



**DEVELOPMENT SERVICES  
INFRASTRUCTURE DEVELOPMENT**  
200 Texas St, Fort Worth, TX 76102

# DRAINAGE STUDY CHECKLIST

**STORMWATER DEVELOPMENT SERVICES (SDS)**  
[SDS@fortworthtexas.gov](mailto:SDS@fortworthtexas.gov)

**Project Information:**

Name:	_____	Submittal Date:	_____
Location:	_____	Site / Plat Area (ac):	_____
Description:	_____	Disturbance Area (ac):	_____
Land Use:	_____	Construction Start Date:	_____

**Owner Information:**

Name: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Email: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 \_\_\_\_\_

**Engineer Information:**

Name: \_\_\_\_\_  
 Firm: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Email: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 \_\_\_\_\_

PE No.: \_\_\_\_\_  
 Firm No.: \_\_\_\_\_

**Additional Design Contact:**

Name: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Email: \_\_\_\_\_

**This Drainage Study is submitted for the purpose of supporting the following development applications (check all that apply):**

<input type="checkbox"/> Single-Phase Preliminary Plat	<input type="checkbox"/> Multi-Phase Preliminary Plat	<input type="checkbox"/> Concept Plan (Multi-Phase)	<input type="checkbox"/> Infrastructure Plan Review
<input type="checkbox"/> Grading Permit	<input type="checkbox"/> Final Plat	<input type="checkbox"/> Zone A (only) Flood Study	<input type="checkbox"/> Update To Previous Study _____ - 20__ - 0____

**Attachments:**

<input type="checkbox"/> Sealed Report or Technical Memo	<input type="checkbox"/> Drainage Area Maps	<input type="checkbox"/> Hydrologic Analysis	<input type="checkbox"/> Hydrologic Model Files
<input type="checkbox"/> Pre & Post Project Maps	<input type="checkbox"/> Offsite Drainage Area Map	<input type="checkbox"/> Land Use Maps	<input type="checkbox"/> Soils Maps
<input type="checkbox"/> Downstream Assessment	<input type="checkbox"/> Hydraulic Analysis	<input type="checkbox"/> Hydraulic Model Files	<input type="checkbox"/> Hydraulic Work Maps
<input type="checkbox"/> Detention Pond Checklist	<input type="checkbox"/> Culvert Hydraulics Checklist	<input type="checkbox"/> Bridge Hydraulics Checklist	<input type="checkbox"/> Dam Maintenance & EAP
<input type="checkbox"/> Record Drawings	<input type="checkbox"/> Previous Applicable SWMP	<input type="checkbox"/> Other (list): _____	

**The Project would require the following items before starting Construction:**

- |   |  |  |  |
|---|--|--|--|
| <input type="checkbox"/> Recorded Maintenance Agreement | <input type="checkbox"/> Offsite Easements | <input type="checkbox"/> Floodplain Development Permit | <input type="checkbox"/> CLOMR               |
| <input type="checkbox"/> Public Infrastructure Plans    | <input type="checkbox"/> Park Conversion   | <input type="checkbox"/> Nationwide Permit             | <input type="checkbox"/> 404 Permit          |
| <input type="checkbox"/> Community Facilities Agreement | <input type="checkbox"/> TCEQ Water Rights | <input type="checkbox"/> Grading Permit                | <input type="checkbox"/> TxDOT Permit        |
| <input type="checkbox"/> Future Improvements Agreement  | <input type="checkbox"/> TRWD Permit       | <input type="checkbox"/> Adjacent Property Letter      | <input type="checkbox"/> Utility Relocations |
| <input type="checkbox"/> Encroachment Agreement         | <input type="checkbox"/> Parkway Permit    | <input type="checkbox"/> Other (list): _____           |  |

**Describe any proposed waivers or variances:**

***Disclaimer: This checklist is intended to assist the developers engineer in preparing a drainage study, and the City’s engineer in reviewing a drainage study. The checklist is not an exhaustive list of requirements and is not a substitute for familiarity with the CFW Stormwater Criteria Manual, NCTCOG iSWM Technical Manuals, other relevant resources or experience applying hydrologic and hydraulic engineering practices and principles.***

Item Description	Yes	No	N/A	Comments, Clarifications and Description
<b>1. Engineering Report (Technical Memo for simple projects)</b>				
a. Signed and sealed by PE Licensed in Texas	_____	_____	_____	_____
b. Design methodology	_____	_____	_____	_____
c. Key assumptions and unusual conditions	_____	_____	_____	_____
d. Downstream assessment throughout Zone of Influence	_____	_____	_____	_____
e. Summary of results and comparison of Pre/Post conditions	_____	_____	_____	_____
f. Compliance with all no adverse impact criteria	_____	_____	_____	_____
g. Mitigation plan and provision of an adequate outfall	_____	_____	_____	_____

