SECTION 2.0
PREPARATION OF MASTER PLANS, CONSTRUCTION PLANS, AND RECORD DRAWINGS

2.1 MASTER PLAN

2.1.1 A "Master Plan" for water, wastewater, and/or reclaimed water is required for all residential or commercial projects to be constructed in multiple phases, or for single – phase residential projects with more than one pump station.

2.1.1.1 The Master Plans must be approved prior to the approval of construction plans. For large subdivisions the Master Plan may require approval before the point of connection can be issued during the processing of the utility service application.

2.1.1.2 The construction plans must be consistent with the approved Master Plan.

2.1.1.3 For any changes to the development, the Developer must submit a revised and updated Master Plan. All revised Master Plans must be submitted with a letter specifying the proposed revisions to the Master Plan, in addition to the signed and sealed plan drawings submitted in accordance with 2.1.1.5 and 2.1.2.

2.1.1.4 The requirement for submittal of a revised Master Plan may be waived by the Development Services Department (DSD) Site Engineering Review Section, in conjunction with Public Utilities Department (PUD) Utility Planning Section, if the County considers the changes to be minor or not significant.

2.1.1.5 Four signed and sealed plan drawings, along with an electronic version in pdf format, must be submitted to DSD.

2.1.1.6 Master Plan approval does not imply acceptance of easements, construction methods, or other items that may be in conflict with technical standards.

2.1.2 The "Master Plan" will consist of a layout of the major water, wastewater, and/or reclaimed water lines superimposed on a topographic map. The layout plan sheet(s) shall be at a minimum scale of 1 inch = 200 feet and show existing and proposed improvements in sufficient detail to show intent of design. In the event that the number of plan sheets exceeds two (2) sheets at the 1 inch = 200 feet scale, the Master Plan shall be submitted at a scale of 1inch = 500 feet The Master Plan shall be signed and sealed by a Professional Engineer licensed in the State of Florida. The requirements for each specific utility plan include:

2.1.2.1 General

a) The topographic map shall be of one-foot contours.
b) Developments immediately adjacent to undeveloped tracts shall include a conceptual plan for extension of potable water, wastewater, and/or reclaimed water service to said tracts.
c) "Master Plans" shall have a vicinity map showing the location of the project and the scale used.
d) All plan elevations shall use the 1988 NAVD Vertical Datum.
e) All utilities to be owned by Hillsborough County shall be located within a right of way no smaller than 50 feet in width.

2.1.2.2 Wastewater

a) Invert and top elevations for manholes.
b) Pipe diameters (both force mains and gravity lines).
c) Total wastewater flow (both average daily flow and peak) to each pump station. A summary of each unit, tract, or phase, including the contribution to each pump station, stating: Type of use (single family residential, master-metered residential,

commercial, etc.), Unit Flow Factors, and Peaking Factors.

d) Pump Station locations with top, invert, and bottom elevations

e) Clear delineation of existing versus future units or tracts.

2.1.2.3 Potable Water

a) Calculations for maximum potable water demand based on full or projected ultimate development or use gross acreage and land use. Maximum water demand will be calculated as peak hour flow plus fire flow per PUD Technical Specification 331001.

b) Consult with the PUD Planning, Records & GIS Section to obtain a "system response curve" (pressure versus flow) representing the County's water distribution network hydraulic response to the requested water demand.

c) Use the network response curve to design a water distribution network. Then, submit the "Master Plan" with a pipe network analysis (e.g., EPANET, KYPIPE, etc.) for flow and pressure distribution for approval. The "Master Plan" shall include connection points and pipe sizes. All available information on hydrant locations and lot platting should be included.

d) Total potable water flow for each unit, tract, or phase stating: Type of use (single family residential, master-metered residential, commercial, etc.), Unit Flow Factors, and Peaking Factors.

e) Clear delineation of existing versus future units or tracts.

2.1.2.4 Reclaimed Water

a) Calculations for reclaimed water demand. Minimum design standards are outlined in Technical Specification 339001, Part 5 "Design Standard for Reclaimed Water Distribution Systems."

b) Consult with the PUD Reclaimed Water Planning Team to obtain a "system response curve" representing the County's distribution network response to the requested water demand.

c) Use the network response curve to design a reclaimed water distribution network. Then, submit the final design with a pipe network hydraulic analysis for flow and pressure distribution for approval. The final design shall include connection points, pipe sizes, meter location(s), and lot platting.

