



**Civil Engineering Review Checklist**  
**Friday, January 5, 2024**

Please utilize the following checklist as a guide only. The checklist is NOT a substitute for the Unified Development Code (“UDC”) and only intends to summarize the UDC in a clear and cogent manner. To the extent that the checklist is in conflict in any way with the UDC, the UDC takes precedence. It is incumbent upon the engineer of record to meet or exceed applicable UDC requirements, general engineering standards, and all applicable federal, state, and local laws and requirements.

**NOTE: Development is defined as any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavating, drilling operations, or storage of equipment or materials. UDC 7.5.C.**

<b>REQUIRED FOR ALL PROJECTS:</b>		<b>40%</b>	<b>100%</b>
<b>1.0</b>	Project narrative of the proposed development that discusses all existing and proposed conditions including utilities and conceptual layouts. <b>UDC Table 13-3, 13-4, &amp; 17-2</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.1</b>	Provide a Geotechnical Report for pavement designs. <b>UDC 15.6.F.</b>		<input type="checkbox"/>
<b>1.2</b>	Provide a general note on the plans stating all improvements will be completed in compliance with all of the City of Spring Hill’s specifications.		<input type="checkbox"/>
<b>1.3</b>	Provide a preservation area adjacent to all watercourses two times the water course width, be designated as a water quality buffer zone. <b>UDC 15.9.C.4.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.4</b>	Provide benchmark coordinates and datums. <b>UDC 17.7.B.1</b>		<input type="checkbox"/>
<b>1.5</b>	All service lines crossing new residential streets shall be installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe. All service lines crossing existing paved roads shall be bored and jacked and installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe. A minimum size 12 gauge copper wire shall be installed along the pipe for detection. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached.		<input type="checkbox"/>
<b>REQUIRED FOR TRANSPORTATION RELATED IMPROVEMENTS:</b>		<b>40%</b>	<b>100%</b>
<b>1.0</b>	Display all existing and proposed pedestrian access including sidewalks, multi-use trails, and bicycle paths	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.1</b>	Dimension and label distances: <b>A.</b> Turn lanes and deceleration lanes with associated storage and transition areas. <b>B.</b> Stacking distances <b>C.</b> Between driveways and intersecting streets. <b>D.</b> Stopping sight distance measurements include calculations. <b>E.</b> Sight triangle and visibility clearances. State the roadway design speed for review purposes.	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.2</b>	Call out pavement markings (one-way arrows, etc.) with paint material and color. Provide Pavement marking details and Signage Plans.	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.3</b>	All curb, gutter, and sidewalk concrete materials must be Class A as per Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction, Section 604.03. <b>UDC 16.5. B.7</b>	<input type="checkbox"/>	<input type="checkbox"/>



1.4	Provide plan and profiles of all proposed streets, including sidewalk and multi-use trails, which must be at a scale of 1" = 50' horizontal and 1" = 5' vertical or larger with the profile view directly under the corresponding plan view. <b>UDC Tables 13-3, 13-4, 17-2.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.5	Collector and arterial roadways must have a 24-inch concrete curb and gutter. Local roadways may utilize either a 24-inch concrete curb and gutter or an 18-inch extruded concrete curb. <b>UDC 16.5. B.6.</b>		<input type="checkbox"/>
1.6	Intersections must be designed with a flat grade wherever feasible. In hilly or rolling areas, at the approach to an intersection, a leveling rea must be provided having not greater than a 2% grade for a distance of 60 feet, measured from the nearest right-of-way line of the intersecting right-of-way. The cross-slope on all public rights-of-way, including intersections, must be 3% or less. For vertical alignment, an extension of the through street cross slope must be carried back 100 to 200 feet each way from the intersection of the two street centerlines, and an allowance of 2% maximum intersection grade is permitted. <b>UDC 16.5. E.</b>		<input type="checkbox"/>
1.7	Show and dimensions turn lanes and deceleration lanes with associated storage and transition areas. <b>UDC 16.5. C.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.8	Label all pavement construction (asphalt, concrete, etc.). <b>UDC 16.5.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.9	Provide and label concrete joints for construction. Sawed Joints to be placed every 20' in all directions except at the expansion joint. Longitudinal sawed joint to be placed at the center of pavement when there is no construction joint. Expansion joints are to be placed at the PCs of an intersection and then every 200' maximum thereafter. Provide joint details. <b>UDC 16.6.</b>		<input type="checkbox"/>
1.10	Provide Temporary Traffic Control Plans and a truck route from the highway to the site. <b>UDC 16</b>		<input type="checkbox"/>
1.11	Access Driveways should be profiled (example being AASHTO Figure 4-12 Driveway Vertical Alignment and Profile Elements). <b>UDC 16.</b>		<input type="checkbox"/>
1.12	Cul-de-sac to be no greater than 750 feet in length and be a minimum of 96 feet in diameter face of curb to face of curb, with ROW no less than 110 feet. <b>UDC 16.3. F.1</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.13	Provide fill compaction requirements, testing specifications, and frequency of testing. 98% Std Proctor. <b>UDC 16</b>		<input type="checkbox"/>
1.14	Dead-end parking lots are prohibited. A turnaround space is required, and the minimum depth and width of such turnaround space must be ten feet and designated with signs stating, "No Parking" and striped to indicate no parking permitted. <b>UDC 10.6.</b>	<input type="checkbox"/>	<input type="checkbox"/>



