Lower Coastal Watershed (L842) Watershed Evaluation Report

Prepared for

Southwest Florida Water Management District

& Pasco County

May 2015

Jeanette A. Kelson, P.E.
Florida P.E. No. 69100

CH2MHILL®

4350 West Cypress Street
Suite 600
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Watershed Evaluation Report

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Contents

Section **Page**

1 Introduction 1-1
1.1 Authorization and Purpose 1-2
1.2 Project Location and General Description 1-2
1.3 Purpose and Objectives 1-2
1.3.1 Work Breakdown Structure 1-2

2 Watershed Inventory 2-1
2.1 Characterization of the Watershed and Tributaries 2-1
2.2 Digital Terrain Model (DTM) Development 2-1
2.2.1 Topographic Data Source 2-1
2.2.2 Horizontal and Vertical Datum 2-1
2.2.3 Digital Elevation Model (DEM) Generation 2-1
2.2.4 Topographic Voids 2-1
2.2.5 Topographic Information Updates 2-2
2.2.6 QA/QC Process Description 2-2
2.3 Hydrologic Inventory 2-3
2.3.1 Catchment Delineation Process 2-3
2.3.2 Tributary Catchments and Characterization 2-3
2.3.3 Soil Characterization 2-3
2.3.4 Land Use Characterization 2-4
2.3.5 Existing Floodplain Characterization 2-4
2.3.6 Tributary Hydrologic Parameterization 2-4
2.3.7 QA/QC Process Description 2-4
2.4 Hydraulic Feature Inventory 2-5
2.4.1 Hydraulic Feature Inventory Development 2-5
2.4.2 Summary of Water Body Features 2-5
2.4.3 Summary of Conveyance Features 2-5
2.4.4 Hydraulic Connectivity 2-5
2.4.5 QA/QC Process Description 2-5

3 Topographic Survey 3-1
3.1 Elevation Control and Collection Accuracy 3-1
3.2 Required Surveys 3-1
3.2.1 Hydraulic Feature Surveys 3-1
3.2.2 Cross Section and Profile Surveys 3-1

4 Preliminary Model Features 4-1
4.1 Subbasins 4-1
4.2 Nodes 4-1
4.3 Pipes and Drop Structures 4-1
4.4 Channels 4-1
4.5 Weirs 4-2

5 References 5-3

List of Figures

Figure 1.2 Watershed Location Map .....
Figure 2.2.1 Topographic Project Areas .....
Figure 2.2.5 Topographic Map .....
Figure 2.3.1-1 ISIS-FAST Results .....
Figure 2.3.1-2 Catchments Map .....
Figure 2.3.2 ICPR Basin Groups.....
Figure 2.3.3 Hydrologic Soil Groups .....
Figure 2.3.4 Land Use Map .....
Figure 2.3.5 Existing FEMA Floodplain.....
Figure 2.4.1 Hydraulic Network Map .....
Figure 4.2 ICPR Network.....

List of Tables

Table 1 Catchment Statistics by Watershed .....
Table 2 Land Use Characterization by Subwatershed .....
Table 3 Soils Characterization by Subwatershed .....
Table 4 Summary of Waterbody Statistics .....
Table 5 Summary of Hydraulic Features .....
Table 6 Summary of Rainfall Station Data.....

1 Introduction

1.1 Authorization and Purpose

The Southwest Florida Water Management District (SWFWMD) entered an agreement with Pasco County to provide a multi-year Watershed Management Plan (WMP) for the Lower Coastal Watershed. CH2M HILL Engineers, Inc. (CH2M), formerly known as Halcrow, Inc., was authorized by SWFWMD to perform engineering and Geographic Information System (GIS) services to provide the WMP under Agreement No. 11CC0000003 (L842).

1.2 Project Location and General Description

The Lower Coastal Watershed is approximately 16 square miles in size and is located in the southwestern portion of Pasco County. The northern portion of the watershed lies within the boundary of the incorporated New Port Richey, whereas the southern portion of the watershed is unincorporated. The watershed is relatively flat, highly urbanized, and features many closed-basin systems. US 19, an evacuation road, runs along the eastern border of the watershed. The northern portion of the watershed is bound by the Pithlachascotee River that flows into the Gulf of Mexico, which borders the watershed to the west. There are two large lakes within the watershed; Lake Conley and Lake Nash, which ultimately drain to the Gulf of Mexico. There are two neighboring watersheds, Bear Creek\Pithlachascotee River Watershed to the northeast and the Anclote Watershed to the southeast and south, that border the Lower Coastal Watershed. A project location map is shown in Figure 1.2.

1.3 Purpose and Objectives

The goal of developing the WMP is to provide a basis for which to evaluate the capacity and performance of the watershed with regards to flood protection, water quality and natural systems enhancement. The SWFWMD process for watershed analysis is comprised of five elements that are performed as a WMP is developed:

1. Topographic Information
2. Watershed Evaluation
3. Watershed Management Plan
4. Implementation of Best Management Practices
5. Maintenance of Watershed Parameters and Models

This report presents a summary of the data collected and work completed through the Watershed Evaluation element of the Watershed Management Plan. The Watershed Evaluation element has the following goals:

- Compile, review and evaluate existing watershed data;
- Develop watershed features that define watershed hydrology and hydraulics;
- Identify survey requirements;
- Engage public participation;
- Develop a watershed GIS database.

This report is intended to be used in conjunction with the concurrently submitted electronic data. All work was completed according to the SWFWMD's Guidelines and Specifications (G&S) and supporting Guidance Documents. Note that the Surface Water Resources Assessment Inventory and Approach was not completed during the Watershed Evaluation phase and may be completed under a future effort.

1.3.1 Work Breakdown Structure

The Watershed Evaluation Work Breakdown Structure (WBS) outlined in the District's Guidance Documents (i.e. Scope of Work Task Descriptions Effective Date, January 27, 2011) can be found at ftp://ftp.swfwmd.state.fl.us/pub/GWIS/WMP_Guidance_Documents. In summary the WBS is captured in the following:

Task 2.1 – Project Development
Task 2.2 - Collection and Assembly of existing topographic and watershed features data,
Task 2.3 - Initial GIS processing
Task 2.4 - Evaluation of GIS and topographic data for issues and voids
Task 2.5 - Public notification of watershed work
Task 2.6 - Pre-Field reconnaissance evaluation
Task 2.7 - Acquisition of Data
Task 2.8 - Data Refinement and Development
Task 2.9 - Geodatabase of model features
Task 2.10 - Surface Water Resource Assessment Analysis and Approach (not included)
Task 2.12 - Final Watershed Evaluation Report & Meeting

2 Watershed Inventory

2.1 Characterization of the Watershed and Tributaries

The Lower Coastal Watershed is relatively flat and densely urbanized. Elevations range from approximately 63 feet (NAVD 88) in the northeast to approximately -3.5 feet (NAVD 88) in the southwest. Many of the internal conveyance systems are for secondary drainage and consist of driveway culverts, collection systems (i.e. catch basins, cross drains, etc.), overland weirs, and ponds.

Along the western boundary of the watershed, many areas are coastally influenced and drain directly or indirectly to the Gulf of Mexico. The watershed also contains multiple waterbodies and canal systems, such as Lake Conley and Cross Bayou.

2.2 Digital Terrain Model (DTM) Development

SWFWMD created a DTM for the Lower Coastal Watershed from elevation and breakline data developed from Light Detection and Ranging (LiDAR) technology. The following subsections provide detail about the source data used to produce the DTM and the associated Digital Elevation Model (DEM).

2.2.1 Topographic Data Source

SWFWMD provided pre-generated DEM tiles for the watershed. The source LiDAR provided by SWFWMD was collected in 2004, 2007 and 2011. The SWFWMD initial LiDAR collection for Pasco County occurred in 2004. Subsequently, the Florida Division of Emergency Management (FDEM) flew LiDAR along coastal areas in 2007 (Task Order: Area A). Refer to Figure 2.2.1 for DTM project area coverage. Although the entire project area is covered by 2004 LiDAR (purple), more recent data from the 2007 (green) FDEM data collection and the 2011 District update (blue) was used where available.

2.2.2 Horizontal and Vertical Datum

Topographic data from both sources were provided in the HARN North American Datum (NAD) of 1983 (feet) for horizontal datum and the North American Vertical Datum (NAVD) of 1988 (feet) for vertical datum. All topographic data were projected in NAD 1983 HARN State Plane Florida West FIPS 0902 (US Feet), per SWFWMD requirements.

2.2.3 Digital Elevation Model (DEM) Generation

SWFWMD provided 5000' by 5000' tiled DEMs in ESRI grid format. The DEM tile resolution was 5' and was in the NAD 83 HARN State Plane West (US Feet) coordinate system. SWFWMD processed these data from LAS files which were converted to multipoint features using LP360 extension in GIS, and from hydrologically enforced break lines. CH2M mosaicked the 2004, 2007, and 2011 DEM tiles falling within the watershed, with a 1000' buffer of the watershed boundary, to create a single, comprehensive elevation model. The coastal elevations were reinforced using the 2007 FDEM coastal break line from project Area A. The FDEM Area A coastal break line enforced the coastal elevation to -1.71 in these areas to flatten out the coastal water body. Additionally, CH2M reinforced the DEM through the incorporation of topographic updates based on ERP plan sets, existing LiDAR break lines, and interpolation of neighboring LiDAR or DEM points to populate void areas.

2.2.4 Topographic Voids

Per the SWFWMD G&S document, topographic void areas are defined as areas where "the available topographic information does not represent the current topography" as a result of (1) land alterations, (2) limitations of aerial photogrammetric projection methods, or (3) unavailable topography data. A review was conducted for the Lower Coastal Watershed. In total, 124 topographic voids were identified for further investigation. From the 124 voids, 86 were deemed significant enough to warrant modifications to ensure proper modeling in the area. Two topographic voids had insufficient or incomplete plan set information.

There were 27 topographic voids associated with recent construction located within the watershed, representing approximately 176.6 acres. These areas were identified using Environmental Resource Permit (ERP) data from SWFWMD. Topographic voids were updated by replacing the DEM values in the grid with new topographic data utilizing as-built plans and/or existing neighboring DEM elevations where planset data was unavailable or insufficient. These areas are identified within a GIS point feature class.

Additional types of topographic voids were identified for several areas within the watershed. Among the most common were; differences in water body elevations resulting from the marriage of the multiple-year DEM tiles, artifacts and gaps at tile corners in the DEM as delivered in the original 5000' by 5000' DEM tiles, and artificial low spots or high areas arising from original classification methods (e.g. loading docks). These voids were corrected for by using existing data (e.g. hydrologic or water body break lines, LAS files, DEM tiles, and neighboring DEM points) interpolated by Triangulate Irregular Networks (TINs) to create replacement grids, which were then incorporated into the larger DEM.

