

Chambers County Drainage Submission Checklist				
Chambers County Permit #:				
Project Name:				
Project Address:				
Project Description:				
Project Area (acres):				
Project Owner / EOR:				
Special Considerations		Y	N	N/A
1	Coordination with Commissioners Court has been discussed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Coordination with Chambers County has been discussed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Pre-development meeting impacting the review process has been discussed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construction Plan Set (Refer to DCM Section 2.3)				
1	Plans are signed and sealed by a licensed engineer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Plans have a cover sheet with a Vicinity Map and Permit number labeled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Survey sheet has a description of the benchmark used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Site map shows proposed developments and are clearly labeled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Cross-sections with elevations are provided for drainage facilities such as detentions basins, channels, swales, roadside ditches, ect.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	A description of the FEMA FIRM panel is provided. FEMA 100YR and 500YR floodplain boundaries for the project area are shown.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Plans include a Drainage Area Map showing local drainage area boundaries and flow directions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Plans include storm drainage calculations for existing and proposed conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Plans show an erosion control map / storm water pollution prevention plan (SW3P)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Plans adjacent to an existing Chambers County Project are labeled as existing and have the corresponding permit number.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Driveway permit approvals are included.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drainage Calculations < 200 acres (Refer to DCM Section 4)				<input type="checkbox"/>
1	Drainage areas are below 200 acres and the rational method is being used to calculate peak discharge rates per storm events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Rational Method is being used per Equation 4.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Runoff coefficients are derived from Table 4-1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Rational method runoff coefficient adjustment factors are applied for corresponding storm events per Table 4-2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	A small description on how time of concentration (Tc) was calculated is provided. Smaller tracts may estimate Tc per Section 4.1.5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Rainfall intensities for corresponding storm events are provided per Equation 4-3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	EBD values are provided per Table 4-3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Calculations for the 5YR, 25YR, and 100YR storm events are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Hydraulic Grade Line calculations are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	A small description on how the starting HGL elevation was determined is provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drainage Calculations > 200 acres (Refer to DCM Section 4.2)				<input type="checkbox"/>
1	For drainage areas 200 ac or more, a HEC-HMS hydrologic analysis was used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Watershed boundary maps for both existing and proposed conditions that were used in the development of the HEC-HMS basin models are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	HEC-HMS meteorological models in accordance with Section 4.2.2, are developed using a 24-hour frequency storm characterized by a maximum intensity duration of five minutes, an intensity position at 67 percent of the storm duration, and a total storm area of 0.01 square miles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Infiltration losses are computed by using the Green & Ampt method. Corresponding Green & Ampt loss parameters for the project site are provided per Table 4-5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Percent impervious cover computations for both existing and proposed conditions are provided. Percent impervious values for different land uses were assigned per Table 4-7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Clark Unit Hydrograph is used as the transform method.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Storage coefficient is estimated per Equation 4.6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Time of Concentration (Tc) is calculated per Section 4.1.5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Existing and proposed longest flow paths for each drainage area are provided. Segments of sheet flow, shallow concentrated flow, and channel flow utilized for the time of concentration calculation are clearly identifiable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Streamflow routing in HEC-HMS is provided per Section 4.2.8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Detention routing and outfall structure sizing within HEC-HMS are provided per methodologies outlined in Sections 7.3 and 7.4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drainage Calculations > 200 acres (HEC-RAS Checklist)				<input type="checkbox"/>
1	HEC-RAS model was used to estimate flow velocities in creeks and channels, assess backwater conditions and overland flooding, perform hydraulic analyses of bridges and culverts, conduct detention analysis, and/or evaluate Zero Impact (No Adverse Impacts) conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Model plan descriptions, including associated geometry files, flow files, vertical datum & horizontal coordinate system, and a summary of key changes are documented in the Plan Editor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	For 1D HEC-RAS cross-sections, a description was provided specifying whether field survey data or LiDAR was used to develop the elevation-station data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	For 2D HEC-RAS model, the corresponding terrain file was included with the model submittal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	For 1D HEC-RAS modeling, cross-sections were cut approximately every 500 feet along the channel per Section 5.2.6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Ineffective flow areas, levees, and blocked obstructions are appropriately defined in the model.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Entrance loss coefficients for the culvert(s) per Table 5-8 are provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	All culvert and bridge parameters, including flow line elevations, low and high chord elevations, type, length, shape, and slope are clearly defined.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	HEC-HMS flow hydrographs that were used as internal boundary conditions within the Unsteady Flow Data editor of the HEC-RAS model are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Boundary conditions in the HEC-RAS are defined per Section 5.2.5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	A Floodway analysis is provided if any modifications are made to HEC-RAS models of FEMA-studied streams.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Existing vs Proposed peak flows, velocities, and water surface elevations at key locations within the project site are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	No Adverse Impact criteria Section 1.2.1 is being met.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Flow velocities meet the limits specified in Table 5-2 and/or 8 fps -2 fps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drainage Calculations (SWMM Checklist)				<input type="checkbox"/>