	<b>REQUIRED FOR UTILITY RELATED IMPROVEMENTS:</b>		
	<b>GENERAL UTILITY IMPROVEMENTS:</b>	<b>40%</b>	<b>100%</b>
<b>1.0</b>	<b>Note:</b> All TDEC approvals will be required before the pre-construction meeting.	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.1</b>	Provide flow direction arrows on the plan views of sewer and storm sewer. <b>UDC Table 17-2.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.2</b>	Provide benchmarks at approximately 1,500-foot intervals based on NAVD88 and NAD83.		<input type="checkbox"/>
<b>1.3</b>	Manholes constructed in the floodplain will be required to be sealed and vented per the wastewater specifications. <b>UDC 4.5. A</b>		<input type="checkbox"/>
<b>1.4</b>	Show and label all existing and proposed utilities, drainage features, lot lines, easement lines, and Rights of Way limits on plan views.		<input type="checkbox"/>
<b>1.5</b>	Include overall plan views of the water system and the sanitary sewer system layout for the entire development (including future phases) with the method of pipe installation (bore or open trench). <b>UDC 15.9.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.6</b>	Show and label and station water mains and sanitary sewers 6-inch diameter and greater in both plan and profile views scaled at a minimum of 1" =50' horizontal and 1" =5' or 1" =10' vertical. <b>UDC Table 17.2.</b>		<input type="checkbox"/>
<b>1.7</b>	Display existing and proposed ground elevations at the centerline of water and sewer pipe spaced no greater than every 100 feet, specifically, the calling out depth of cover including pavement thickness. <b>UDC Table 17.2.</b>		<input type="checkbox"/>
<b>1.8</b>	Label all water and sewer pipe sizes including thicknesses, measure separation from outside of the pipes, and include material type in their respective profile views. <b>UDC Table 17.2.</b>		<input type="checkbox"/>
<b>1.9</b>	Show and label all parallel and crossing utilities (including drainage (features) in all profile views. <b>UDC Table 17.2.</b>		<input type="checkbox"/>
<b>1.10</b>	Call out backfill under the pavement in the water and sewer profiles. Show trench details with compaction requirements and label all sheeting, shoring, and bracing location. Deep manholes and mains will require trench boxing, etc. Provide details and notes denoting proper use of trench boxing. Provide fill compaction requirements, testing specifications, and frequency of testing to ensure proper compaction. <b>UDC 15.9. I.10.</b>		<input type="checkbox"/>
<b>1.11</b>	Display casing and conduit for future utility crossings. <b>UDC 15.9. I.10.</b>		<input type="checkbox"/>
	<b>WATER IMPROVEMENTS:</b>	<b>40%</b>	<b>100%</b>
<b>1.0</b>	Provide a minimum of two water feeds to proposed developments. Dead-end waterlines will not be accepted unless no other option is available. <b>UDC 15.10.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.1</b>	Water mains will be required to be extended for future developments in coordination and as directed by staff. <b>UDC 15.10.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.2</b>	Provide a water meter on all fire lines for townhomes, apartments, and condominiums. <b>UDC 15.10.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.3</b>	Provide a double detector check valve in a backflow preventer vault when connecting fire lines to the water main. <b>UDC 15.10.</b>		<input type="checkbox"/>
<b>1.4</b>	Provide a general note on the plans stating all newly laid water pipes will be hydrostatically tested and disinfected by the City of Spring Hill's Water Specifications <b>UDC 15.10.</b>		<input type="checkbox"/>