2.2 CONSTRUCTION PLAN FORMAT

2.2.1 General

2.2.1.1 Plans shall be prepared on 24-inch by 36-inch sheets, unless otherwise pre-approved by the County. The cover sheet shall include a vicinity map.

2.2.1.2 An index of all drawings shall be included on the cover sheet or first sheet following. Include an overall utility plan on one sheet and if there are more than three Plan and Profile sheets, include a key map to identify the Plan and Profile sheet numbers.

2.2.1.3 A title block shall be located in the lower right hand corner of each sheet including the cover sheet identifying the Engineer of Record (EOR), firm, telephone number and page content.

2.2.1.4 All pages of blueprint/black line construction plans submitted for review and approval must be signed, sealed, and dated by the Florida Registered Professional Engineer responsible for the project.

2.2.1.5 All submittals must be accompanied by a letter of transmittal to include the DSD assigned Service Request Number, the project Folio Number(s), along with the name, address and telephone number of the project Engineer.

2.2.1.6 If a pressure system is to be constructed, a copy of the manufacturer's pump

performance curve overlaid on the system response curve must be included in the submittal.

2.2.1.7 All plan elevations shall use the 1988 NAVD Vertical Datum.

2.2.1.8 All construction plans require the EOR to have Level "A" SUE work (locate) performed for all points of connection. Level "A" SUE shall comply with the definition by ASCE 38-02 and adopted by FDOT.

2.2.2 Design Criteria: The design criteria and specifications presented in Sections 3, 4, and 5 herein and within the PUD Water, Wastewater, and Reclaimed Water Technical Specifications shall be used in preparation of design plans and specifications.

2.2.3 Drawings

2.2.3.1 Construction plans with gravity facilities shall show both plan and profile views of the gravity system. Plans with only on-site water, reclaimed water, and wastewater pressure facilities will not require profile views, unless the proposed construction will be within areas of existing infrastructure, but will require a plan view. The horizontal scale may be one inch = 20 feet down to, but no less than, one inch = 40 feet. The vertical scale shall be one inch = five feet.

2.2.3.2 **When proposed construction will be within areas of existing infrastructure**, e.g., points of connection to existing infrastructure in the road right-of-way, **plan and profile views shall be shown. The horizontal scale shall be one inch = 20 feet and the vertical scale shall be one inch = five feet**. All underground utilities, storm drains or other structures which may cross or be located close to the proposed pipelines and structures shall be shown on the drawings in both plan and profile views. Show cross section details of all conflicting crossings and location and elevation of all air release valves.

2.2.4 Utility Easements: Potable and reclaimed water transmission/distribution mains and wastewater collection systems must be constructed within County road rights-of-way. Under special circumstances (design exception), utility lines within easements may be approved, subject to conditions included in Table 2-1.

2.2.4.1 All perpetual utility easement agreements or easement dedications by Plat shall include the following condition: **"No structure shall be placed or constructed, permanently or temporarily, on, in, or over the easement."**

2.2.4.2 Water, wastewater, and reclaimed water easements outside the right-of-way shall be dedicated for "Hillsborough County" use, and not specified for "public" use. No private entities shall be allowed to use easements dedicated to the County.

a) Meter assemblies (greater than 2" in size) shall be installed within a dedicated Hillsborough County easement. The easement width shall be a minimum of 20 feet.

b) A minimum five-foot "landscape free" buffer shall be maintained around the meter slab. No mulch or landscape shall be installed within this buffer zone.