Item Description	Yes	No	N/A	Comments, Clarifications and Description
<b>2. Planning and Data Collection</b>				
a. List and reference previous drainage studies, iSWM Plans or watershed plans that considered the project area.	_____	_____	_____	_____
b. Note the source and date of contour or topography information (2015 LiDAR contours freely available from the CFW GIS website).	_____	_____	_____	_____
c. Is there known or suspected flooding or erosion downstream of the project? (If yes, describe and identify)	_____	_____	_____	_____
d. Are there any known or suspected downstream constrictions such as undersized culverts?	_____	_____	_____	_____
e. Are there any FEMA floodplains that require a flood study, CLOMR, LOMR, etc. If yes, list and reference any existing studies.	_____	_____	_____	_____
f. Are there any known or suspected wetland areas, mitigation areas, waters of the US, or other natural habitat features that may require consideration, 404 permit, nationwide permit, or state or federal permit?	_____	_____	_____	_____
g. Are there any existing impoundments or dams that could be, or become, subject to TCEQ permitting?	_____	_____	_____	_____
h. Are there any existing environmental concerns that would require special treatment or design consideration (e.g. fuel station, vehicle maintenance, auto recycling, illegal dump sites, industrial facilities, etc.)?	_____	_____	_____	_____
<b>3. Does this project provide opportunities for Low Impact Design? If yes, then describe.</b>				
a. Preserve floodplains, streams, drainage patterns, natural storage, or steep slopes?	_____	_____	_____	_____
b. Preserve trees, natural vegetation, wetlands, or other natural features?	_____	_____	_____	_____
c. Drain runoff to pervious or vegetated areas?	_____	_____	_____	_____
d. Utilize natural drainage systems (without erosion) instead of storm drain systems.	_____	_____	_____	_____
e. Reduce pavement, minimize impervious cover or use alternative materials	_____	_____	_____	_____
<b>4. Pre-Development Conditions Map</b>				
a. Project boundaries	_____	_____	_____	_____
b. Aerial photo representing existing conditions (imagery captured within 5 years of submission)	_____	_____	_____	_____

Item Description	Yes	No	N/A	Comments, Clarifications and Description
c. Perennial and intermittent streams	_____	_____	_____	_____
d. Delineate effective FEMA floodplains	_____	_____	_____	_____
e. Delineate wetlands and natural habitat areas	_____	_____	_____	_____
f. Location of dams and impoundments	_____	_____	_____	_____
g. Existing roads, buildings and other impervious features	_____	_____	_____	_____
h. Existing major utilities, pipelines and easements	_____	_____	_____	_____
i. Existing stormwater conveyance systems, including: overland flow, storm drains, inlets, catch basins, channels, swales, culverts, bridges	_____	_____	_____	_____
<b>5. Post-Development Map</b>				
a. Limits of clearing and grading	_____	_____	_____	_____
b. Proposed street and lot layout (SFR)	_____	_____	_____	_____
c. Site plan (buildings, facilities, parking lot, etc.)	_____	_____	_____	_____
d. Construction phasing plan	_____	_____	_____	_____
e. Location and size of proposed storm drains and other stormwater controls (e.g. ponds)	_____	_____	_____	_____
f. Proposed dams or ponds subject to TCEQ requirements	_____	_____	_____	_____
g. Proposed FEMA floodplain limits	_____	_____	_____	_____
<b>6. Pre-Development Drainage Area Maps shall include:</b>				
a. Project boundaries	_____	_____	_____	_____
b. Existing topography (1 or 2 foot contour interval, 5 or 10 foot for areas more than one square mile)	_____	_____	_____	_____
c. USDA hydrologic soil types (or separate soils maps)	_____	_____	_____	_____
d. Perennial or intermittent stream centerlines	_____	_____	_____	_____
e. Delineate FEMA floodplains, studied floodplains, floodplain easements and open channels	_____	_____	_____	_____
f. Location of wetlands, dams and impoundments	_____	_____	_____	_____
g. Existing roads, buildings and other impervious areas	_____	_____	_____	_____
h. Locations and size major utility lines and easements	_____	_____	_____	_____