<b>SEWER IMPROVEMENTS:</b>		<b>40%</b>	<b>100%</b>
<b>1.0</b>	Sewer lines must be located under the pavement in the center of roadways and outside flooding areas when possible and shall not be located within detention basins. Designed for uniform slope with a clear minimum distance of 10 feet separation between water lines. <b>UDC 15.11.J and UDC 15.11. Q.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.1</b>	The energy gradient line must be maintained whenever a small sewer joins a larger sewer. This can be approximated as the 0.8 depth of both sewers. <b>UDC 15.11.Q.</b>		<input type="checkbox"/>
<b>1.2</b>	Four-foot diameter manholes can be used for pipes up to 18 inches. Five-foot diameter manholes must be used for pipes 21 inches in diameter and larger. <b>UDC 15.11. R.</b>		<input type="checkbox"/>
<b>1.3</b>	Display all flow line invert elevations at all manhole connections <b>UDC Table 17-2.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.4</b>	Show and label all grease traps per the City of Spring Hill’s Fats, Oils & Grease Ordinance and per <b>UDC 15.11. S.</b>		<input type="checkbox"/>
<b>1.5</b>	Show and label all oil-water separators per the City of Spring Hill’s specifications. <b>UDC 15.11. S.</b>		<input type="checkbox"/>
<b>1.6</b>	Provide a general note on the plans stating all manholes will be vacuum tested to a vacuum of 10 inches per the City of Spring Hill’s Sewer Specifications. <b>UDC 15.11. O.</b>		<input type="checkbox"/>
<b>1.7</b>	Provide a general note stating all pipes will be low-pressure air exfiltration tested as specified in ASTM C828-80 per the City of Spring Hill’s Sewer Specifications. <b>UDC 15.11. O.</b>		<input type="checkbox"/>
<b>1.8</b>	Provide a general note on the plans stating all new gravity sewer lines and service laterals shall be required to be inspected using CCTV video. <b>UDC 15.11. G.</b>		<input type="checkbox"/>
<b>1.9</b>	Provide a note where the “serviceability” of a lot or residence is questionable stating that the service tee is to be placed at the lowest possible elevation on the main line and the service line is to be laid on a minimum slope. The home builder is responsible for the location of the elevation of the end of the service line and setting building finished floor elevations such that gravity service is available. A sewer connection must be provided for each parcel or proposed lot. All service connections shall be shown as SDR 26 PVC (machine made only), four (4) inches for residential and six (6) inches for commercial. <b>UDC 15.11.</b>		<input type="checkbox"/>
<b>1.10</b>	Sewer pipe will be required to be SDR 26 PVC pipe or Class 250 Ductile Iron pipe.		<input type="checkbox"/>
<b>1.11</b>	Manholes shall be provided at a distance not greater than 350 feet for sewers 15 inches in diameter or less, 400 feet for sewers 18 inches and larger. <b>UDC 15.11.R.</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.12</b>	SDR 26 PVC pipe shall have a minimum of 30 inches of cover on private property and 48 inches in paved areas subject to vehicular traffic. In general, sewers should be set at a minimum depth of five (5) feet and Sewer crossings shall have a minimum of 18 inches below the bottom of the culvert or conduit and the sewer line. <b>UDC 15.11.</b>		<input type="checkbox"/>
<b>1.13</b>	Call out if the development proposes a lift station. All sheets that relate to the design and construction of a lift station must be differentiated from other sheets with the plan set. <b>UDC 15.11.</b>	<input type="checkbox"/>	<input type="checkbox"/>