Table 2-1: Special Circumstances (Design Exceptions)

Special Circumstances		
Easement Over Lot Lines	Gravity Wastewater Lines	• Easement width of 20 feet (minimum) • Line installed in the center of the easement • Pipe material shall be PVC • No Lateral connections allowed
	Pressure Lines (Potable/Reclaimed Mains, Force Mains)	• Easement width of 20 feet (minimum) • Line installed in the center of the easement • Line installed within a steel sleeve • Sleeve to extend minimum of 15 feet beyond front plane of adjacent houses and 20 feet minimum beyond the rear plane of adjacent houses • Top of sleeve to be a minimum of three feet (potable/reclaimed) or four (force main) feet below grade • Install isolation valves in the right-of-way and near the rear of the lots
Easement in Open Area	Gravity Wastewater Lines	• Easement width of 25 feet (minimum) for lines up to 15 feet deep • Easement width of 30 feet (minimum) for lines greater than 15 feet deep • Line installed in the center of the easement • Pipe material shall be PVC • No lateral connections allowed
	Pressure Lines (Potable/Reclaimed Mains, Force Mains)	• Easement width of 20 feet (minimum) • Line installed in the center of the easement

2.3 STANDARD ITEMS FOR CONSTRUCTION PLAN REVIEW

2.3.1 All Construction Plans

2.3.1.1 Plans on 24-inch by 36-inch paper.

2.3.1.2 Proper scale is used and noted on each view.

2.3.1.3 Plans must reflect the approved point of connection (P.O.C.) as specified in the "Service Application Conditional Approval Letter."

2.3.1.4 North arrow, abbreviations, notes, etc.

2.3.1.5 Signed, sealed and dated by the Engineer of Record registered in the State of Florida (all sheets).

2.3.1.6 Width and center line of each right-of-way indicated.

2.3.1.7 Width of pavement and distance to property line shown for all streets.

2.3.1.8 Street names or identifiers indicated (correct location on plan).

2.3.1.9 Subdivision name, lot, and block numbers.

2.3.1.10 All existing County-regulated utilities proximate to the design shall be shown on the plan view in their reported location with dimensioning.

2.3.1.11 Maintain a minimum of 18 inches vertical clearance for all utility crossings.

2.3.1.12 Size, type, material, and length of pipes shown for all water, reclaimed water, and wastewater lines both on-site and off-site.

2.3.1.13 Whenever the water, reclaimed water, or wastewater line crosses existing pavement, specify the crossing method, i.e., jack and bore or open-cut.

2.3.1.14 Specify the invert of all intersecting utilities on the plan or profile views with the accompanying SUE information.

2.3.1.15 Minimum line clearance from property line is five feet.

2.3.1.16 Minimum cover is 36 inches over water and reclaimed water pipelines, and 48 inches over force main pipelines.

2.3.1.17 Permanent structures shall not be constructed in easements or right-of ways containing water, reclaimed water or wastewater utilities.

2.3.1.18 An aesthetic plan to address above ground water meter assemblies and any other above ground facilities shall be submitted explaining how visual impact is to be minimized.

2.3.1.19 Datum information marked on plans.

2.3.2 Plans with Water Mains

2.3.2.1 Joint restraint length shall be specified at all water main bends, valves, fittings, fire hydrants, and tapping sleeves. The joint restraint information shall be included on the plan and profile drawings. The joint restraint detail shall conform to County specifications.

2.3.2.2 Valves with roadway boxes shall be provided for all branch connections (three valves on a tee, four valves on a cross), loop ends, fire hydrant stubs and other locations, as required by Hillsborough County PUD to facilitate operation of the distribution system. Valves shall be placed so that the maximum allowable length of water main required to shut down for repair work shall not be more than 500 feet in commercial, industrial, multi-family and residential districts; and 1,000 feet in rural areas. If construction is to be phased, a valve followed by one full length of pipe must be installed at the end of each line that is to be continued. Valves shall meet the requirements of PUD Technical Specification 331001.

2.3.2.3 Air release valves, or fire hydrants, shall be specified water main high points where the profile is such that air pockets or entrapment could occur resulting in flow blockage. Manual air release valves are preferred, over automatic ARV's.

2.3.2.4 Fire hydrant spacing in accordance with PUD Technical Specification 331001.

2.3.2.5 The location of sleeves for use in connection with far side water service installations.

2.3.2.6 Water distribution mains within residential subdivisions shall be PVC, or Ductile Iron Pipe (DIP), and shall comply with the requirements of PUD Technical Specification 331001. All other water mains shall be DIP. Note size and type of material.

2.3.2.7 A note indicating that PVC water mains shall have suitable locator/tracer wire affixed to the pipe.

2.3.3 Plans with Wastewater Gravity Mains

2.3.3.1 For gravity mains, the size, type of pipe, slope, and distance between manholes shall be stated on the profile view.