2.2.5 Topographic Information Updates

TINs were created to update topographic void areas only. Terrains were not utilized to generate the initial DTM. Data added to the TIN were entered as one of the following types – Masspoint, Hard Line, Hard Replace, and Hard Clip. In general, these data types generally consisted of the following information:

- Masspoint – point features from the centroid of neighboring DEM grid cells and Spot elevations from ERP/As-built data;
- Hard Line – ERP topographic contour lines or change in slope lines, Hydrographic Feature and Road lines;
- Hard Replace – ERP buildings, and waterbody polygons; and
- Hard Clip – bounding polygons around topographic voids used as exclusion areas.

The TIN was converted to a 5' by 5' DEM. The TIN was converted to a raster using 3D analyst. The extents and settings were created such that the process resulted in a 5' by 5' grid raster with the grid corners located on 0 and 5 interval coordinates. The separate tiles were merged using the Mosaic function in ArcToolbox to form a merged raster for Pasco County. A watershed-wide DEM was created using the Mosaic tool in ArcToolbox. Figure 2.2.5 shows the revised DEM created for the project.

2.2.6 QA/QC Process Description

The DEM was checked for accuracy through visual evaluation. The surface was reviewed for errors including discontinuities and abrupt changes in land slope that may affect future processing. Additionally, surfaces were compared against rectified aerials to confirm land features. It was noted during the review that there are seams in the DEM arising from merging LiDAR collected in different years and vendors. Generally, the variations are minor and are most apparent when the DEM is viewed in conjunction with a Hillshade raster. For the most part, these seams did not affect the usefulness of the DEM for catchment delineation. In those areas where the differences were impacting catchment delineation, a topographic void point was placed to mark the area and an appropriate fix was incorporated.

2.3 Hydrologic Inventory

2.3.1 Catchment Delineation Process

Catchments were delineated using Arc Hydro Tools, an extension for ArcGIS, which were executed on the revised DEM. Initially, using Arc Hydro Tools, the catchments were delineated solely on the results of the revised DEM. However, the catchments were revised based on information attained from desktop reconnaissance such as as-builts and approved plans, aerial photography, parcel boundaries, and CH2M's ISIS-FAST tool (a rapid inundation model used to generate preliminary flood depths and target flow directions) results, to name a few. The catchments were further refined based on additional findings from field reconnaissance and survey data collected.

CH2M's ISIS-FAST tool, a rapid inundation model, was used to generate preliminary flood depths and target flow directions. ISIS-FAST works by pre-processing DEM data to identify depressional sub-catchments in the ground surface. Hydrological input data, such as rainfall, inflows, tidal/water level boundaries are then routed through the model to generate flood extent and depth results. Integrating the results from ISIS-FAST and comparing them to the Arc Hydro basins vetted initial reasonable catchment delineations, pending public comments, field reconnaissance and surveying efforts. Moreover as a check to the preliminary flood extents, the ISIS-FAST results were compared to the Pasco County's Flooding Complaints database, shown in Figure 2.3.1-1. Generally, Figure 2.3.1-1 shows a good correlation between the flooding complaints and the flood depths generated by ISIS-FAST. In summary the results of ISIS-FAST provide an upfront understanding of where flooding issues may exist, facilitating an improved planning and efficiency for the project as a whole.

There are a total of 1,213 catchments delineated within the Lower Coastal watershed, summarized in Table 1. Catchments were delineated for areas both identified by Arc Hydro tools and manually refined through desktop and field reconnaissance, as shown in Figure 2.3.1-2. In general, some coastal areas within the watershed were not delineated unless the model would gain some value by including them. For example, if the area was not rural and was noted as having chronic flooding complaints, or if the area included stormwater infrastructure that tied into an upstream system, the area was often delineated to provide information.

2.3.2 Tributary Catchments and Characterization

There are a total of seven subwatersheds (ICPR Groups) identified within the watershed. Within these, there are a total of 1,213 catchments ranging in size from approximately 0.09 acres to 430 acres. There are numerous catchments less than an acre in size. These are located throughout the entire watershed and are generally a result of the depressional / pitted terrain and small retention systems within the watershed. Subwatersheds were named (A through G) moving from north to south, and were grouped based on hydraulic features and contributing area characteristics. The subwatershed groups are illustrated in Figure 2.3.2.

2.3.3 Soil Characterization

Soils within the entire Lower Coastal watershed area consist of Adamsville Fine Sand, Anclote Fine Sand, Aripeka Fine Sand, Astatula Fine Sand (0 To 5 Percent Slopes), Basinger Fine Sand, Depressional, Candler-Urban Land Complex (0 To 8 Percent Slopes), Candler Fine Sand (0 To 5 Percent Slopes), Candler Fine Sand (5 To 8 Percent Slopes), Chobee Soils, Eaugallie Fine Sand, Electra Variant Fine Sand (0 To 5 Percent Slopes), Homosassa Mucky Fine Sandy Loam, Immokalee Fine Sand, Lacoochee Complex, Myakka Fine Sand, Narcoossee Fine Sand, Okeelanta-Terra Ceia Association, Paola Fine Sand (0 To 8 Percent Slopes), Pits, Pomello Fine Sand (0 To 5 Percent Slopes), Quartzipsaments, Shaped (0 To 5 Percent Slopes), Sellers Mucky Loamy Fine Sand, Smyrna Fine Sand, Tavares-Urban Land Complex (0 To 5 Percent Slopes), Tavares Sand (0 To 5 Percent Slopes), Udalfic Arents-Urban Land Complex, Urban Land, Wabasso Fine Sand, and Wabasso Variant Fine Sand, as shown in Figure 2.3.3 and summarized in Table 3.

Soils within the delineated catchment area are mostly comprised of hydrologic group A with well-drained sandy and urban soils (61.3%). The remaining soils are a mixture of generally poorly draining soils (hydrologic groups A/D, B/D, and C/D). The poorly drained soils are typically found near tidal areas along the coastline.

2.3.4 Land Use Characterization

Land use data (2011) were obtained from SWFWMD for the watershed. As most of the watershed is urbanized, a large portion of the watershed, specifically along the east side around US Highway 19, is Residential land use (either high density of medium density) or commercial. Considerable areas west of US Highway 19 are coastal and consist of tidal flats, wetland prairies, saltwater marshes, wetland coniferous and mixed forests. Land uses are depicted in Figure 2.3.4 and summarized in Table 2.

2.3.5 Existing Floodplain Characterization

According to the FEMA DFIRM data (2014), obtained from SWFWMD, there are approximately 10,207 acres of existing floodplains in the watershed boundary (7,239 acres within the delineated catchment area). Of these floodplains delineated within the catchment area, approximately 81 acres are classified as Zone VE, and approximately 4,718 acres are classified as Zone AE with base flood elevation established. Existing floodplains are shown in Figure 2.3.5.

2.3.6 Tributary Hydrologic Parameterization

Hydrologic parameterization will be conducted under the next scope of work element in this project, the Watershed Management Plan. Hydrology will be analyzed using the Interconnected Channel and Pond Routing (ICPR) model which will use the Green-Ampt method to predict rainfall excess. Parameters for the Green-Ampt method will be developed from the soils and land use data compiled during this Watershed Evaluation. Times of concentration for each basin will be created using Arc Hydro Tools executed on the 5 foot grid DEM to generate the longest flow paths and slopes. A summary of rainfall stations within the watershed are summarized in Table 6.

2.3.7 QA/QC Process Description

Catchments were iterated several times in Arc Hydro to refine and obtain an acceptable level of detail. After each iteration, catchments were reviewed by the project engineer for accurate delineation and appropriateness in relationship to the DEM and the findings of desktop and field reconnaissance.

2.4 Hydraulic Feature Inventory

2.4.1 Hydraulic Feature Inventory Development

An initial hydraulic feature inventory was compiled based on ERP and FDOT documents, import of an existing GIS-based stormwater infrastructure inventory obtained from Pasco County, and review of aerial imagery. This hydraulic inventory was then later refined through field reconnaissance and survey efforts. In total, there were 3,405 pipe records, 1,091 weir records, and one bridge record created as part of the Watershed Evaluation. Of these records, only 1,129 pipe records, 305 weir records, and one bridge record are being proposed for modeling. All of these hydraulic features were developed in the project GWIS database, and are shown in Figure 2.4.1.

It should be mentioned that there were some issues noticed with the existing Pasco County Stormwater Inventory Database, which was imported to GWIS under the Watershed Evaluation phase. Some of the issues noticed were; pipes drawn in opposing directions to their provided inverts, duplicate point and line features for the same structure, empty data fields, and questionable inverts/diameters. To the greatest extent possible, especially for intermediate, model-scale features, CH2M resolved some of the inconsistencies through data collections, field reconnaissance, etc. However, for the most part, the features from the Pasco County Stormwater inventory Database were imported as-is, and were assumed to be the best available data unless other data sources showed contradiction.

2.4.2 Summary of Water Body Features

Along the western boundary of the watershed, many areas are coastally influenced and drain directly or indirectly to the Gulf of Mexico. The watershed also contains multiple waterbodies and canal systems, such as Lake Conley and Cross Bayou. The total waterbody coverage is summarized in Table 4.

The National Hydrologic Dataset (NHD) shows water body polygons across the area where no names were provided. National wetland inventory data was also compiled in as part of the water body features collection, which showed most of the wetlands are in coastal portion of the watershed west of US Highway 19.

2.4.3 Summary of Conveyance Features

There were a number of roadside swales and ditch features within that watershed that help convey drainage. For the purpose of this study, these diches and swales will be modeled as weir features with cross sections to come from available DEM data.

2.4.4 Hydraulic Connectivity

A hydrologic and hydraulic network, consisting of hydraulic junctions (hydrojunctions) and reaches (hydroedges), was generated using Arc Hydro Tools in ArcGIS. Arc Hydro tools created the hydraulic network for overland flow based upon the flow paths interpreted from the DEM.

2.4.5 QA/QC Process Description

The hydraulic inventory and hydraulic network were reviewed by the project engineer and project manager for completeness. A number of GIS checks were performed on the GWIS database to ensure proper relationships were formed between the HydroNetwork, HEP Network, and relationship tables such as the Pipe Barrel and Weir tables. Topology checks were also performed to ensure that the line features were properly snapped to an endpoint feature, and to ensure that there were no unintentional “floating”, or stand-alone, point features.

3 Topographic Survey

A significant amount of data was retrieved from the Pasco County Stormwater Inventory, however it was necessary to collect some data from field reconnaissance and outside survey efforts. A detailed survey was conducted to collect elevation (z) data for selected inventory features.

