope of services is established. In some cases although a project has a potential for a significant time laps between the PD&E Study and Construction stage; it may prove beneficial to conduct a more targeted pond siting approach and proceed with advanced right-of-way acquisition of those parcels. This approach is prudent particularly with a rapidly developing corridor. Another consideration for rapidly developing corridors is to acquire joint use ponds where the Department can utilize a developments internal stormwater management system to address the portion of the roadway fronting the development. This works best when the adjacent property owner is developing a new site and the requirement can become part of the properties development order.

**Step 7 Draft Pond Siting Report**

- ☐ Prepare Document Containing Analyses and Evaluation Matrix
- ☐ Submit Draft Report (See Sample Table of Contents) for Review and Comment by Team Members
- ☐ Should it be in the Department's interest to pursue "Advanced R/W Acquisition"; the R/W Office should be notified prior to completion of the Draft Pond Siting Report for coordination with the property owners and proper public notification.

**Step 8 Team Meeting to Make / Review Final Recommendations Prior to Public Hearing**

- ☐ Update Report to Address Team Members Comments
- ☐ Team Members to make Final Matrix Recommendations
- ☐ Submit Draft Pond Siting Report for Inclusion into Public Hearing

**Step 9 Complete Pond Siting Report**

- ☐ Review Comments Generated from Public Hearing
- ☐ Convene Team to Evaluate Public Comments if Deemed Necessary
- ☐ Rank Recommended and Alternative Pond Sites
- ☐ Finalize Pond Siting Report and Recommendations Based on Team Evaluation
- ☐ Incorporate findings into NEPA documents (Project Design Summary Report (PDSR), Environmental Assessment (EA) / Finding of No Significant Impact (FONSI) and/or Environmental Impact Statement (EIS)).

**Step 10 Hand-off Meeting between PD&E and Design**

Prior to completion of the Design Scope of Services a coordination meeting is to be held between the PD&E Project Manager and the District Consultant Management Office or In-house PM to review the Pond Siting Report and the corresponding Final Design Scope of Services. Activities during this meeting will include:

- ☐ Review Project's Scope of Services as it Relates to Drainage and Pond Sites
- ☐ Estimate Required Scope of Services for the Pond Site Re-Evaluation and Additional Data Required
  - o Survey
  - o Geotechnical
- ☐ Identify need to process a Re-Evaluation with FHWA for NEPA compliance of the project. This generally occurs if pond sites will require changes or if a project has been on the shelf for some time.

At the commencement of the final design phase a hand-off meeting will be held between the PD&E Project Manager and the Final Design Project Manager to review the Pond Siting Report and Transfer all information pertaining to the project to the design team.

## INITIAL ENGINEERING PHASE

### Step 11 Re-Evaluation of Final Pond Siting Recommendations

When the project reaches the initial engineering stage, the roadway design project manager (either in-house or consultant) will initiate a re-evaluation of the existing pond siting report. The roadway design project manager will assemble the original pond siting team (The PD&E Engineer will play a very limited role at this stage) with as many original members as possible. A comparable replacement should be made for any original team member who is unavailable. The team will be responsible for providing engineering data and input about all issues that have changed since the original pond siting report was produced. If necessary, the team will then modify the pond siting report to create the “official” pond siting report. The roadway design project manager will then send to right-of-way mapping the preferred pond sites as specified in the pond siting report. Specific activities which are to be incorporated into this step include:

- ☐ Conducting a Field Review of Recommended Pond Sites to insure compliance with the intent of the design. In addition each pond site should be reviewed for changes which have occurred since the original pond siting report.
- ☐ Re-Evaluation documentation of the PD&E Study is to be developed and submitted to FHWA for approval. Please note that re-evaluation of the pond siting report, is not the same as re-evaluation of the PD&E Study. In final design the pond sites are re-evaluated to ensure project requirements and compliance with NEPA requirements. Should pond locations shift or significant changes be required the updated Pond Siting Report would be included as part of the re-evaluation documents submitted to FHWA for compliance with NEPA.
- ☐ Assign Update of Preliminary Drainage Report to Drainage / Design Team Members
- ☐ Provide Summary of Relevant Changes to Team Members
- ☐ The Team members are to receive plans during all formal phase reviews.