Item Description	Yes	No	N/A	Comments, Clarifications and Description
i. Location, size, and City File Number for existing stormwater conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	_____	_____	_____	_____
j. Locations and dimensions of channels, bridges, or culvert crossings	_____	_____	_____	_____
k. Delineation of watershed or drainage area boundaries, with correctly orientated flow arrows	_____	_____	_____	_____
l. Delineate offsite drainage areas (1 or 2 foot contour interval, 5 or 10 foot for areas more than one square mile)	_____	_____	_____	_____
m. Contours extend beyond project limits and offsite drainage areas to ensure the entire watershed has been delineated	_____	_____	_____	_____
n. Delineate longest flow path each drainage area	_____	_____	_____	_____
o. Provide time of concentration calculations for each area and lag time calculations for hydrograph methods.	_____	_____	_____	_____
p. Computation table showing drainage areas, runoff coefficients or curve numbers, time of concentration or lag times, rainfall intensities and peak discharges for the 1, 5, and 100 year storms. Include a column to identify the collection point for each drainage area.	_____	_____	_____	_____
q. Location of all site outfalls or where runoff leaves the site	_____	_____	_____	_____
r. Delineate entire zone of influence and identify analysis points.	_____	_____	_____	_____
s. Existing zoning and land use	_____	_____	_____	_____
t. Composite calculations for runoff coefficients or curve numbers	_____	_____	_____	_____
u. Drainage area and analysis point labels consistent with hydrologic and hydraulic calculations tables	_____	_____	_____	_____
<b>7. Post-Development Drainage Area Maps shall include:</b>				
a. Project boundaries	_____	_____	_____	_____
b. Existing and proposed topography (1 or 2 foot contour interval, 5 or 10 foot for areas more than one square mile)	_____	_____	_____	_____
c. USDA hydrologic soil types (or separate soils maps)	_____	_____	_____	_____
d. Perennial or intermittent stream centerlines	_____	_____	_____	_____
e. Delineate FEMA floodplains, studied floodplains, floodplain easements and open channels	_____	_____	_____	_____

Item Description	Yes	No	N/A	Comments, Clarifications and Description
f. Location of wetlands, dams and impoundments	_____	_____	_____	_____
g. Roads, buildings and other impervious areas	_____	_____	_____	_____
h. Locations and size major utility lines and easements	_____	_____	_____	_____
i. Location, size, and City File Number for existing stormwater conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	_____	_____	_____	_____
j. Locations and dimensions of channels, bridges, or culvert crossings	_____	_____	_____	_____
k. Delineation of watershed or drainage area boundaries, with flow arrows	_____	_____	_____	_____
l. Delineate offsite drainage areas (1 or 2 foot contour interval, 5 or 10 foot for areas more than one square mile)	_____	_____	_____	_____
m. Contours extend beyond project limits and offsite drainage areas to ensure the entire watershed has been delineated	_____	_____	_____	_____
n. Delineate longest flow path each drainage area	_____	_____	_____	_____
o. Provide time of concentration calculations for each area and lag time calculations for hydrograph methods.	_____	_____	_____	_____
p. Computation table showing drainage areas, runoff coefficients or curve numbers, time of concentration or lag times, rainfall intensities and peak discharges for the 1, 5, and 100 year storms, for existing, proposed and ultimate conditions. Include a column to identify the collection point for each drainage area.	_____	_____	_____	_____
q. Location of all site outfalls or where runoff leaves the site, including labels with pre/post/ultimate discharges.	_____	_____	_____	_____
r. Proposed and ultimate zoning and land use	_____	_____	_____	_____
s. Identify changes to watershed boundaries	_____	_____	_____	_____
t. Composite calculations for runoff coefficients or curve numbers	_____	_____	_____	_____
u. Delineate entire zone of influence and identify analysis points.	_____	_____	_____	_____
v. Show downstream constrictions with runoff controls	_____	_____	_____	_____
w. When the development is a multi-phase project provide an overall drainage area map with all phases labeled.	_____	_____	_____	_____
x. Proposed stormwater facilities with private maintenance (includes private storm drains, if detention is proposed, provide volume required)	_____	_____	_____	_____

Item Description	Yes	No	N/A	Comments, Clarifications and Description
y. Drainage area and analysis point labels consistent with hydrologic and hydraulic calculations tables.				
<b>8. Hydrologic Analysis</b>				
a. Analysis methodology and inputs conform to Chapter 3.4 and relevant sections of the NCTCOG iSWM Technical Manuals.				
b. Selected hydrologic methods per Table 3.4				
c. Runoff coefficient and curve numbers per Table 3.5				
d. On site existing conditions per actual land use, not zoning				
e. Offsite conditions modelled as existing land use for comparison of pre- and post-development conditions				
f. Entire watershed (onsite and offsite areas) modelled per zoning or land use, which ever yields the highest peak discharge, for ultimate conditions hydrology.				
g. Ultimate conditions hydrology used for easement and stormwater facility sizing				
h. Unit hydrograph analysis performed using acceptable software package and models files provided.				
i. Modified Rational Method, if selected, was calculated using the equations described in the <i>NCTCOG Hydrology Technical Manual</i> , and not using a software package.				
j. The hydrologic analysis and downstream assessment is carried to, or beyond, the zone of influence based on the 10% rule of thumb. This is required even when detention is provided (except for the specific small site waiver).				
k. Hydrologic work map was provided and shows model basins and routing				
l. Junctions or calculation nodes provided at critical analysis points (e.g. at outfalls, culvert crossings, ponds, etc.)				
m. Reach modelling approaches applied per criteria manual and standard modelling conventions				
n. Pre- and post-development modelling include onsite storage (e.g. upstream of a road culvert) and floodplain storage to determine impacts of any watershed storage loss that result from the development				
o. Where a project discharges to more than one outfall, provide a corresponding analysis for each outfall				
p. Include mitigation design and analysis.				