3.1 Elevation Control and Collection Accuracy

Survey data was collected per the specifications of the SWFWMD document "Acquisition of Geospatial Information to Complete the Generic Watershed Parameters" (Appendix of future Watershed Management Program Guidelines and Specifications). The horizontal datum of collected data was the North American Datum of 1983 (NAD83) upgraded to the High Accuracy Reference Network (HARN) and projected in the State Plane West coordinate system. The vertical datum of collected data was the North American Vertical Datum of 1988 (NAVD88). Horizontal and vertical control for surveyed features was established using GPS/RTK with an accuracy of better than 0.1 foot horizontally and 0.2 foot vertically.

3.2 Required Surveys

Features were identified for survey based upon selection of inventoried hydraulic features and a desktop review of aerial imagery and topographic data. These features were selected based upon size, location, contributing area and anticipated significance with regards to developing the watershed model. The majority of identified features were pipes, culverts and control structure features that were not contained in the Pasco County Stormwater Inventory, or for which data or plans were unclear or unavailable.

3.2.1 Hydraulic Feature Surveys

Features from the hydraulic feature inventory that are expected to be represented in future modeling efforts were identified for detailed survey. In general, these features were selected based upon the following criteria:

- Culverts/Control Structures connecting water bodies
- Culverts/Control Structures crossing catchment boundary lines
- Culverts/Control Structures located under significant roadways
- Culverts/Weirs that are downstream and connected to a major drainage system that will be incorporated into the model

3.2.2 Cross Section and Profile Surveys

No cross section or profile surveys were requested as part of this Watershed Evaluation. Drainage ditches and swales are to utilize the available DEM data as needed.

4 Preliminary Model Features

4.1 Subbasins

Model subbasins were created from the final version of the iterated catchments generated from Arc Hydro. The catchments, and subsequent subbasins, were generally delineated based upon ridge lines, significant drainage features, and drainage areas. In general, catchments were reviewed and generalized based upon size and depth of depression. Catchments delineated for depressions less than one foot deep and/or with an area less than one acre were scrutinized and merged to adjacent subbasins where it was considered to not have adverse impact to model representation. Areas with chronic flooding complaints were often afforded greater detail than other areas. Subbasins were generally maintained with sufficient detail to accurately represent storage and hydrology for the watershed.

There are a total of 1,213 subbasins delineated within the watershed, which are provided with the GWIS Database submitted as part of this deliverable. The subbasins were named according to the group it is located within, followed by a 5 digit unique numeral identifier (Example: A10010).

4.2 Nodes

Each delineated subbasin was assigned to one designated stage/area node that serves as the basin's loading node. These loading nodes were, for the most part, placed in the lowest point of each subbasin. Additional "dummy" stage/area nodes were also placed within the watershed, as needed. These additional stage/area nodes were placed primarily for the purpose of serving as junction nodes, or nodes that represent pipe size changes along a series of pipes.

Multiple boundary nodes (time/stage) were placed along the border of the neighboring watersheds and along the border of the Gulf of Mexico. The boundary nodes and the boundary subbasins will be refined further during the WMP phase of the project.

Each basin's assigned loading node was named according to the subbasin it is located within, preceded by the letter "N" (Example: NA10010). Additional "dummy" nodes within the subbasin were named similarly to the basin node, with a unique increased numeral component (Example: NA10011, NA10012, etc.). Nodes that will be considered for future boundary conditions take on a name preceded by "BNDRY" (Example: BNDRY0039).

There are a total of 2,114 nodes in the GWIS Database. The ICPR network, including the node locations, are represented in Figure 4.2.

4.3 Pipes and Drop Structures

Pipe and drop structure links were created based upon field reconnaissance findings, topographic survey data, and/or ERP/FDOT planset information. There are 1,030 ICPR pipe links and 99 ICPR drop structure links in the GWIS Database, summarized in Table 5. Associated to the ICPR drop structure links, there are 245 weir records. ICPR pipe links were named according to the node they originate from, followed by a "P1", "P2", etc. (Example: 10010P1). ICPR drop structure links were named according to the node they originate from, followed by a "DS1" (Example: 10010DS1).

4.4 Channels

Although there are noticeable waterbody channels within the Lower Coastal watershed, these channel systems are not being modeled as explicit channels. Instead, these waterbodies are included as part of individual basin's storage. However, important conveyance features such as box culverts are modeled along these channel reaches when present. Modeling these systems as channels could introduce future model instabilities if the channel cross sections don't demonstrate enough of a gradient to "act like a channel".

4.5 Weirs

There are two types of ICPR weir links incorporated in the model – structural weirs and natural overflows. Natural overflows were identified using the preferential flow path tool. This tool identified likely overflow locations based upon the elevation of the DEM. It is anticipated that these weirs are preliminary and will be revisited and edited after initial model runs are used to identify additional overflow locations.

Excluding the weir features associated with drop structures (discussed in Section 4.3), there are a total of 3,772 ICPR weir links. Of these, 3,712 are overland weirs and 60 are structural weir records. ICPR overland flow weirs were named according to the node they originate from, followed by a “W1”, “W2”, etc. (Example: 10010W1). ICPR structural weir links were named according to the node they originate from, followed by a “SW1”, “SW2”, etc. (Example: 10010SW1).

5 References

1. SWFWMD's Guidelines and Specifications (G&S), SWFWMD, August 2002 (current revision)
2. Acquisition of Geospatial Information to Complete the Generic Watershed Parameters, SWFWMD, Current Version

Figures

Figure 1.2

Watershed Location Map

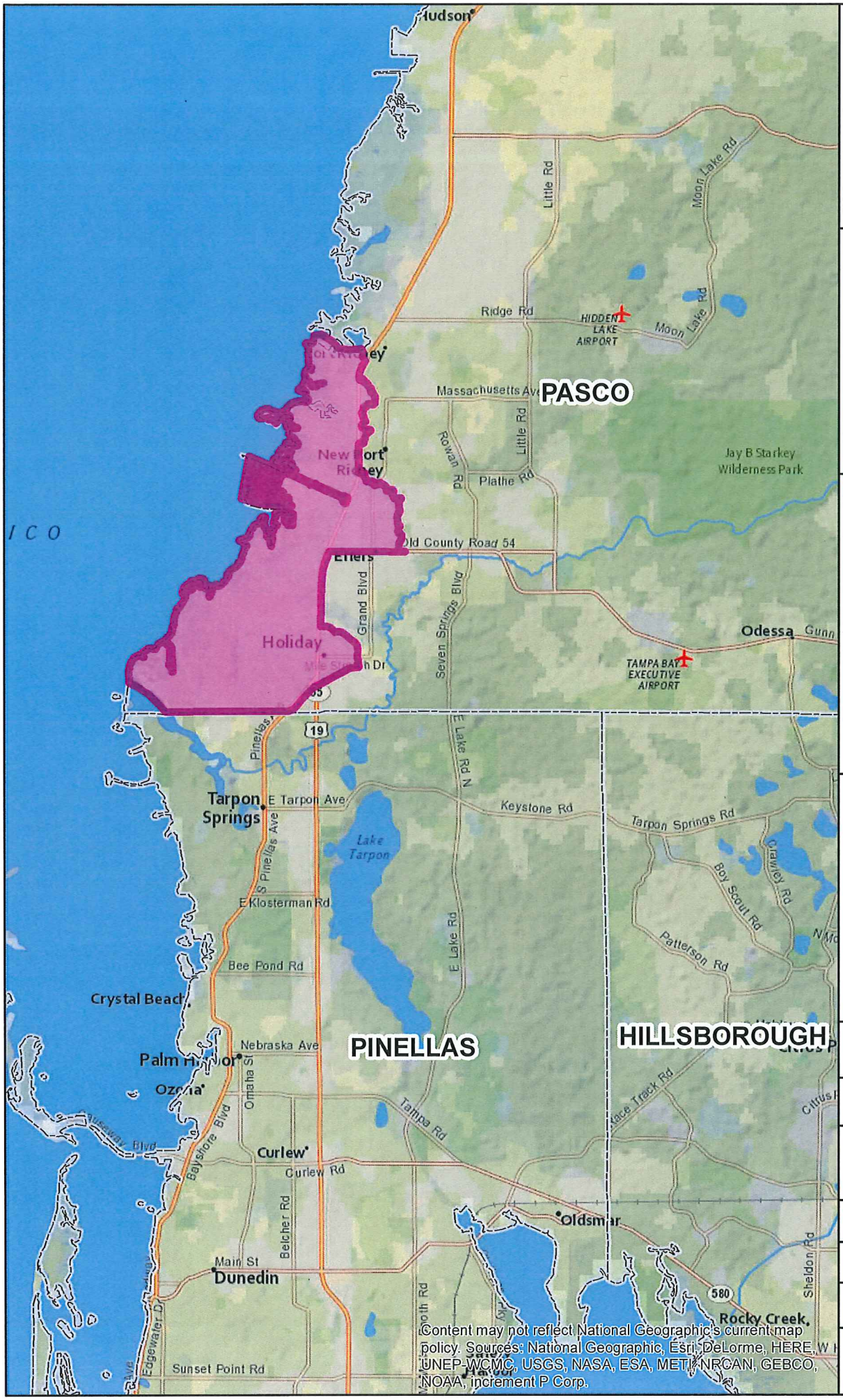
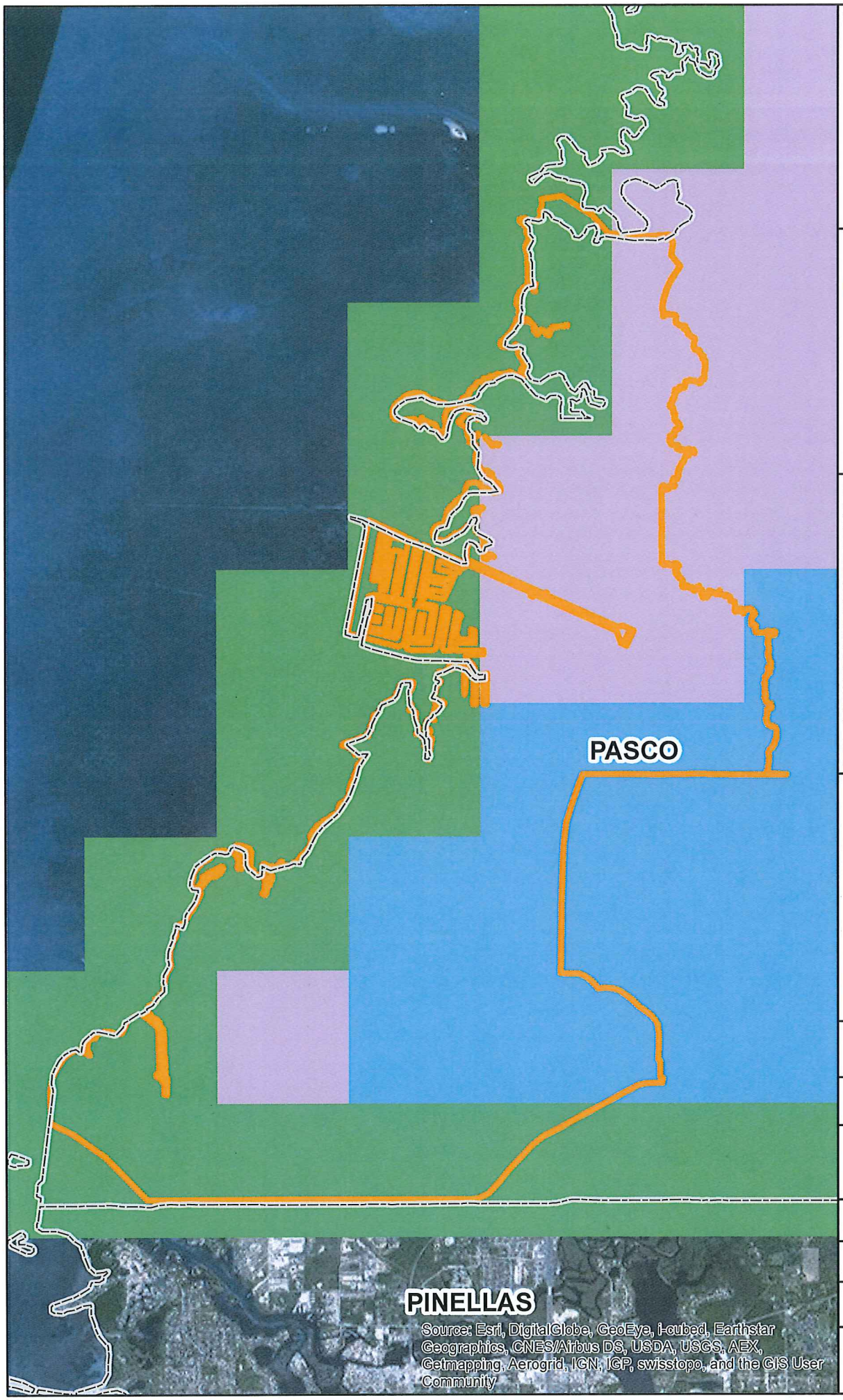