Note: If ponds or any other drainage system which required the acquisition of right-of-way was included in the PD&E Study the project can go into preliminary engineering immediately upon completion of the PD&E Study. If pond sites change or are added after Location Design Concept Acceptance (LDCA), the Right-of-way phase of the project cannot commence until the Re-Evaluation for FHWA approval is complete for new pond sites.

### Step 12 Meeting to Update Alternatives and Recommendations

- ☐ Re-convene Team to Review Recommendations and Changes
- ☐ Identify Sites, which have Significant Changes Requiring Re-Ranking of Recommendations
- ☐ Identify Pond Sites Alternatives for Re-Evaluation by Team Members
- ☐ Identify Additional Design Information, Survey and Geotechnical Data Required for Final Re-Evaluation of Pond Sites
- ☐ Refine Pond Site Layouts with Real Site Geometrics for the Viable Recommended Sites and Identified Alternatives

**Step 13 Detailed Re-Evaluation of Pond Sites**

- ☐ Re-Evaluate Remaining Viable Recommended Sites and Identified Alternate Sites
  - o Potential Environmental Impacts and Permit Issues (By EMO with Drainage support on issues).
  - o Potential Relocations (By R/W Office).
  - o Potential Development Issues (By R/W Office – Land Planner and Drainage Office).
  - o Potential Construction Issues (By Construction Office).
  - o Potential Maintenance Issues (By Maintenance Office).
  - o Potential R/W Costs and Impacts (By R/W Office).
  - o Potential Relocation Costs (By R/W Office).
  - o Property Acquisition Costs (By R/W Office).
  - o Potential Business Damage Costs (By R/W Office).
  - o Potential Demolition and Remediation Costs (By R/W Office).
  - o Potential Social Impacts (By PL/EM and Drainage Office).
- ☐ Team Members Conduct Field Reviews as Deemed Necessary
- ☐ Finalize Pond Site Layout with Real Site Geometrics for the Viable Recommended Sites and Identified Alternatives

**Step 14 Prepare Re-Evaluation of Sites and Seek FHWA Approval**

- ☐ Convene Team to Review Findings, Update the Matrix as Necessary and Recommend Final Pond Sites for Project.
- ☐ Finalize Re-Evaluation Report and Recommendations Based on Team Evaluation.
- ☐ Send R/W requirements to R/W Mapping.
- ☐ Seek FHWA approval for LDCA or Re-Evaluation. FHWA needs to approve the Re-Evaluation prior to the Department opening the any funding phase (Design, R/W, etc.)

**FLOW CHART OF PROCESS**

**SEE ATTACHED FILE FOR REFERENCE**

**CONCERNS / GUIDANCE FOR RURAL VERSUS URBAN POND SITING**

General rule of thumb, one pond per mile of corridor.

| ISSUE                               | RURUAL PONDS                                                                                                                                                                                                                                                                                                                              | URBAN PONDS                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conveyance system                   | In the design of rural pond sites and associated roadway the use of swales for conveyance and storage should be maximized to control costs                                                                                                                                                                                                | Minimize the length and size of the stormwater conveyance system (Trunk line) required to convey the runoff to the pond.                                                                                                                                                                          |
| Use of Fencing                      | If wet ponds have 1:4 slopes or flatter a perimeter fence is not mandatory.                                                                                                                                                                                                                                                               | In an urban environment wet ponds will require fencing.                                                                                                                                                                                                                                           |
| Access to pond site for maintenance | Place as close to the outfall as possible.                                                                                                                                                                                                                                                                                                | Ponds are to be set behind commercial properties to avoid impacting high property value frontage along the highway. This will require obtaining the necessary access easements.                                                                                                                   |
| Joint Use Ponds                     | Wet ponds cannot be utilized for recreational purposes such as swimming, fishing, etc. However the can be utilized in Golf Courses and other recreational facilities which prohibit swimming, fishing, etc.                                                                                                                               | When ponds sites are utilized in conjunction with developments, the require pond areas may need to be larger. For example when utilizing a pond which is being established for residential zoning a littoral shelf at a fairly flat slope is required. This will increase the required pond area. |
| Off-site Flow<br>contirbution       | Rural ponds can more easily allow for the bypass of offsite runoff through the use of conveyance ditches and regional cross-drains.                                                                                                                                                                                                       | Construction within an urban section may not allow for bypass of offsite water. This requires larger ponds. A cost benefit ratio of larger ponds versus the use of a separate by-pass system may be needed.                                                                                       |
| Outfall                             | Rural locations have a greater possibility of having ponds placed near wetlands. The tail water condition for the pond can be affected by the staging in these wetlands and must be considered...                                                                                                                                         | Potential for landlock or the need to bleeddwn through another drainage collection system to reach ultimate outfall.                                                                                                                                                                              |
| Utilities                           |                                                                                                                                                                                                                                                                                                                                           | Conflicts more prevalent.                                                                                                                                                                                                                                                                         |
| R/W Availability                    | Land more available, less restrictions on location of potential pond sites. However, wetland areas must be avoided. In some cases ponds can be located adjacent to wetland areas on uplands. When a pond is located adjacent to a wetland the potential for draw down of the wetland exists. This needs to be verified (See SFWMD Manual) | Restricted to available vacant locations size impacts to existing businesses or residential properties are very costly. This requires more in-depth cost analysis.                                                                                                                                |
| Overtopping                         | If a rural pond overtops the impacts are not as critical. However freeboard requirements must still be met.                                                                                                                                                                                                                               | Berm must be set high enough to contain runoff to avoid overtopping.                                                                                                                                                                                                                              |