2.3.3.2 Invert elevations and directions shall be specified for each pipe entering or exiting a manhole. Rim elevation must also be specified. Identify the lowest point (rim elevation) in the gravity system.

2.3.3.3 All manhole stubs and connections shall be shown on both the plan and profile view. All stubs shall include plugs.

2.3.3.4 Manhole and manhole connection details shall be shown.

2.3.3.5 Drop manhole and detail is required for drops two feet or more.

2.3.3.6 Gravity lines shall be eight-inch PVC minimum within right-of-way, six-inch minimum for double service laterals, and four-inch minimum for single service laterals.

2.3.3.7 Manholes shall include water-tight manhole cover inserts.

2.3.4 Plans with Wastewater Force Mains

2.3.4.1 Joint restraint length shall be specified at all force main bends, valves, fittings, and tapping sleeves. The joint restraint information shall be included on the plan and profile drawings. The joint restraint detail shall conform to County specifications.

2.3.4.2 Valves with roadway boxes shall be provided for all branch connections (three valves on a tee, four valves on a cross), and other locations as required by the Hillsborough County PUD to facilitate the operation of the distribution system. In-line valves shall be provided at intervals not to exceed 1,000 feet. Valves shall meet the requirements of PUD Technical Specification 333002.

2.3.4.3 Air release valves shall be specified where the force main profile is such that air pockets or entrapment could occur resulting in flow blockage.

2.3.4.4 A note indicating that all PVC force mains shall have a locator/ tracer wire affixed to the pipe.

2.3.4.5 Pipe used in force mains shall comply with the requirements of PUD Technical Specification 333002.

2.3.5 Plans with Reclaimed Water Mains

2.3.5.1 Joint restraint length shall be specified at all reclaimed water main bends, valves, fittings, and tapping sleeves. The joint restraint information shall be included on the plan and profile drawings. The joint restraint detail shall conform to County specifications.

2.3.5.2 Valves with roadway boxes shall be provided for all branch connections (three valves on a tee, four valves on a cross), and other locations as required by Hillsborough County PUD to facilitate operation of the distribution system. Valves shall be placed so that the maximum allowable length of reclaimed water main required to shut down for repair work shall not be more than 1,000 feet in commercial, industrial, multi-family, and residential districts; and 2,000 feet on transmission systems. If construction is to be phased, a valve followed by one full length of pipe shall be installed at the end of each line that is to be extended. Valves shall meet the requirements of PUD Technical Specification 339001.

2.3.5.3 Air release valves (manual preferred) shall be specified where the water main profile is such that air pockets or entrapment could occur resulting in flow blockage.

2.3.5.4 The location of sleeves for use in connection with far side water service installations.

2.3.5.5 Reclaimed water distribution mains within residential subdivisions shall be PVC, or Ductile Iron Pipe (DIP). All other water mains shall be DIP. Note size and type of material.

2.3.5.6 A note indicating that PVC reclaimed water mains shall have a locator/tracer wire affixed to the pipe.

2.3.6 Jack and Bore Crossings

2.3.6.1 Jacked crossings shall show the casing pipe on both the plan and profile view. County standard jacking detail must be included. Jack & Bore details can be found in, Specification 331002 for potable water mains; Specification 333006 for wastewater mains; and Specification 339002 for reclaimed water mains. Refer to Specification 330524 for installation requirements.

2.3.6.2 A cross sectional detail of the jacking shall be included with all accompanying SUE information. All utility crossings require a Level "A" SUE locate.
2.3.6.3 Casing pipe diameter must be specified on the detail and profile views.
2.3.6.4 Class and thickness of casing pipe shall be specified.

2.3.7 Wastewater Pump Stations (privately owned)
2.3.7.1 Location of pump station on private property.
2.3.7.2 Design capacity (average daily/peak flows) and system response/curve calculations.
2.3.7.3 Pump identification, including all nameplate data. Pump curve for selected pump with design point noted.
2.3.7.4 Wet well operating elevations, inverts, and slab elevations.
2.3.7.5 Identification of fittings and valves on private property.