Item Description	Yes	No	N/A	Comments, Clarifications and Description
q. All applicable hydrologic condition analyses, including but not limited to: existing, proposed, proposed with mitigation if applicable, and ultimate. A multi-phased development would include an additional condition for each phase.	_____	_____	_____	_____
r. Rainfall depths per <i>NCTCOG iSWM Hydrology Technical Manual</i> .	_____	_____	_____	_____
s. A summary results and comparison table was provided, and includes all junctions and design storms.	_____	_____	_____	_____
t. Analysis for a Zone A floodplain includes all applicable design storms and complies with FEMA guidelines.	_____	_____	_____	_____
<b>9. Hydraulic Analysis</b>				
a. Analysis methodology and inputs conform to Chapter 3.8 and other relevant sections of the Stormwater Criteria Manual, the NCTCOG iSWM Technical Manuals, and applicable references (e.g. HEC-RAS manual).	_____	_____	_____	_____
b. Standard modelling conventions are adhered to (e.g. ineffective flow areas at culverts, cross-sections perpendicular to flow, bank stations contained well inside the floodplain, etc.)	_____	_____	_____	_____
c. For 1D analysis, Manning's n per Table 3.15, Table 3.16 and other relevant technical references.	_____	_____	_____	_____
d. Proposed multi-barrel culverts designed with one of the barrel flow lines at the stream centerline, and other barrels set higher to establish a single low flow drainage path	_____	_____	_____	_____
e. Provide a hydraulic work map including, but not limited to: aerial imagery, cross sections, inundation limits, stream centerline, structures, flow change locations, labels, proposed easement limits, etc.	_____	_____	_____	_____
f. Provide a summary table that correlates cross-sections to hydrologic nodes or add hydrologic nodes to RAS workmap	_____	_____	_____	_____
g. Analysis considers appropriate tail water and effect of coincidental peaks	_____	_____	_____	_____
h. Analysis sizes all driveway culverts and demonstrates that roadside ditch design meets design standards.	_____	_____	_____	_____
i. Mixed flow regime analysis is included if Froude number(s) is 0.9 or above (supercritical flow check).	_____	_____	_____	_____
j. Analysis shows compliance with all applicable design criteria in Chapter 3.8.	_____	_____	_____	_____
k. Analysis shows compliance with all No Adverse Impact criteria throughout the entire Zone of Influence	_____	_____	_____	_____



Item Description	Yes	No	N/A	Comments, Clarifications and Description
l. Results summaries for all design storms and watershed conditions are tabulated.	_____	_____	_____	_____
m. Summary tables include a comparison of pre- and post-development conditions at all cross sections and critical locations.	_____	_____	_____	_____
n. Culvert and bridge hydraulics checklists are completed and attached for all proposed hydraulic structures.	_____	_____	_____	_____
o. Where a project discharges to more than one outfall, provide a corresponding analysis for each outfall.	_____	_____	_____	_____
p. A dam breach analysis was performed and the results, dam maintenance plan and EAP are attached	_____	_____	_____	_____
q. Drainage structure sizes and easement delineations (ultimate conditions 100-year flow)	_____	_____	_____	_____
r. Flood elevations and corresponding minimum finished floor elevations for all potentially affect and proposed lots (ultimate conditions 100-year flow)	_____	_____	_____	_____
s. Any other information pertinent to the preparation and review of project documents, including plat and construction plans.	_____	_____	_____	_____

***For additional information about the requirements, standards, criteria, or policies that apply to the preparation or review of a drainage study, please refer to the relevant portions of the CFW Ordinances, Policies and Stormwater Criteria Manual, NCTCOG Technical Manuals, and applicable engineering technical publications.***

<p>(Texas PE Seal)</p>	<p>I certify that this drainage study and all attached and referenced exhibits, documents and appendices were prepared under my responsible supervision and that the information presented on the checklist, report, and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the City of Fort Worth does not waive any City standards or requirements unless a specific waiver request was submitted and approved.</p> <p>Signed: _____ Date: _____  Name: _____ Firm No: _____</p>
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