PASCO
PINELLAS
HILLSBOROUGH
Holiday
Odessa
Tarpon Springs
Crystal Beach
Palm Harbor
Ozona
Curlew
Dunedin
Oldsmar
Rocky Creek
Lake Tarpon
HIDDEN LAKE AIRPORT
TAMPA BAY EXECUTIVE AIRPORT
Jay B Starkey Wilderness Park
Ridge Rd
Massachusetts Ave
Little Rd
Moon Lake Rd
Rowan Rd
Plathe Rd
Old County Road 54
Grand Blvd
Seven Springs Blvd
E Tarpon Ave
Keystone Rd
Tarpon Springs Rd
E Klosterman Rd
Bee Pond Rd
E Lake Rd
Nebraska Ave
Omaha St
Tampa Rd
Curlew Rd
Belcher Rd
Main St
Sunset Point Rd
Sheldon Rd
Patterson Rd
Boy Scout Rd
Crawley Rd
Pinellas
S Pinellas Ave
Baysh Blvd
Eddy Ave
Eddy Ave
Eddy Ave

Figure 2.2.1

Topographic Project Areas



Legend

- Counties
- Watershed Boundary

LiDAR Project Year

- 2004
- 2007
- 2011

Notes:
This information is being developed in accordance with the Southwest Florida Water Management District's WatershedManagement Program Guidelines and is provided for informational and review purposes.
The Guidelines define the watershed parameters used to develop a computer model that simulates projected surfacewater levels. This information should be used as a referenceonly. The District does not guarantee the completeness of this information and it is being provided as preliminary. The District shall not be liable for any damages suffered as a result of using this information. If you have questions or comments on the information and the methods used, please contact the SWFWMD's Engineering Section at 352-796-7211 ext. 4232. Environmental Resource Permit (ERP) applicants are encouraged to schedule a pre-application meeting(s) with the District's Regulatory staff to discuss the use of any watershed study/model in a subsequent ERP application.

Find the District's Guidelines at:
ftp://ftp.swfwmd.state.fl.us/public/GWIS/WMP_Guidance_Documents

N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.2.1 Topographic Project Areas

Filename: LCLetterSize.mxd

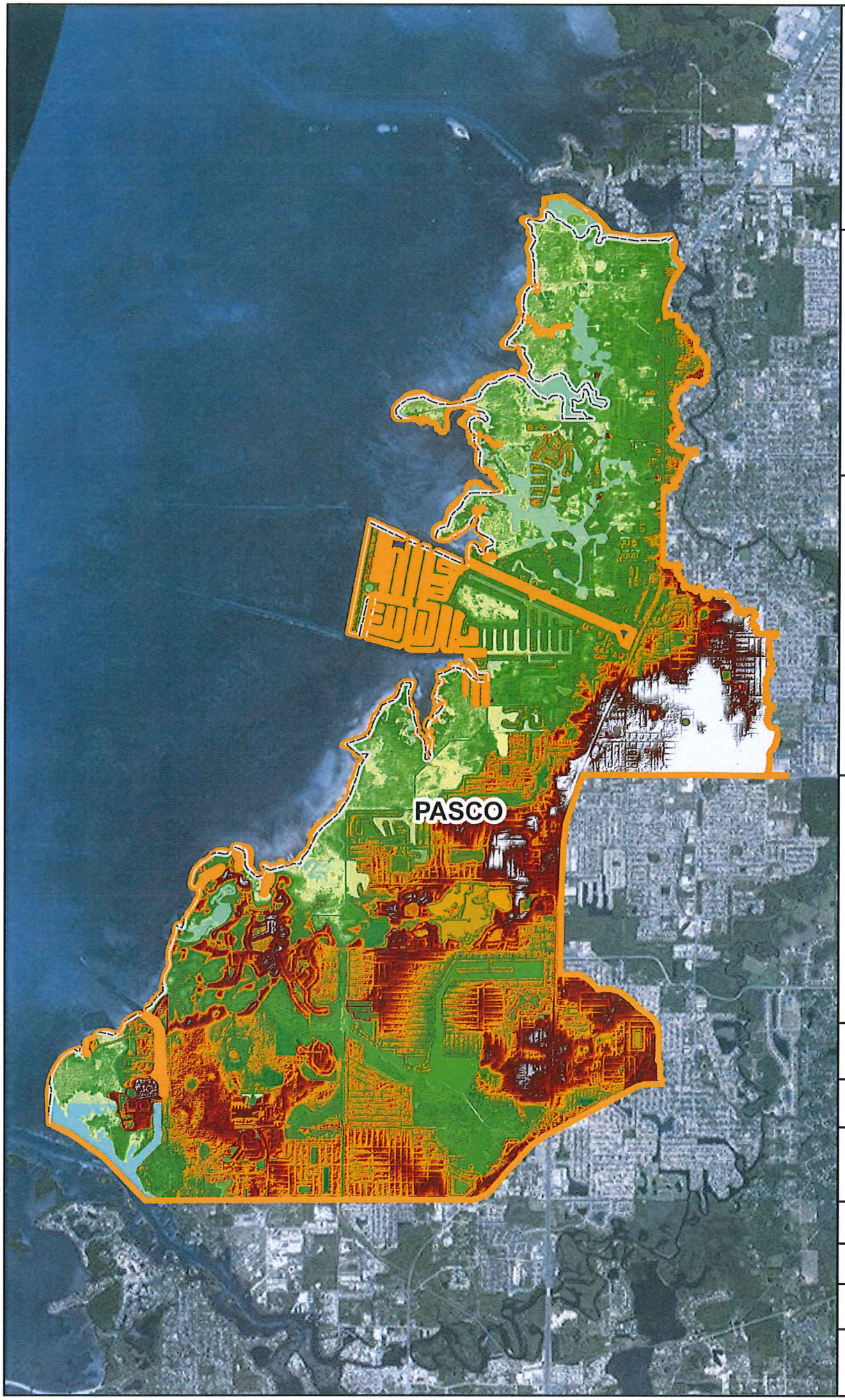
Map Date: 3/20/15

Map Prepared By: CH2M HILL

Source Background: ESRI Base Map, 2015

Figure 2.2.5

Topographic Map



Legend

Counties

Watershed Boundary

DEM Elevation (NAVD88)

Value

High : 63.1527

Low : -3.5

Notes:
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Find the District's Guidelines at:
ftp://ftp.swfwmd.state.fl.us/public/GWIS/WMP_Guidance_Documents

N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.2.5
Topographic Map

Filename:
LCLetterSize.mxd

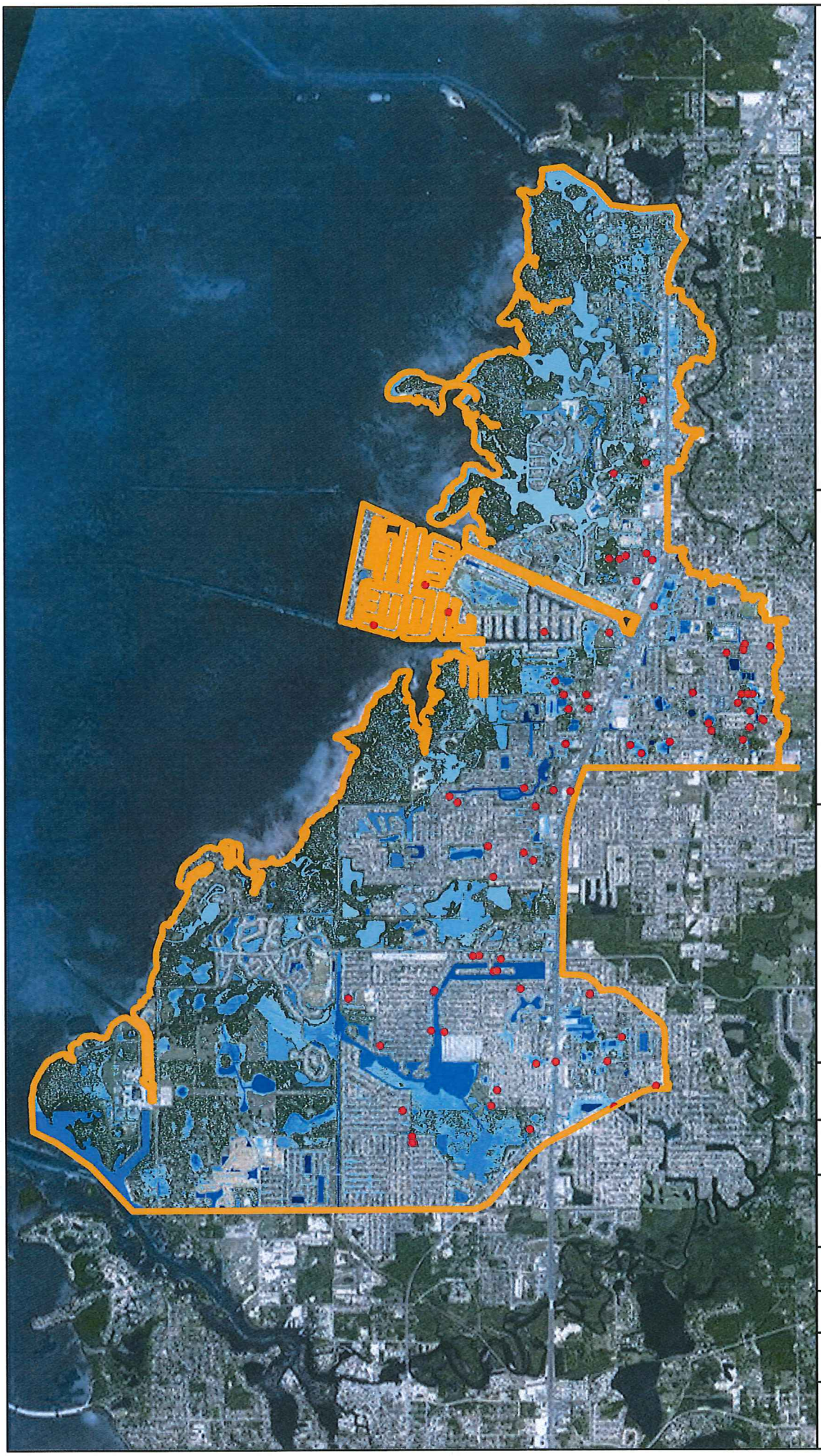
Map Date: 3/20/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.1-1