2.3.8 Wastewater Pump Stations (to be County owned and maintained)
2.3.8.1 Size of site to be dedicated to County. The service driveway shall be a minimum of 28 feet from edge of road pavement to front of pump station fence/gate, unless otherwise approved.
2.3.8.2 Setback requirements for a Master Pump Station (serves 3,000 ERCs or more) are 20 feet to residential lot line and 50 feet to surrounding residential structures or building envelopes. Setback requirements for a Neighborhood Pump Station (serves less than 3,000 ERCs.) are 20 feet to the rear or side lot line and 30 feet to surrounding residential structures or building envelopes.
2.3.8.3 All utilities required for maintenance and operation of the pump station.
2.3.8.4 Valve and piping identification.
2.3.8.5 Backflow prevention device.
2.3.8.6 By-pass capabilities.
2.3.8.7 Pump identification, including all nameplate data.
2.3.8.8 Design capacity (average daily/peak flows) and system response/curve calculations.
2.3.8.9 Wet well design criteria and pump control level settings.
2.3.8.10 Pump curve for selected pump with design point noted.
2.3.8.11 Information in Sections 2.3.8.7 - 2.3.8.10, above, shall be included on a pump station calculations detail sheet.
2.3.8.12 Electrical Load Calculation, short circuit analysis, arc-flash classification for each control panel, and Breaker Coordination Study included on electrical sheet.

2.3.9 Wastewater Pump Stations Hydraulic Requirements: Prior to actual design of any pumping station, the Developer's Engineer must contact the Site Engineering Review Section of the Development Services Department and the Utility Planning Section of PUD. Proper coordination between the Developer's Engineer and these Sections will assure the proposed pumping station will meet the hydraulic requirements of the County wastewater system.

2.3.10 Plan Submission Check List: Appendix 1 is a check list which the Engineer may use, if desired, as a final check on construction plans prior to plan submission to the County.

2.4 RECORD DRAWING SUBMITTALS FOR PUD

2.4.1 Following completion of construction and testing, the Engineer of Record (licensed in the State of Florida) shall submit, to the DSD Site Engineering Review Section, or the HC Project Manager (for Capital Improvement Projects), the following:
2.4.1.1 Two sets of "Record" drawings on CD:

a) AutoCAD:
- Contributed Assets: One (1) AutoCAD 2012 or later DWG file having no XREF dependencies and containing a consolidated, pre-construction base map geo-referenced to the West Florida State Plane coordinate system and visibly include at least one (1) County benchmark published in LABINS. Said base map shall include the site topography, roadway geometry, all existing utility geometry (water, wastewater, reclaimed water, storm water, and other buried utilities if known), all newly installed utility geometry (water, wastewater, reclaimed water, and storm water), and all newly installed utility features (valves, fittings, manholes, etc.). All geometry and utility features shall be easily discernable (line weight and type) on separate layers with appropriate labeling. File should not contain any cross sections, profiles, construction notes, tabs, dimensions, or details.
- Capital Improvement Projects: One (1) complete project file in AutoCAD 2014 or later containing all associated XREFs, blocks, sheets, survey drawings, details, profiles, DWF underlays, point clouds and raster images. Also, one (1) consolidated drawing file in DWG format meeting all the requirements of the Contributed Assets submittal delineated above.

b) One (1) PDF file containing a complete set of Record Drawings for the Project. The PDF file shall include the entire project plan set, from cover sheet through the final details. It shall be comprehensive in nature and include all water, wastewater, and reclaimed water utility design sheets, all plan/profile sheets, all roadway design sheets, all storm water utility and drainage design sheets, all cross sections, all construction details, and any landscaping plans associated with the project (saved at 24-inch by 36-inch, 300 DPI with bar scale).

2.4.1.2 In addition, three sets of rolled 24-inch by 36-inch blue or black line prints, all pages signed and dated in ink and sealed by the Engineer of Record. If BOCC acceptance is not required, the number of blue/black line print sets can be reduced to two.

2.4.2 All drawing revisions shall be consistent in style, color, line weight, font, symbol, and layer with the original construction documents. No additional colors, fonts, line weights, or block symbols shall be accepted.

2.4.3 All file revisions must be performed on a computer using AutoCAD 2012 or later. No conversions from Microstation or other CAD based programs will be accepted.