1	SWMM model was used to perform hydraulic analyses of storm sewers, conduct detention analysis, and/or evaluate Zero Impact (No Adverse Impacts) conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Existing and Proposed SWMM models were submitted for review.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Supporting hydrology model files used to develop both the existing and proposed SWMM models are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	The stage-storage or stage-area relationship based on the detention basin grading plan is developed and provided in the model.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Subcatchments, pipes, and junctions for both models are clearly labeled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	All manholes, pipes, culverts, and open channel inputs included in the model correspond to the field survey data for existing condition and to the plan sets for proposed condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Existing vs Proposed peak flows, velocities, and water surface elevations at key locations within the project site are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	No Adverse Impact criteria Section 1.2.1 is being met.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Flow velocities meet the limits specified in Table 5-2 and/or 8 fps -2 fps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drainage Report for Projects > 200 acres				<input type="checkbox"/>
1	Report includes the following sections: - Executive Summary. - Introduction covering project background, location, topography, FEMA floodplain information, a brief overview of previous studies, and the basis for the current analysis. - Hydrology Methodology for both existing and proposed conditions; Hydraulic Methodology for both existing and proposed conditions. - Results comparing existing and proposed peak flows, velocities, water surface elevations, and associated analyses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	A discussion of the hydrology methodology, including relevant parameters and the following tables: 24-hour rainfall data, Green & Ampt infiltration parameters, storage coefficient and time of concentration, and a summary of percent imperviousness is provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	A discussion of the hydraulic methodology, including key parameters is provided. Include a stage-storage or stage-area relationship for the proposed detention basin, Manning's roughness table and a flow allocation or distribution table if applicable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	A discussion of the detention routing methodology used, which may include HEC-HMS, HEC-RAS unsteady flow, the Storm Water Management Model (SWMM), or a detention routing spreadsheet is provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	A discussion of the hydrologic and hydraulic results for both existing and proposed conditions is provided. Include tables summarizing peak flows, velocities, and water surface elevations for existing, proposed, and proposed-minus-existing conditions at key locations within the project site.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	The following exhibits and maps, as applicable to both existing and proposed conditions: Location Map, Topographic Map, FEMA Floodplain Map, Drainage Area Map, Longest Flow Path, Land Use Map, and Hydraulic Model Layout are provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Detention Checklist (Refer to DCM Section 7)				
1	For areas up to 20 ac, detention is sized at 0.65 acre-feet per acres.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	For areas between 20 ac and 200 ac, detention is sized by comparing Small Watershed/ Malcom's Method with 0.65 ac-ft/ac and using the larger volume.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	For areas over 200 ac, a detention routing analysis was performed. See x for additional requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Detention volume is designed for a 100YR storm event.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	A minimum of one-foot of freeboard is provided in the detention basin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Side slopes are minimum 4:1 unless verified by geotechnical report.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	A minimum transverse slope of 0.50-percent is used on the bottom of the detention basin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	A pilot channel is provided at the bottom of the detention pond:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Concrete Pilot Channel: - Six-foot wide - 4-inch depth - Minimum slope of 0.10-percent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Earthen Pilot Channel: - 2-foot depth - Minimum slope is 0.20-percent - Side slopes are not steeper than 3:1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Maintenance berm is provided for the detention pond and meets the following requirements:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Minimum 30-foot maintenance berm for public properties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Minimum 20-foot maintenance berm for private properties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Detention Pond is adjacent to a paved area and is using 10-feet of the maintenance berm requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Maintenance berm grades away from TOB at 2%.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Storm sewer pipes are not being used for detention.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Outfall pipe is minimum 18-inches.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Back slope interceptors are provided and spaced out at 600-feet for detention ponds deeper than 6-foot.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	The detention pond's peak discharge rate is restricted to be between the existing 10-year and 100-year storm event peak discharge rates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	An extreme event overflow structure is provided to carry excess runoff from the 100-year storm event. The structure elevation must be set at or above the pond's 100-year water surface elevation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>