1.14	<b>NOTE:</b> International building code requires slopes of 1/8 inch per foot for laterals of 3" to 6", which is 1.041667%. Recommend 1.5% to avoid issues with not meeting the minimum required slope in construction.		<input type="checkbox"/>
1.15	Sewer lines must be extended to the property boundaries of the development to allow future connections. <b>UDC 15.11.E.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.16	Drop manholes cannot be used unless the invert elevations between the receiving pipe and the discharging pipe is more than three feet and the discharging pipe has greater than five feet of cover by <b>UDC 15.11.Q.3</b>		<input type="checkbox"/>
	<b>REQUIRED FOR GRADING PLANS:</b>	<b>40%</b>	<b>100%</b>
1.0	Show and label existing and proposed contours that address lot-to-lot drainage in intervals of not more than two feet. Show and label the proposed limits of land-disturbing activities. <b>UDC Table 13-3.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.1	Plan and profile all proposed channels/ditches/swales showing existing contours and proposed centerline, top-of-bank, channel bottom, stationing, and the 100-year water surface elevation with 1 foot of freeboard. Include all hydraulic calculations. <b>UDC 7.6.11.C &amp; Table 17-2.</b>		<input type="checkbox"/>
1.2	Provide cross-sections of typical swales, berms, channels, and any other such improvement. Provide slopes and alignment on plans including improvements. Provide capacity with a minimum of 1-foot of freeboard. <b>UDC Table 17-2.</b>		<input type="checkbox"/>
1.3	Show and label proposed fences, required screen walls, gates, and retaining walls. Label maximum heights. Retaining walls over 3 feet must include plans from a licensed Engineer.		<input type="checkbox"/>
1.4	<b>NOTE:</b> All erosion control prevention must be in place before any other activities.	<input type="checkbox"/>	<input type="checkbox"/>
	<b>REQUIRED STORM WATER RELATED IMPROVEMENTS</b>	<b>40%</b>	<b>100%</b>
1.0	Show, label, and station all storm sewers (including future phases) in plan and profile views at a minimum scale of 1" =50' horizontal and 1" =5' vertical. Provide separate land and profiles of storm sewers. List hydraulics on each segment of pipe profile that includes design flow and storm frequency event, Manning's roughness coefficient, full flow capacity, slope, depth, velocity, and $v^2/2g$ . Plot and label the hydraulic grade line and friction slope when at or above full pipe flow. <b>UDC 15.9. I.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.1	Label all energy dissipaters. Call out rock riprap size and specifications including underlying blanket thickness. Include all hydraulic data, dimensioning, and sizing calculations with construction details for all proposed energy dissipaters. <b>UDC 15.9.</b>		<input type="checkbox"/>
1.2	Show and label all existing and proposed contour lines (including the pavement) in the profile view. <b>UDC 15.9.</b>		<input type="checkbox"/>
1.3	Show and label flow line invert elevations and water surface elevations at the storm drain outfall in profile views at connections and spaced not to exceed 100 feet. <b>UDC Table 17-2.</b>		<input type="checkbox"/>
1.4	Provide dimensioned details of all non-standard junction boxes, headwalls, storm sewers, flumes, and manholes. <b>UDC Table 17-2.</b>		<input type="checkbox"/>
1.5	Show and label drainage easements onsite and downstream as necessary to convey site drainage. <b>UDC 15.7.C.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.6	All stormwater piping must have a minimum velocity of three feet per second. <b>UDC 15.10. I.8</b>		<input type="checkbox"/>



1.7	Show conveyance of the 100-year storm event. <b>UDC Table 13-1.</b>		<input type="checkbox"/>
1.8	Show and label runoff and flow direction at all inlets. <b>UDC Table 17-2.</b>		<input type="checkbox"/>
1.9	Provide inlet capacity, including formulas used and inlet design computation tables. Inlets to be designed at 50% clogged. <b>UDC 15.9.1.7.</b>		<input type="checkbox"/>
	<b>REQUIRED FOR EROSION CONTROL PLANS:</b>	<b>40%</b>	<b>100%</b>
1.0	<b>NOTE:</b> All erosion control prevention must be in place before any other activities.	<input type="checkbox"/>	<input type="checkbox"/>
1.1	Provide an erosion control plan following the City of Spring Hill and TDEC's requirements. <b>a.</b> Show and label the limits of clearing, grubbing, and all land-disturbing areas. <b>b.</b> Show and label water wells, wellhead protection areas, and any other such critical area boundaries or existing utilities. <b>c.</b> Provide details of temporary erosion/sediment control devices and best management practices for all phases of the development. <b>d.</b> Provide a plan view to show and label all temporary erosion/sediment control devices. <b>e.</b> Show and label all natural drainage features for both existing and proposed conditions. <b>f.</b> Show and label construction entrances, stockpiles, and concrete washouts. <b>g.</b> Provide permanent stabilization details. <b>h.</b> Provide locations and details of all temporary sedimentation basins, including drainage calculations, de-watering times, basin dimensions, and outlet/dewatering structure designs.	<input type="checkbox"/>	<input type="checkbox"/>
1.2	Show and label water quality buffer zone easements of 30 feet on each side for unimpaired streams/ETW and 60 feet for impaired streams/ETW, as measured from the edge of the top-of-bank, on both sides of the creek. The buffer must not encroach on any platted lots or have any structures or improvements within.	<input type="checkbox"/>	<input type="checkbox"/>
1.3	Provide a preservation area, parallel to the watercourse, containing a width equal to and not less than two times the water course width (as measured from top-of-bank to top-of-bank). This area will be designated as a water quality buffer zone easement and cannot be disturbed by the proposed development.	<input type="checkbox"/>	<input type="checkbox"/>
1.4	2 yr/24hr storm event, is checked for non-ETW/Waters with available parameters. Sediment basins for drainages of 10 ac or more.	<input type="checkbox"/>	<input type="checkbox"/>
1.5	5 yr/24hr storm event, is checked for ETW/Waters with unavailable parameters or the area is within CGP unavailable drainage. Sediment basins for drainages of 5 ac or more.	<input type="checkbox"/>	<input type="checkbox"/>
1.6	Provide the following notes: <b>a.</b> All utility and drainage easements located on proposed lots are to be maintained by the individual property owners of said lot. <b>b.</b> All Common Areas/Open Spaces are to be maintained by the Homeowners Association, their heirs, or assigns. <b>c.</b> No HVAC Equipment is permitted in Public Utility and Drainage Easements where utilities are located. <b>d.</b> All Open Space areas are a Public Utility and Drainage Easement.	<input type="checkbox"/>	<input type="checkbox"/>