**Optional Stormwater Management Techniques for Urban Areas:** In highly urbanized areas traditional treatment may not meet the needs of a community. Other methods often times need to be considered such as Compensatory Treatment.

**Compensatory treatment** is a method acceptable to many regulatory agencies in cases where it is impractical to construct a stormwater management system to capture runoff from a portion of the project due to extreme physical site condition and constraints or nominal right-of-way availability. The criterion for this treatment is that the alternate treatment site be located within the principal drainage basin of the project. This alternative will require close coordination with the respective stormwater management agency and a collaborative pre-application meeting with the agency is strongly recommended. There are two methods that have been successfully utilized to compensate for lack of treatment. The first method is providing **over-treatment** and the second is **off-site compensation**.

The **over-treatment method** consists of treating the runoff from the project area that can be captured and conveyed to a proposed pond to a higher level than the rule requires to compensate for the portions of the project corridor that are not receiving treatment due to physical constraints. There are specific pollutant removal efficiency goals that must be met if this method is utilized. These are outlined in the stormwater management agencies criteria. This method may be utilized by taking several basins which are hydraulically connected within the project corridor that fall within the same watershed and suing a regional approach to improving the water quality for that watershed.

For the **off-site compensation method**, an existing development or local road that is currently not treated will be treated to compensate for untreated portions of the proposed project corridor. For this method the area that is going to be treated has to have a similar or higher pollutant loading than the portion of the project corridor that is going to remain untreated due to physical constraints. The off-site areas must also fall within the same watershed as the proposed project corridor.

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**APPENDICES**

|             |                                                                                                                                                                                                                        |
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| Appendix A- | Pond Siting Plan                                                                                                                                                                                                       |
| Appendix B- | Geotechnical Data                                                                                                                                                                                                      |
|             | a. Excerpts from Draft Preliminary Report of Geotechnical Exploration; S. R. 50 from Hancock Road to Orange County Line, Lake County, Florida by Law Engineering and Environmental Services, Inc. October 2003.        |
|             | b. Excerpts from Draft Preliminary Report of Geotechnical Exploration; S. R. 50 from Lake County Line to East Turnpike Ramps, Orange County, Florida by Law Engineering and Environmental Services, Inc. October 2003. |
|             | c. Excerpts from the PD&E Geotechnical Investigation                                                                                                                                                                   |
|             | d. Excerpts from Soil Survey of Lake County, Florida                                                                                                                                                                   |
|             | e. Excerpts from Soil Survey of Orange County, Florida                                                                                                                                                                 |
| Appendix C- | Rainfall                                                                                                                                                                                                               |
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| Appendix H- | Project Correspondence                                                                                                                                                                                                 |

**PROPOSED CHANGES TO PD&E SCOPE OF SERVICES****2.22 Drainage Analysis and Pond Siting Report**

The CONSULTANT shall perform preliminary drainage design in order to determine potential outfall locations and preliminary sizes (volume and area) of required detention and/or retention facilities for storm water treatment or attenuation. The location and size of potential detention/retention areas will be determined for all viable alternate alignments.