ISIS-FAST Results



Legend

- Flooding Complaints
- Watershed Boundary

ISIS-FAST 100-Yr Water Levels

Depth (ft)

High : 13.666

Low : 0.001

Notes:
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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.1-1
ISIS-FAST Results

Filename:
LCLetterSize.mxd

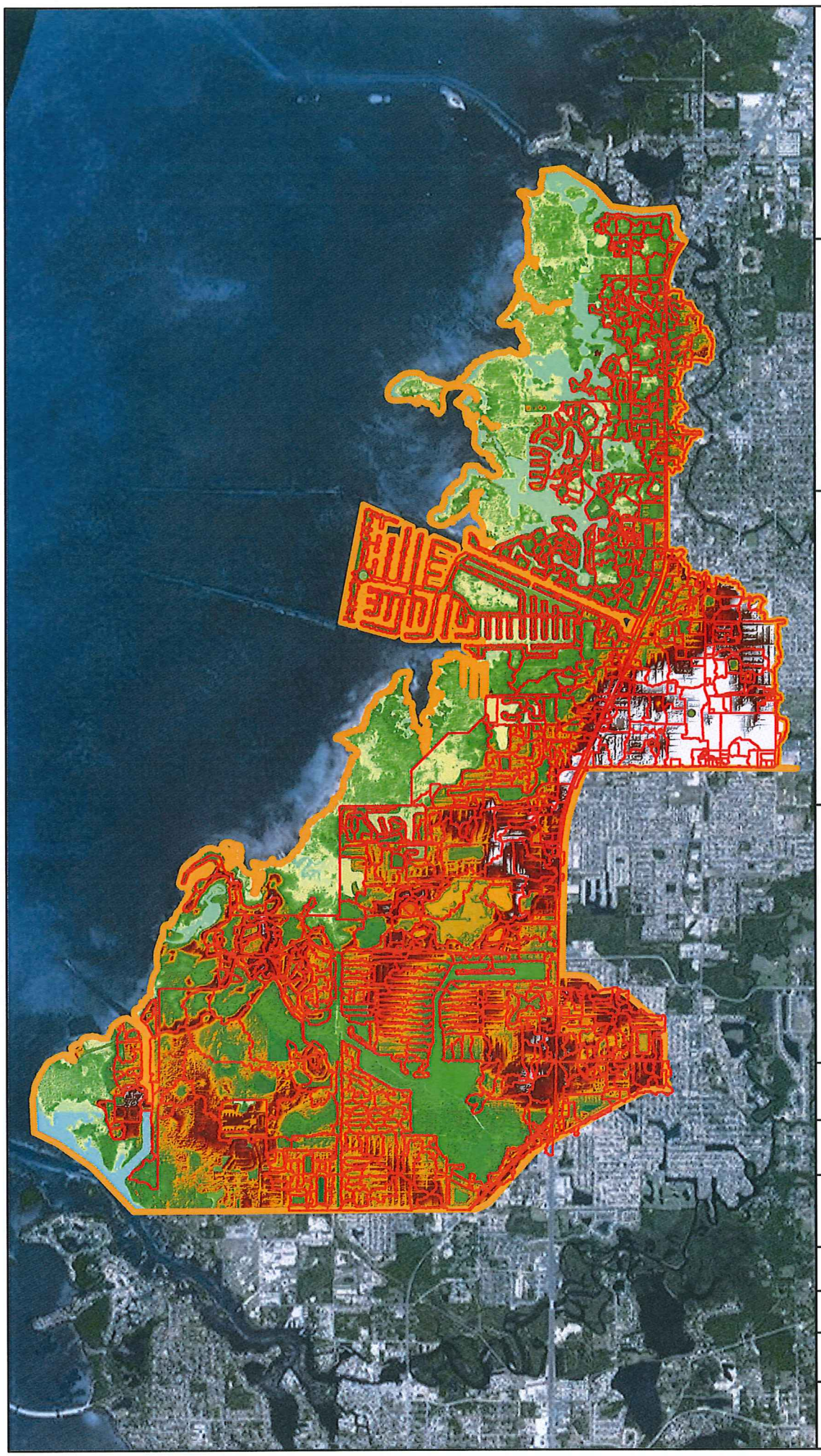
Map Date: 4/30/15

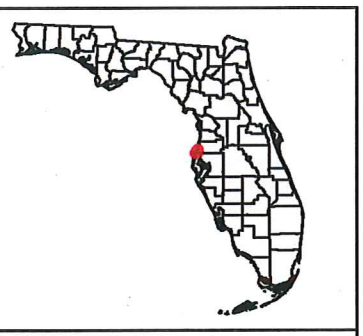
Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.1-2

Catchments Map





Legend

Catchments

Watershed Boundary

DEM Elevation (NAVD88)

Value

High : 63.1527

Low : -3.5

Notes:
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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.1-2
Catchments Map

Filename:
LCLetterSize.mxd

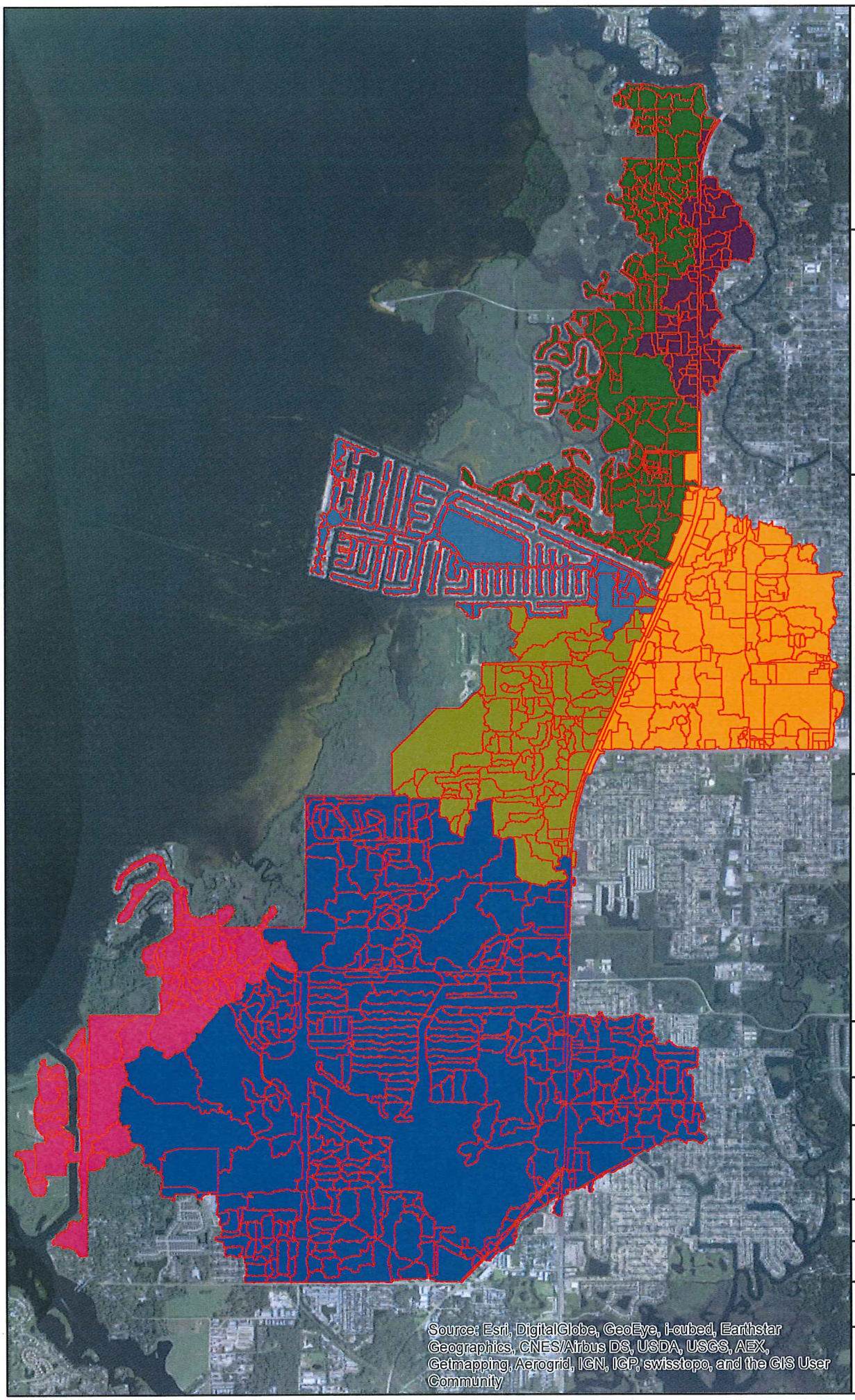
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.2

ICPR Basin Groups



Legend

Catchments

ICPR Basin Groups

- A
- B
- C
- D
- E
- F
- G

Notes:
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N

0 1,200 2,400 4,800 Feet

0 0.15 0.3 0.6 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.2
ICPR Basin Groups