1.7	Internal silt fence phased during development may be required to prevent perimeter silt fence blowouts. Silt fence to meet the following design requirements: <b>a.</b> Max drainage area of 0.25 acre per 100 linear feet of silt fence. <b>b.</b> Max 200 feet distance of flow to the silt fence; 50 feet if slope exceeds 10%. <b>c.</b> Min. of 3 feet overlap at fabric joints. <b>d.</b> Turn ends of silt fence line upslope a min. of 10 feet. <b>e.</b> Install stone overflow structures at low points and approximately every 300 feet if no apparent low spot occurs within the max distance of 300 feet of the silt fence.	<input type="checkbox"/>	<input type="checkbox"/>
<b>REQUIRED FOR DETENTION OR RETENTION PONDS:</b>		<b>40%</b>	<b>100%</b>
1.0	No stormwater management facilities may be located within streamside buffers, nor can they be detrimental to such buffers, unless a plan with appropriate mitigation is authorized by the City Engineer <b>UDC 15.9. I.5.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.1	Water level fluctuations between the normal and high-water level cannot exceed 18 inches for the 2-year design event and cannot exceed five feet for the 100-year design event. <b>UDC 15.9. I.6.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	Provide cross sections/profile of the detention basin, controlling outfall structure, and emergency spillway. <b>UDC 15.9.</b>		<input type="checkbox"/>
1.3	Include detention elevation versus storage curves and elevation versus discharge curves.	<input type="checkbox"/>	<input type="checkbox"/>
1.4	Show and label all fencing, drainage, and access easements for detention ponds from ROW along the accessible route. Stormwater basins must be in an easement. <b>UDC 15.9.I.6.</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.5	Show existing and proposed contours for the detention basin. <b>UDC 11.1. B.4</b>		<input type="checkbox"/>
1.6	Include embankment sections for water storage impoundment with compaction specifications. <b>UDC 15.9.</b>		<input type="checkbox"/>
1.7	Include structural details and hydraulic calculations for the controlling outfall structure and emergency spillway. <b>UDC 15.9.</b>		<input type="checkbox"/>
1.8	Provide volume calculations and dimensions of detention, sediment, and bioretention ponds. <b>UDC 15.9. I.1.</b>		<input type="checkbox"/>
1.9	Obtain an approved detention basin inspection and maintenance/management plan before the pre-construction meeting. The plan must note the responsibility of the Owner/HOA, provide periodic inspection, and provide for minimum maintenance and repair needs that include, but are not limited to, removal of silt, litter, and other debris, cutting of the grass, and vegetation removal, and replacement of landscape vegetation in detention or retention ponds and inlets and drainage pipes and any other stormwater appurtenance. <b>UDC 15.7.</b>		<input type="checkbox"/>
1.10	Retention ponds will be required to have the ability to drain out to empty the pond for maintenance. <b>UDC 15.7. B</b>	<input type="checkbox"/>	<input type="checkbox"/>
1.11	Provide all electronic design files and state which program was used to run the design calculations. <b>UDC 15.</b>		<input type="checkbox"/>