The CONSULTANT shall prepare a “Pond Siting Report” for the project in accordance to the Department’s Stormwater Facilities Handbook **and the FDOT District 4 Pond Siting Procedures.**

**PROPOSED CHANGES TO ROADWAY FINAL DESIGN SCOPE OF SERVICES**

- 6.0 DRAINAGE ANALYSIS:** The CONSULTANT shall analyze and document Drainage Tasks in accordance with all applicable manuals, guidelines, standards, handbooks, procedures, and current design memorandums.

The CONSULTANT shall be responsible for designing a drainage and stormwater management system. All design work shall comply with the requirements of the appropriate regulatory agencies and the DEPARTMENT's Drainage Manual. The CONSULTANT shall coordinate fully with the appropriate permitting agencies and the DEPARTMENT's staff. All activities and submittals should be coordinated through the DEPARTMENT's Project Manager. The work will include the engineering analyses for any or all of the following:

**6.1 Determine Base Clearance Water Elevation**

Analyze, determine, and document high water elevations which will be used to set roadway profile grade. Determine surface water elevations at cross drains, floodplains, outfalls and adjacent stormwater ponds. Determine groundwater elevations at intervals between the above-mentioned surface waters.

**6.2 Pond Siting Analysis and Report**

Evaluate pond sites using a preliminary hydrologic analysis. Document the results and coordination for all of the project's pond site analyses. The Drainage Manual and District 4 Pond Siting Procedures provide specific documentation requirements.

**6.3 Design of Cross Drains**

Analyze the hydraulic design of cross drains. Check existing cross drains to determine if they are structurally sound and can be extended. Document the design as required. Determine and provide flood data as required.

**6.4 Design of Roadway Ditches**

Design roadway conveyance ditches. This includes determining ditch cross sections, grades, selecting suitable channel lining, designing the side drain pipes, and documentation.

**6.5 Design of Outfalls**

Analyze and document the design of ditch or piped outfalls. (Pond outlet structure included in task 6.6)

**6.6 Design of Stormwater Management Facility (Offsite Pond)**

Design stormwater management facilities to meet requirements for stormwater quality treatment and attenuation. Develop proposed pond layout (shape, contours, slopes, etc.), perform routing calculations, and design the outlet control structure.

**6.7 Design of Stormwater Management Facility (Roadside Ditch as Linear Pond)**

Design stormwater management facilities to meet requirements for stormwater quality treatment and attenuation. Develop proposed pond layout (shape, contours, slopes, etc.), perform routing calculations, and design the outlet control structure.

**6.8 Design of Flood Plain Compensation Area**

Determine flood plain encroachments, coordinate with regulatory agencies, and develop proposed compensation area layout (shape, contours, slopes, etc.). Document the design following the requirements of the regulatory agency.

#### **6.9 Design of Storm Drains**

Develop a “working drainage map”; determine runoff, inlet locations, and spread. Calculate hydraulic losses (friction, utility conflict and, if necessary, minor losses). Determine Design Tailwater and, if necessary, outlet scour protection.

#### **6.10 Optional Culvert Material**

Determine acceptable options for pipe materials.

#### **6.11 French Drain Design**

Design French Drain Systems to provide stormwater treatment and attenuation. Identify location for percolation tests and review these, determine the size and length of French Drains, design the control structure/weir, and model the system of inlets, conveyances, French Drains, and other outfalls using a routing program such as ICPR.

#### **6.12 Drainage Wells**

Design the discharge into deep wells to comply with regulatory requirements. Identify the location of the well, design the control structure/weir, and model the system using a routing program such as ICPR.

#### **6.13 Drainage Design Documentation Report**

Compile drainage design documentation into report format. Include documentation for all the drainage design tasks and associated meetings and decisions, except the Pond Siting Analysis Report and Bridge Hydraulics Report.

#### **6.14 Bridge Hydraulic Report**

Calculate hydrology, hydraulics, scour, and deck drainage. Prepare report and the information for the Bridge Hydraulics Recommendation Sheet.

#### **6.15 Temporary Drainage Analysis**

Evaluate and address drainage to adequately drain the road and maintain existing offsite drainage during all construction phases. Provide documentation.