Filename:
LCLetterSize.mxd

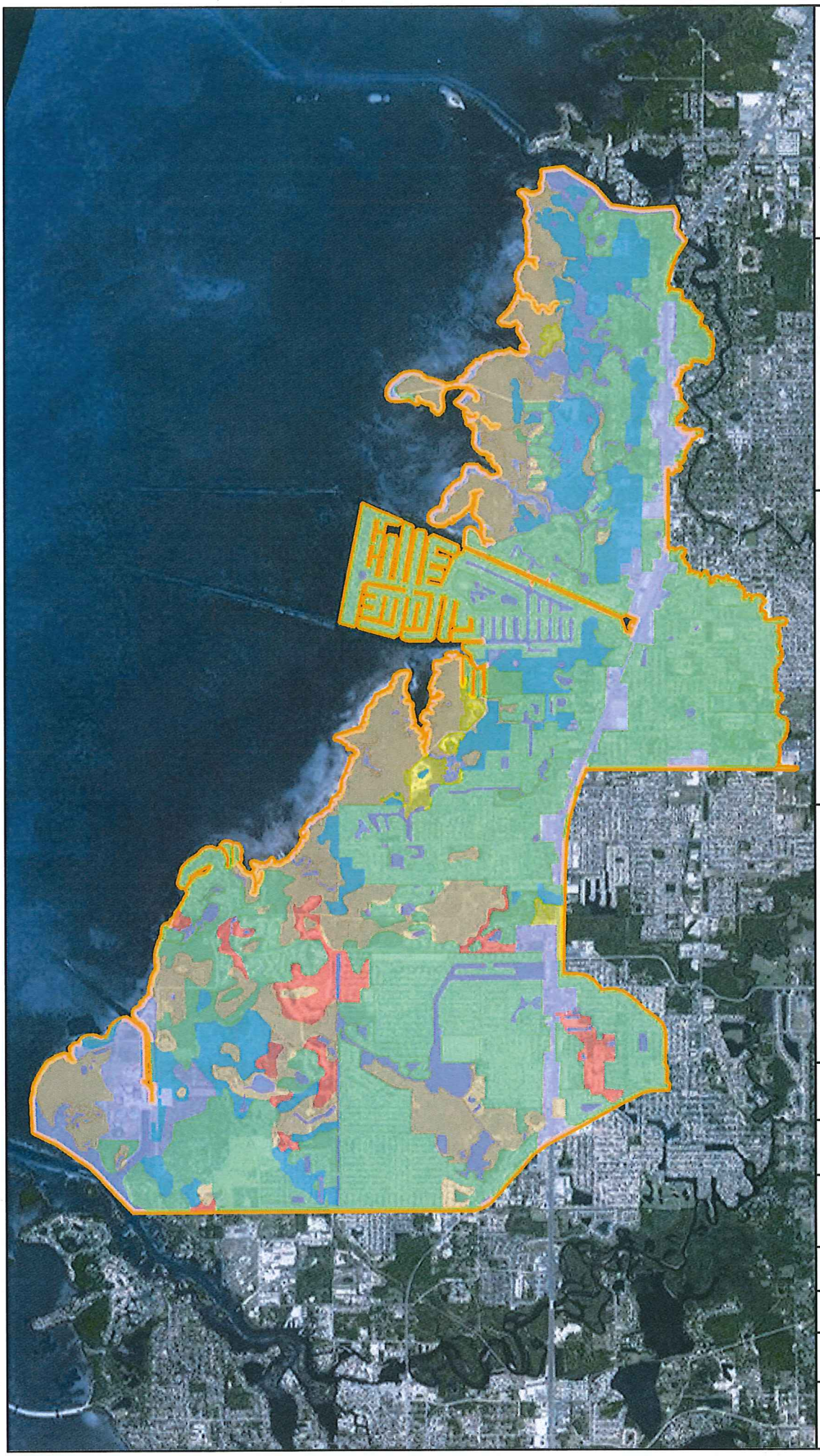
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.3

Hydrologic Soil Groups



Legend

Watershed Boundary

Soil Hydro Group

- Unclassified
- A
- A/D
- B
- B/D
- C/D

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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.3
Hydrologic Soil Groups Map

Filename:
LCLetterSize.mxd

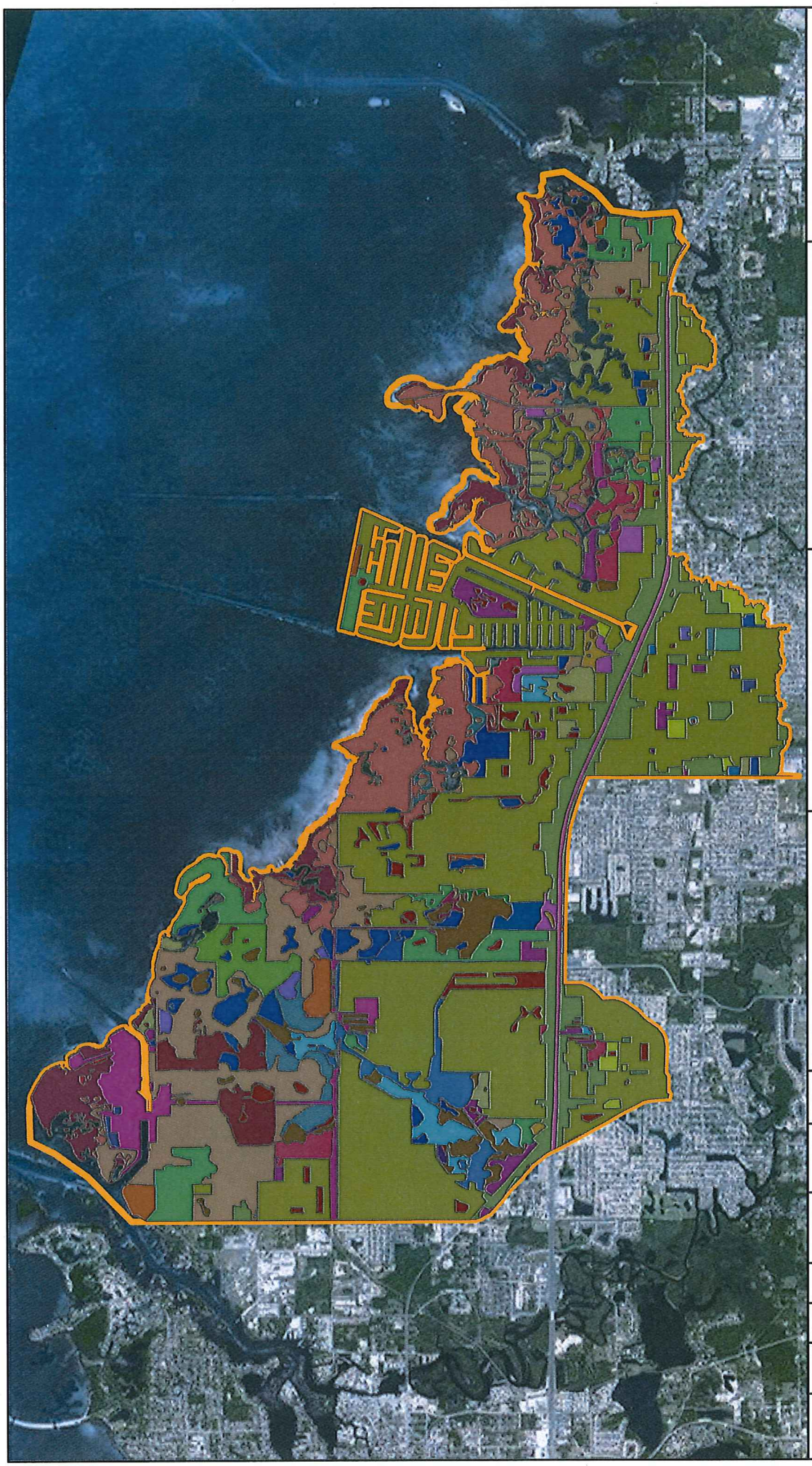
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.4

Land Use Map



Legend

Watershed Boundary

FLUCS Description

- Bay Swamps
- Bays & Estuaries
- Commercial & Services
- Cropland & Pastureland
- Cypress
- Disturbed Land
- Emergent Aquatic Veg.
- Freshwater Marshes
- Hardwood Conifer Mix
- Institutional
- Intermittent Ponds
- Lakes
- Longleaf Pine - Xeric Oak
- Mangrove Swamps
- Nurseries & Vineyards
- Open Land
- Rural Open Land
- Pine Flatwoods
- Recreational
- Reservoirs
- High Residential
- Medium Residential
- Low Residential
- Saltwater Marshes
- Shrub & Brushland
- Stream & Lake Swamps
- Tidal Flats
- Transportation
- Tree Plantations
- Upland Coniferous Forest
- Upland Hardwood Forest
- Utilities
- Wet Prairies
- Wetland Coniferous Forests
- Wetland Forested Mix

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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.4
Land Use Map

Filename:
LCLetterSize.mxd

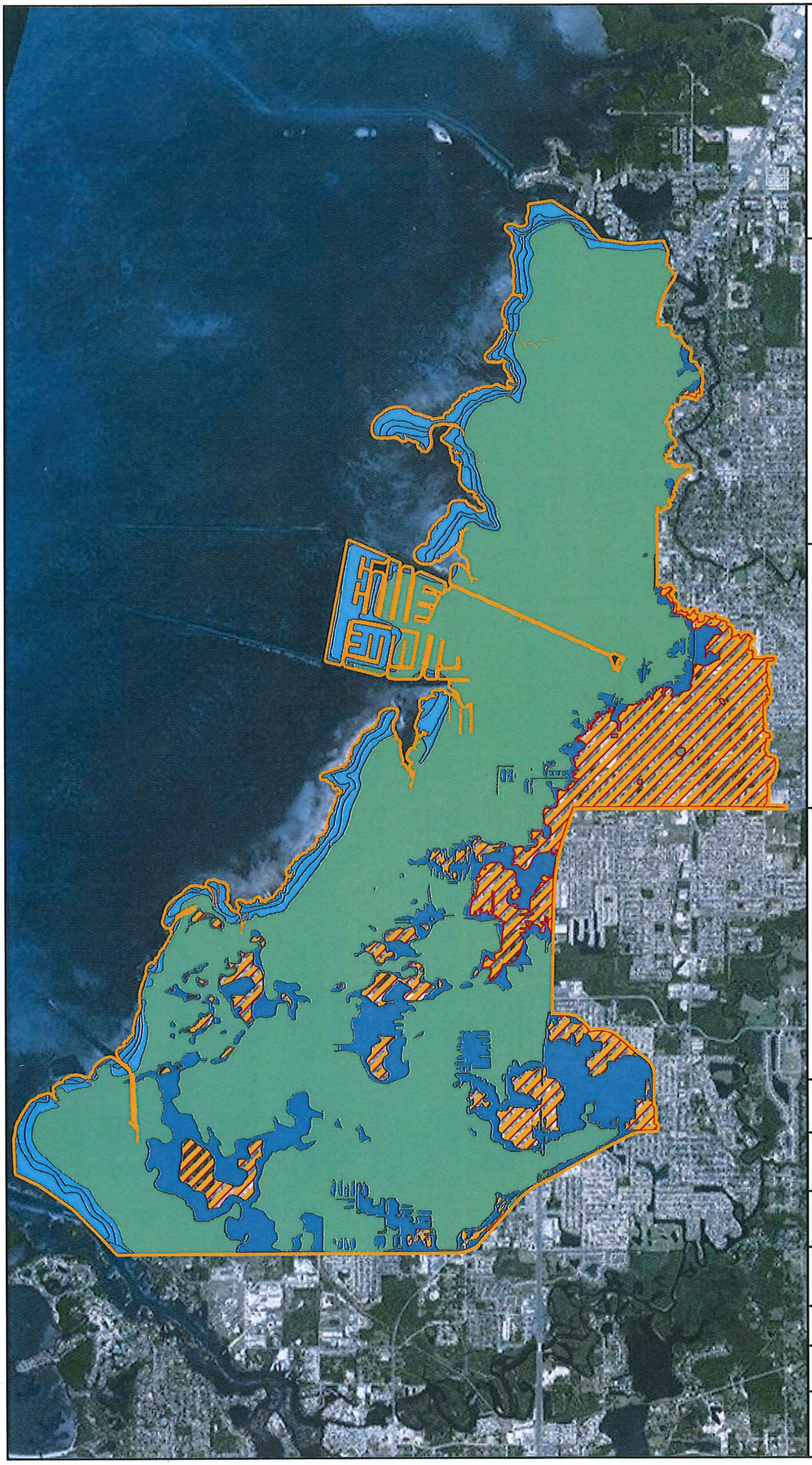
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 2.3.5