1.12	Enclosed detention pond outfall structures must be analyzed for buoyancy. <b>UDC 15.</b>		<input type="checkbox"/>
1.13	All site designs shall control the first flush storm event (0.50-inches) and peak flow rates of storm water discharge associated with design storms specified in this ordinance or in the City of Spring Hill BMP Manuals and Water Quality Buffer Zone Policy listed in Section 18-406(1)(a) and reduce the generation of post-construction storm water runoff to a minimum of pre-construction levels. These practices shall seek to utilize pervious areas for storm water treatment and to infiltrate storm water runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to the maximum extent practical to provide treatment for both water quality and quantity. <b>Stormwater Management Ordinance</b>		<input type="checkbox"/>
1.14	The volume of a dry detention basin consists of two elements: the live pool (the upper portion of the basin representing detention capability) and the first flush volume (the lower portion of the basin representing stormwater quality treatment). <b>Tennessee BMP Manual Stormwater Treatment (BMP Phase II)</b>		<input type="checkbox"/>
1.15	The first flush volume should be sized to capture and slowly release the “first flush” of stormwater runoff, or the volume most likely to contain contaminants and particulate matter. Common practices include slow release of the first one-inch of runoff over a 24 to 72 hour period, or the detention of a 1-year storm. <b>Tennessee BMP Manual Stormwater Treatment (BMP Phase II)</b>		<input type="checkbox"/>



	<b>REQUIRED FOR DRAINAGE ANALYSIS:</b>	<b>40%</b>	<b>100%</b>	
<b>1.0</b>	<b>NOTE:</b> All hydrologic analyses shall use NOAA Atlas 14 Point Precipitation Frequency Estimates.			
<b>1.1</b>	<p>Drainage Report:</p> <ol style="list-style-type: none"> <li>a. Executive Summary</li> <li>b. Introduction</li> <li>c. Data Sources (topographic, land cover and land use, soil cover, rainfall, FEMA FIRM reference, Upstream/downstream flood studies)</li> <li>d. Hydrology               <ul style="list-style-type: none"> <li>• Methodology</li> <li>• Model domain, platforms, conditions</li> <li>• Pre-project and Post-project</li> <li>• Ultimate (full buildout)</li> <li>• Watershed delineation</li> <li>• Watershed lag time</li> <li>• Rainfall to runoff transformation method</li> <li>• Meteorological models</li> <li>• Results</li> </ul> </li> <li>e. Hydraulics               <ul style="list-style-type: none"> <li>• Storm Sewer Design</li> <li>• Detention Pond Design (including Hydrographs)</li> <li>• Results</li> </ul> </li> <li>f. Conclusions</li> </ol>	<p>Flood Study:</p> <ol style="list-style-type: none"> <li>a. Executive Summary</li> <li>b. Introduction</li> <li>c. Data Sources (topographic, land cover and land use, soil cover, rainfall, FEMA FIRM reference, Upstream/downstream flood studies)</li> <li>d. Hydrology               <ul style="list-style-type: none"> <li>• Methodology</li> <li>• Model domain, platforms, conditions</li> <li>• Pre-project and Post-project</li> <li>• Ultimate (full buildout)</li> <li>• Watershed delineation</li> <li>• Baseflow</li> <li>• Watershed Lag Time</li> <li>• Meteorological Models</li> <li>• Reach Routing Method</li> <li>• Results</li> </ul> </li> <li>f. Hydraulics               <ul style="list-style-type: none"> <li>• Methodology</li> <li>• Model domain</li> <li>• Model state and method</li> <li>• Modeling platforms</li> <li>• Topographic data</li> <li>• Manning's roughness coefficients, Expansion and Contraction coefficients</li> <li>• Ineffective flow and Distributive flow</li> <li>• Geometries</li> <li>• Downstream Boundary Conditions</li> <li>• Results</li> </ul> </li> <li>g. Conclusions</li> </ol>	□	□