#### **6.16 Cost Estimate**

#### **6.17 Technical Special Provisions**

#### **6.18 Field Reviews**

#### **6.19 Technical Meetings**

#### **6.20 Quality Assurance/Quality Control**

#### **6.21 Independent Peer Review**

#### **6.22 Supervision**

## STAFF HOUR RANGES FOR POND SITING

The Department has procedures in place which establish guidance for the estimation of staff hours associated with Design and PD&E projects. The ranges reflected in those guidelines are general in nature and should consider the complexities of the specific project being scoped. The following is offered as points of consideration in establishing staff hours for any given project. Predominately what is identified below is the effort required for the Drainage Engineers Technical Work. Additional Guidance is provided for coordination aspects between disciplines.

### ☐ Step 1 Collect Initial Data / Drainage Kick-off Meeting / Conceptual Analysis

- o Data Collection – 6 to 12 hrs per drainage basin. For rural projects assume at least one drainage basin per mile of roadway. Urban drainage systems will have more basins. This time is utilized to gather existing plans and review of prior studies which could affect the proposed design. In addition to this time, hours should be provided for field reviews by the drainage engineer to assess the existing conditions. These hours are based on the complexity of project, but will range between 8 to 12 hours per mile.
- o Drainage Office Coordination Kick-off Meeting – 4 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.
- o Conceptual Drainage Analysis – With any drainage design the establishment of a good pre-development drainage model allows for ease of design and decision making. Preliminary computations addressing these requirements would consist of 8 to 12 hrs per drainage basin.
- o Seasonal High Ground Water Determination – 8 to 16 hrs for documentation and coordination with Geotechnical Engineer.
- o Coordination for Drainage Issues and set-up of Pond Siting Team - 8 to 16 hrs.

### ☐ Step 2 Pond Siting Kick-off Meeting

- o Pond Siting Kick-off Meeting – 6 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.

### ☐ Step 3 Evaluation of Conceptual Options

- o During this phase each team member evaluates the various issues associated with their respective area of practice and submits information to the Drainage Engineer for review. It is assumed that the Drainage Engineer will require 6 to 8 hrs per pond site to evaluate information received from the other team members. Additional hydraulic analysis may be required should pond sites change and some additional hours should be allocated for this as a contingency item. Hours associated with the other disciplines work should be added to the respective items based on the complexity of the work.

### ☐ Step 4 Team Meeting to Screen Alternatives

- o Screening Meeting – 6 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.

- ❑ Step 5 Detailed Evaluation of Alternatives
  - During this phase each team member evaluates the various issues associated with their respective area of practice and submits information to the Drainage Engineer for review. It is assumed that the Drainage Engineer will require 12 to 24 hrs per pond site to evaluate information received from the other team members and Post Development ICPR hydraulic Analysis. Additional hydraulic analysis may be required should pond sites change and some additional hours should be allocated for this as a contingency item. Hours associated with the other disciplines work should be added to the respective items based on the complexity of the work. Additional hours for field reviews may need to be considered.
- ❑ Step 6 Team Meeting to Summarize Impacts and Analysis
  - Screening Meeting – 16 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.
- ❑ Step 7 Draft Pond Siting Report
  - Preparation of Draft Pond Siting Report – 48 hrs for compilation and preparation of Report.
- ❑ Step 8 Team Meeting to Make Final Recommendations
  - Screening Meeting – 12 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting, plus coordination time with team members for comments on matrix. This could be handled through a meeting or e-mail correspondence.
- ❑ Step 9 Complete Pond Siting Report
  - Coordination Meeting – 12 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.
  - Preparation of Final Pond Siting Report – 40 hrs for compilation and preparation of Report.
- ❑ Step 10 Hand-off Meeting between PD&E and Design
  - Hand-off Meeting – 8 hrs for preparation and 4 to 8 hrs per person attending meeting based on distance traveled to District. The meeting time includes preparation of meeting notes documenting the decisions made during the meeting.
- ❑ Steps 11 through 14 Initial Engineering Phase
  - Staff hours for these phases will be dependent on the complexity of issues required to be addressed and the extent of what was done in the PD&E phase. Utilize above guidance in establishing hours.

As can be seen above the Pond Siting process encompasses a significant amount of coordination between disciplines. The amount of work effort can vary significantly based on issues and project location. The above is provided as a guideline only with engineering judgment required to estimate the proper amount of time to do a good job. Remember that the construction of ponds can be costly; therefore the pond siting process should not be taken lightly!