Existing FEMA Floodplain



Legend

Watershed Boundary

FEMA Flood Zones

0.2 PCT ANNUAL CHANCE

A

AE

VE

X

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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.3.5
Existing FEMA Floodplain

Filename:
LCLetterSize.mxd

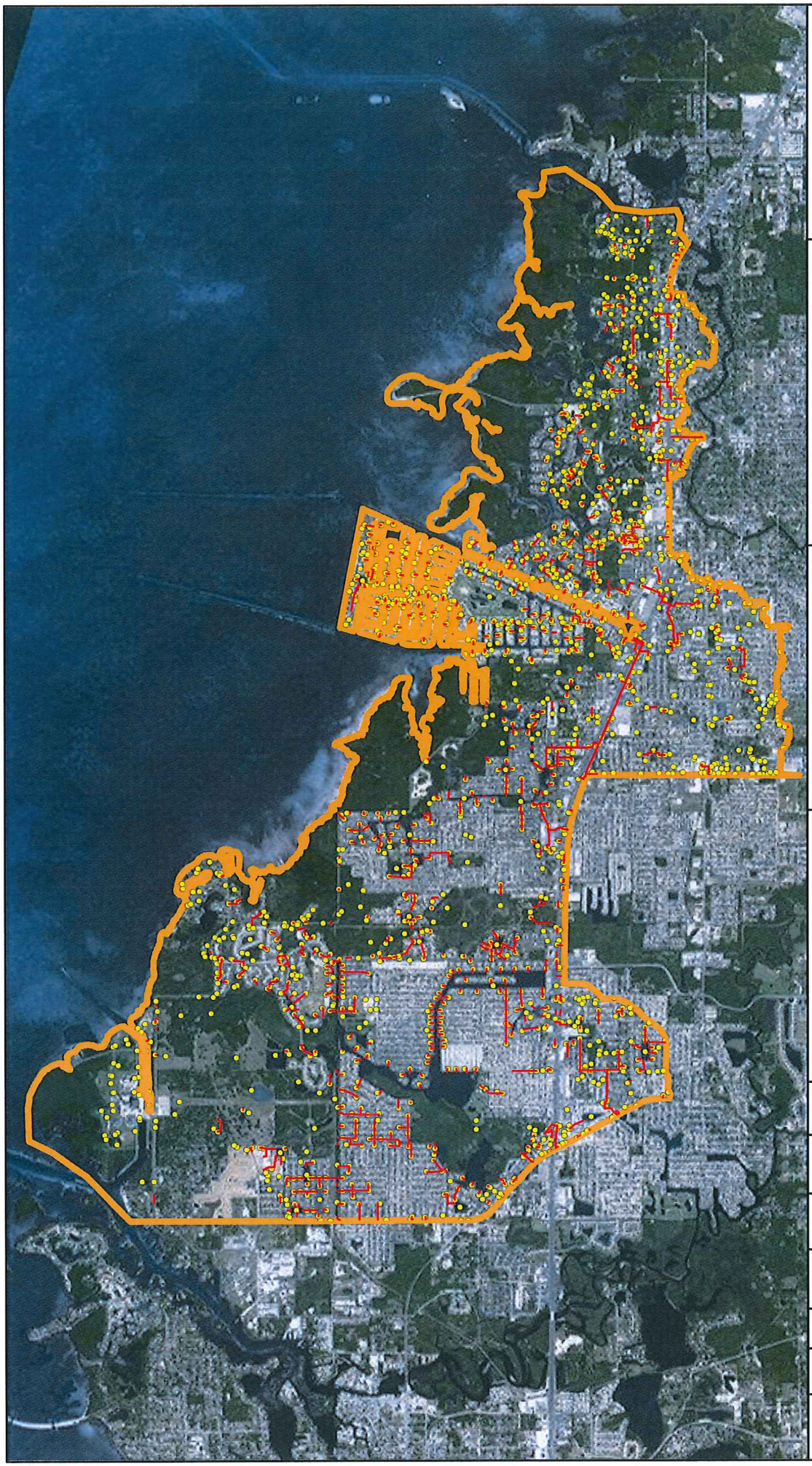
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015
FEMA DFIRM Flood Plains, Sept. 2014

Figure 2.4.1

Hydraulic Network Map



Legend

- Watershed Boundary
- HYDROEDGE
- HYDROJUNCTION

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N

0 1,500 3,000 6,000 Feet

0 0.2 0.4 0.8 Miles

Project: L842

Lower Coastal Watershed

Figure 2.4.1
Hydraulic Network Map

Filename:
LCLetterSize.mxd

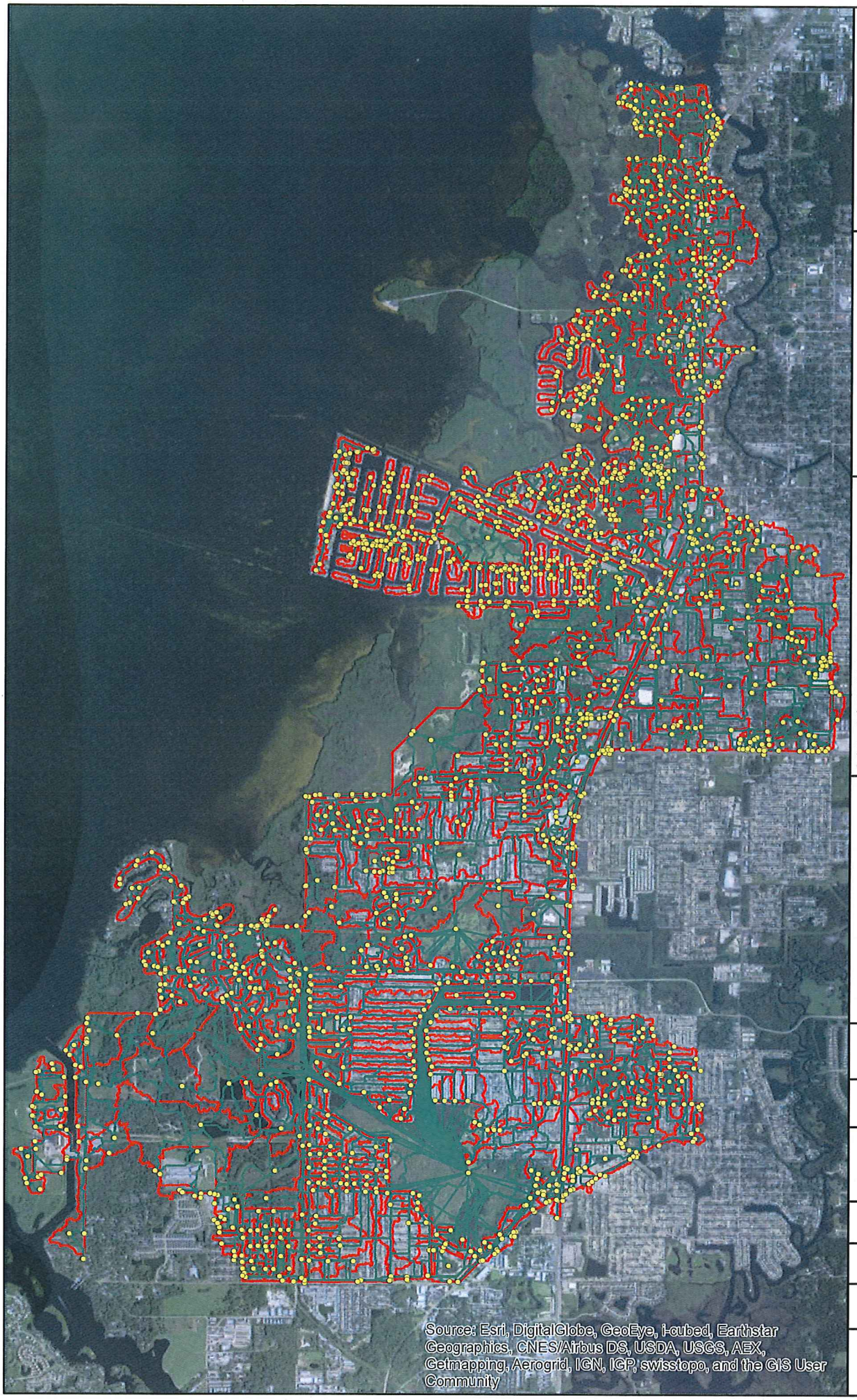
Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Figure 4.2

ICPR Network



Legend

- ICPR Nodes
- ICPR Links
- ICPR Basins

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ftp://ftp.swfwmd.state.fl.us/public/GWIS/WMP_Guidance_Documents

N

0 1,200 2,400 4,800 Feet

0 0.15 0.3 0.6 Miles

Project: L842

Lower Coastal Watershed

Figure 4.2
ICPR Network

Filename:
LCLetterSize.mxd

Map Date: 4/30/15

Map Prepared By:
CH2M HILL

Source Background:
ESRI Base Map, 2015

Tables

Table 1

Catchment Statistics by Watershed

Table 1: Catchment Statistics by Subwatershed

Subwatershed		Catchments			
Name	Area (acres)	Count	Min Area (acres)	Max Area (acres)	Avg Area (acres)
A	817.22	231	0.20	60.94	3.54
B	248.16	68	0.20	16.98	3.65
C	929.73	151	0.09	53.75	6.16
D	350.50	106	0.21	59.84	3.31
E	754.30	114	0.37	100.67	6.62
F	3616.02	461	0.24	429.76	7.84
G	540.41	82	0.60	51.30	6.59
Total	7256	1213			