2.4.4 Record drawings must show changes to and deviations from approved construction plans. They must clearly indicate the “as-built” condition. Changed information must be crossed out while remaining legible with the new information printed beside the original. Significant changes such as pipeline routing or alignment shall be highlighted on the drawings using a "cloud." The completed Record Drawings shall have the look and appearance of the original. The Record Drawings shall include the following information:

2.4.4.1 All Water/Wastewater/Reclaimed Water Record Drawings

a) Offsets from edge of pavement and right-of-way to pipe lines shall be shown at not greater than 200 feet intervals.
b) Location of casing pipe, concrete encasement, and sheeting by X-Y-Z coordinate. Include size (diameter), length, material type and wall thickness of casing.
c) Record all changes to finished grade.
d) Datum information
e) Record changes in alignment or elevation of other utilities due to construction.

Record all found utilities not shown on approved construction plans.

f) Installed pipe diameter, material type, and AWWA/ASTM/ANSI classification.

g) If abandonment of existing facilities is approved by the County, provide size, type, depth, location, and limits (XYZ coordinates) of any abandoned pipe. Also include the method of abandonment (i.e., grout filled, etc.).

h) Cross-sectional details shall be provided where utilities cross.

i) Record Drawings shall contain a clear statement if the project name has changed.

2.4.4.2 Water, Wastewater, and Reclaimed Water Pressure Pipe Drawings

a) X-Y-Z coordinates and type of all fittings, bends, reducers, sleeves, plugs, caps, tees, crosses, taps, restrained joints, valves, blow-offs, hydrants, high and low points, etc.

b) Provide installed top of pipe (XYZ coordinates) and finished grade elevations at a minimum of 200 feet intervals for all pressure mains and at all high points for air release valves.

c) X-Y-Z coordinates for all service connections when they are not on property lines.

2.4.4.3 Gravity Line Drawings

a) On the plan view, show X-Y-Z coordinates at center of wastewater manhole cover.

b) Annotate the distance between manholes, finished rim elevations, entrance and exit pipe invert elevations, invert directions at each manhole, and pipe slopes on plan and profile sheets.

c) Provide X-Y of all lateral cleanouts and the depth of cover at the property line if it is less than or greater than the standard depth (three feet – four feet).

d) Provide size, length, invert elevation and surface grade of stub outs for future connections.

2.4.5 Other Certification: When certification of "Record" Drawings is performed by an Engineer other than the Design Engineer, the following requirements shall apply:

2.4.5.1 The certification shall be completed by a Registered Professional Engineer (PE) licensed in the State of Florida.

2.4.5.2 Any deviations from the original design which were made shall be coordinated with the Design Engineer to insure that the integrity of the original design was not compromised. The deviations shall be highlighted on the drawing, using a “cloud”, to indicate any items revised by the certifying Engineer. Revisions shown on Record Drawings shall be in CAD or drafted to the same quality as the original drawings, not hand drawn. All revisions to computer generated drawings shall be made in AutoCAD 2012 or later using the same symbols, style, colors, line weights and fonts as used in the original drawings. All completed Record Drawings shall have the look and appearance of the original drawings.

2.4.5.3 A statement by the certifying Engineer, responsible for making the revisions, shall be placed on each sheet, which states that they made the revisions designated by the “cloud” and is responsible for the revision.

a) Each sheet shall contain the certifying Engineer's engineering company logo with their Certificate of Authorization, name, address and telephone number.

b) Each sheet shall contain a statement that the certifying Engineer, or someone under their direct supervision, observed the construction, prepared the Record Drawing, and found that the construction was performed in substantial compliance with the intent of the design drawings. Statements by the certifying Engineer disclaiming responsibility for accuracy of Record Drawings are **NOT** allowed.

c) The certifying Engineer shall sign in ink, date, and seal each record drawing sheet. Drawings and electronic file submittals shall comply with the requirements in

Section 2.4.1

2.4.6 Construction Feature Information/Asset Data Templates: Information on the as-built features (potable water, wastewater, and reclaimed water) shall be submitted per Appendix 2. The information shall be submitted on a CD at the time of Record Drawing submittal. Each feature on the spreadsheet shall be given a unique ID that shall correspond with its designation on the Record Drawings.