1.2	<p>Floodplain properties will be required to provide a Flood Study <b>UDC 7.5 &amp; UDC 15.9.E:</b></p> <p><b>a.</b> Hydrologic and hydraulic analysis.</p> <p><b>b.</b> Downstream analysis/assessment showing no adverse impacts to adjacent, upstream, and downstream properties and structures including culverts, bridges, and buildings.</p> <p><b>c.</b> A LOMR/CLOMR may be required.</p>	□	□
1.3	<p>A hydrologic and hydraulic downstream analysis and/or capacity analysis will be required by all developments proposing no detention and/or conveyance to existing storm sewer facility showing no adverse impacts to adjacent, upstream, and downstream properties and structures including culverts, bridges, and buildings. UDC 15.9.E</p>	□	□
1.4	<p>The use of StreamStats must be justified as the following limitations preclude it from most design/modeling uses:</p> <p><b>a.</b> Flood-frequency prediction methods described in this report should not be applied to heavily developed basins or storm-sewer basins having greater than 10% impervious cover. Water Resources Investigations Report 03-4176.</p> <p><b>b.</b> Annual-peak streamflow records, historical flood information, and selected basin characteristics for stream gages in the study area with 10 or more years of record through the water year 1999 were combined to form a database that was used to develop the prediction methods for use at unregulated sites in Tennessee Water-Resources Investigations Report 03-4176. Stream stats utilize 20-year-old flow values. With the development in Spring Hill being required to detain to the 25-year storm event, the 100-year storm event has been left unattenuated, increasing the 100-year storm events' peak discharge in streams and rivers throughout Spring Hill.</p> <p><b>c.</b> Regulated is defined as having attenuating properties/structures (detention ponds, dams, culvert crossings, etc.).</p> <p><b>d.</b> Hydrologic results are not proposed or ultimate flows.</p> <p><b>e.</b> Streamstats is not currently being accepted by TEMA/FEMA and cannot be used for flood study hydraulic analysis.</p>	□	□
1.5	<p>Provide separate drainage area maps for existing, proposed, and ultimate (as necessary) conditions.</p>	□	□
1.6	<p>Show and label the Time of Concentration lines (broken down to flow type if using the velocity method). Sheet Flow length must either be based on engineering judgment with supporting data or use McCuen and Spiess approximate length equation (can be found in USDA NRCS Part 630 Chapter 15 – Time of Concentration manual, page 15-7, equation 15-9). Time of Concentration calculations and equations shall meet the <b>USDA NRCS Part 630 Chapter 15 published in 2010</b></p>	□	□
1.7	<p>Include runoff and routing methods, parameters, and calculations for all areas including flow arrows within each subbasin</p>	□	□
1.8	<p>Show and label the effective and proposed floodplain.</p>	□	□



1.9	Lots to be configured for positive drainage away from buildings. No cross-lot drainage is allowed	<input type="checkbox"/>	<input type="checkbox"/>
1.10	Any flood-prone area must be outside the floodway by elevation or at least two feet above the regulatory flood protection elevation (100-year flood) for a distance extending at least 25 feet beyond the limits of intended structures.	<input type="checkbox"/>	<input type="checkbox"/>
1.11	For drainage swales, lined channels, and natural channels, the system must be designed to carry the 100-year storm and can convey storm runoff without hazards or damage	<input type="checkbox"/>	<input type="checkbox"/>
	<b>REQUIRED FOR BRIDGES AND CULVERTS:</b>	<b>40%</b>	<b>100%</b>
1.0	A culvert or other drainage facility must be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the subdivision. Necessary facilities will be sized based on the construction specifications and assuming conditions of maximum potential watershed development permitted by any zoning regulations. <b>UDC 15.9. D.</b>		<input type="checkbox"/>
1.1	Plan and profile bridge or culvert crossing starting a minimum of 50 feet upstream of the structure and extending a minimum of 50 feet downstream of the structure. Label slopes, backfill, riprap design, design methods/calculations, pipe material, guardrail details, sidewalks, etc. <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>
1.2	Provide all hydraulic calculations. Clearly state the culvert flow type (inlet, outlet, submerged, and unsubmerged). <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>
1.3	Show, label, and state the tailwater elevation and computation. A short narrative or statement should be provided explaining why this elevation is used as the tailwater condition. <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>
1.4	Show and label skew angle, and vertical and horizontal centerline alignments. <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>
1.5	Provide bridge scour analysis. <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>
1.6	Provide all electronic design files and state which program was used to run the design calculations. HEC-RAS is the preferred hydraulic calculation software. <b>UDC 16.5. B.4.</b>		<input type="checkbox"/>