Table 2

Land Use Characterization by Subwatershed

Table 2: Land Use Characterization by Subwatershed

Subwatershed	FLUCCS Code	Landuse Description	Area (acres)	% Area
A	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	13.29	0.18%
A	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	115.14	1.59%
A	1300	RESIDENTIAL HIGH DENSITY	387.30	5.34%
A	1400	COMMERCIAL AND SERVICES	54.57	0.75%
A	1700	INSTITUTIONAL	9.09	0.13%
A	1800	RECREATIONAL	4.13	0.06%
A	1900	OPEN LAND	18.34	0.25%
A	3200	SHRUB AND BRUSHLAND	1.18	0.02%
A	4110	PINE FLATWOODS	41.69	0.57%
A	4200	UPLAND HARDWOOD FORESTS - PART 1	2.24	0.03%
A	4340	HARDWOOD CONIFER MIXED	56.95	0.78%
A	5200	LAKES	0.86	0.01%
A	5300	RESERVOIRS	9.34	0.13%
A	5400	BAYS AND ESTUARIES	20.14	0.28%
A	6120	MANGROVE SWAMPS	2.36	0.03%
A	6200	WETLAND CONIFEROUS FORESTS	6.12	0.08%
A	6300	WETLAND FORESTED MIXED	9.91	0.14%
A	6410	FRESHWATER MARSHES	10.53	0.15%
A	6420	SALTWATER MARSHES	37.89	0.52%
A	8100	TRANSPORTATION	0.53	0.01%
A	8300	UTILITIES	15.64	0.22%
		Subtotal	817.22	11.26%
B	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	1.51	0.02%
B	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	27.22	0.38%
B	1300	RESIDENTIAL HIGH DENSITY	70.09	0.97%
B	1400	COMMERCIAL AND SERVICES	109.92	1.51%
B	1700	INSTITUTIONAL	6.56	0.09%
B	4340	HARDWOOD CONIFER MIXED	0.52	0.01%
B	5100	STREAMS AND WATERWAYS	0.01	0.00%
B	5300	RESERVOIRS	0.29	0.00%
B	6300	WETLAND FORESTED MIXED	3.66	0.05%
B	6410	FRESHWATER MARSHES	4.55	0.06%
B	8100	TRANSPORTATION	23.83	0.33%
		Subtotal	248.16	3.42%
C	1300	RESIDENTIAL HIGH DENSITY	535.98	7.39%
C	1400	COMMERCIAL AND SERVICES	247.01	3.40%
C	1700	INSTITUTIONAL	77.82	1.07%
C	1900	OPEN LAND	21.07	0.29%
C	4400	TREE PLANTATIONS	4.54	0.06%
C	5300	RESERVOIRS	2.87	0.04%
C	5400	BAYS AND ESTUARIES	0.00	0.00%

Subwatershed	FLUCCS Code	Landuse Description	Area (acres)	% Area
C	6410	FRESHWATER MARSHES	1.04	0.01%
C	6430	WET PRAIRIES	0.63	0.01%
C	6440	EMERGENT AQUATIC VEGETATION	0.92	0.01%
C	6530	INTERMITTENT PONDS	0.63	0.01%
C	8100	TRANSPORTATION	37.20	0.51%
		Subtotal	929.73	12.81%
D	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	2.87	0.04%
D	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	29.25	0.40%
D	1300	RESIDENTIAL HIGH DENSITY	229.71	3.17%
D	1400	COMMERCIAL AND SERVICES	6.13	0.08%
D	1700	INSTITUTIONAL	3.83	0.05%
D	1800	RECREATIONAL	0.02	0.00%
D	1820	GOLF COURSES	38.49	0.53%
D	1900	OPEN LAND	6.55	0.09%
D	3300	MIXED RANGELAND	6.28	0.09%
D	5300	RESERVOIRS	11.14	0.15%
D	5400	BAYS AND ESTUARIES	0.01	0.00%
D	6300	WETLAND FORESTED MIXED	14.10	0.19%
D	6410	FRESHWATER MARSHES	2.11	0.03%
		Subtotal	350.50	4.83%
E	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	47.43	0.65%
E	1300	RESIDENTIAL HIGH DENSITY	381.58	5.26%
E	1400	COMMERCIAL AND SERVICES	90.16	1.24%
E	1900	OPEN LAND	2.56	0.04%
E	3300	MIXED RANGELAND	1.16	0.02%
E	4340	HARDWOOD CONIFER MIXED	11.57	0.16%
E	5300	RESERVOIRS	40.60	0.56%
E	5400	BAYS AND ESTUARIES	15.86	0.22%
E	6120	MANGROVE SWAMPS	5.08	0.07%
E	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	20.34	0.28%
E	6300	WETLAND FORESTED MIXED	64.53	0.89%
E	6410	FRESHWATER MARSHES	4.12	0.06%
E	6420	SALTWATER MARSHES	44.82	0.62%
E	6440	EMERGENT AQUATIC VEGETATION	1.87	0.03%
E	6600	SALT FLATS	17.15	0.24%
E	8100	TRANSPORTATION	5.45	0.08%
		Subtotal	754.30	10.40%
F	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	32.79	0.45%
F	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	151.56	2.09%
F	1300	RESIDENTIAL HIGH DENSITY	1767.16	24.35%
F	1400	COMMERCIAL AND SERVICES	199.86	2.75%
F	1700	INSTITUTIONAL	81.47	1.12%
F	1800	RECREATIONAL	49.69	0.68%
F	1900	OPEN LAND	73.04	1.01%

Subwatershed	FLUCCS Code	Landuse Description	Area (acres)	% Area
F	2100	CROPLAND AND PASTURELAND	37.01	0.51%
F	4110	PINE FLATWOODS	50.44	0.70%
F	4340	HARDWOOD CONIFER MIXED	248.14	3.42%
F	5200	LAKES	133.99	1.85%
F	5300	RESERVOIRS	149.54	2.06%
F	5400	BAYS AND ESTUARIES	0.01	0.00%
F	6110	BAY SWAMPS	7.13	0.10%
F	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	3.12	0.04%
F	6200	WETLAND CONIFEROUS FORESTS	3.50	0.05%
F	6210	CYPRESS	7.80	0.11%
F	6300	WETLAND FORESTED MIXED	105.45	1.45%
F	6410	FRESHWATER MARSHES	317.18	4.37%
F	6420	SALTWATER MARSHES	12.82	0.18%
F	6430	WET PRAIRIES	1.68	0.02%
F	6440	EMERGENT AQUATIC VEGETATION	9.91	0.14%
F	8100	TRANSPORTATION	28.14	0.39%
F	8200	COMMUNICATIONS	11.52	0.16%
F	8300	UTILITIES	133.08	1.83%
		Subtotal	3616.03	49.83%
G	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	85.67	1.18%
G	1300	RESIDENTIAL HIGH DENSITY	61.16	0.84%
G	1800	RECREATIONAL	21.89	0.30%
G	1900	OPEN LAND	10.58	0.15%
G	3300	MIXED RANGELAND	8.35	0.12%
G	4120	LONGLEAF PINE - XERIC OAK	5.36	0.07%
G	4340	HARDWOOD CONIFER MIXED	139.36	1.92%
G	5300	RESERVOIRS	5.33	0.07%
G	5400	BAYS AND ESTUARIES	0.00	0.00%
G	6120	MANGROVE SWAMPS	0.92	0.01%
G	6300	WETLAND FORESTED MIXED	38.44	0.53%
G	6410	FRESHWATER MARSHES	30.86	0.43%
G	6430	WET PRAIRIES	0.57	0.01%
G	6530	INTERMITTENT PONDS	2.56	0.04%
G	8300	UTILITIES	129.37	1.78%
		Subtotal	540.41	7.45%
		Grand Total	7256	100.00%

Table 3

Soils Characterization by Subwatershed

Table 3: Soils Characterization by Subwatershed

Subwatershed	Soils Group	Area (acres)	% Area
A	N/A*	82.07	1.13%
A	A	456.31	6.29%
A	A/D	19.75	0.27%
A	B	259.10	3.57%
Subtotal		817.22	11.27%
B	N/A*	94.49	1.30%
B	A	127.63	1.76%
B	B	26.05	0.36%
Subtotal		248.16	3.42%
C	N/A*	135.80	1.87%
C	A	793.93	10.95%
Subtotal		929.73	12.82%
D	N/A*	11.27	0.16%
D	A	311.76	4.30%
D	B	27.47	0.38%
Subtotal		350.50	4.83%
E	N/A*	93.61	1.29%
E	A	461.59	6.36%
E	A/D	22.60	0.31%
E	B	130.15	1.79%
E	C/D	46.36	0.64%
Subtotal		754.30	10.40%
F	N/A*	422.69	5.83%
F	A	2068.83	28.53%
F	A/D	615.63	8.49%
F	B	212.69	2.93%
F	B/D	269.86	3.72%
F	C/D	22.40	0.31%
Subtotal		3612.10	49.81%
G	N/A*	132.38	1.83%
G	A	226.94	3.13%
G	A/D	88.98	1.23%
G	B	52.32	0.72%
G	B/D	39.79	0.55%
Subtotal		540.41	7.45%
Grand Total**		7252	100.00%

* Water, Pits, or Urban Land

** Soils data presented is from the Pasco County 2010 GIS data

Table 4

Summary of Waterbody Statistics

Table 4: Summary of Water Body Statistics

Subwatershed	# of Waterbody Polygons	Total Waterbody (Acres)
A	2	4.7
B	0	0
C	0	0
D	2	8.67
E	2	15.11
F	9	143.71
G	1	0.32
	Total:	**172.51**

Table 5

Summary of Hydraulic Features

Table 5: Summary of Hydraulic Features by Tributary

Subwatershed	Hydraulic Features (to be modeled) *		
	Pipe Records	Weir Records	Channel Records
A	184	70	0
B	60	13	0
C	108	38	0
D	110	14	0
E	107	12	0
F	506	120	0
G	54	38	0
Total	**1129**	**305****	**0**

* Summary only includes model features

** Only includes structural weir records, not overland weirs

Table 6

Summary of Rainfall Station Data

Table 6: Summary of Rainfall Station Data

Station Site ID	Station Name	Station Status	Station Type	LATITUDE	LONGITUDE	Begin Date	End Date	Collection Interval
20186	NEW PORT RICHEY II	Inactive	Gauge Rainfall	28 14 53.03	82 44 07.35	12/31/1984	11/30/1991	Daily
20392	HOLIDAY LAKES	Inactive	Gauge Rainfall	28 10 48.00	82 46 36.00	5/31/2000	5/31/2005	Daily

Note: All Station data came from the SWFWMD WMIS system. No data was found for the site from NOAA