City of Albany Stormwater Local Design Manual

Engineering Department

Revised July, 2017

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1. FORWARD

This Stormwater Local Design Manual (LDM) is meant to serve as a comprehensive guide to implementing stormwater management systems in the City of Albany (City). Additionally, the LDM is designed to supplement the Georgia Stormwater Management Manual (GSMM), current edition, which shall serve as the technical reference manual for design and specification of individual components within the system.

1.1. Meeting the Stormwater Management Requirements of the City

The following outlines the process for developing a stormwater management plan as required for issuance and maintenance of site development permit in the City.

Pre-Design Phase

Step 1. Check for new special district requirements with City staff
Step 2. Check for concept plan submittal requirements
Step 3. Prepare concept plan (if required)
Step 4. Submit concept plan to City and schedule concept plan meeting (if required)
Step 5. Meet with City staff to discuss concept plan (if required)

Design Phase

Step 6. Prepare stormwater management plan
Step 7. Submit stormwater management plan to City for approval

Construction Phase

Step 8. After receiving approval from City begin construction
Step 9. Coordinate construction with City inspection staff during construction

Post Construction Phase

Step 10. After construction prepare As-Built Survey and As-Built Design Certification
Step 11. Adjust stormwater structures if necessary
Step 12. Execute stormwater inspection and maintenance agreement for all private onsite stormwater management facilities
Step 13. Secure Certificate of Occupancy / Final Plat

2. GENERAL LEVEL OF SERVICE STANDARDS

2.1. Detention Requirements

2.1.1. Discharge Rates from New Development Projects

Development plans including site grading and drainage plans should be developed to minimize disruption of natural drainage patterns on properties, as well as to minimize impacts to downstream drainage infrastructure and structures. Whenever a Hydrologic & Hydraulic Report (as defined in Section 7 of this document) indicates a potentially adverse impact resulting from development of a property on a downstream property, that project shall incorporate stormwater detention facilities to reduce the discharge rate. The meaning of adverse impact shall apply to situations where the post-development discharge rates, up to and including the 100-year storm event, exceed those determined for the pre-developed conditions. Additionally, no increases in stormwater runoff rates shall be allowed at any discharge point from the site unless approved by the City.

The baseline or pre-developed conditions shall be on an analysis of the existing conditions taking into account existing land use, stormwater management controls and other factors that can affect the hydrologic responsiveness of the site. Proposed developments shall be analyzed for the following storm events:

- 1-year 24-hour Design Storm
- 2-year 24-hour Design Storm
- 5-year 24-hour Design Storm
- 10-year 24-hour Design Storm
- 25-year 24-hour Design Storm
- 50-year 24-hour Design Storm
- 100-year 24-hour Design Storm

If the total area of the site (i.e. total property area) and the drainage area to each stormwater management facility is less than one acre, then a rainfall intensity based analysis (i.e. rational method) may be performed. However, if detention facilities are to be designed and constructed in series, the 24-hour storm criteria will apply regardless of the drainage area.

Where downstream conditions indicate that the conveyance and/or storage capacity of existing infrastructure could be impacted by the post development conditions, or where existing structures could be impacted by the post developed conditions, a more stringent standard may be required. For example, if the project site drains into an existing detention pond within the study area then the designer will be required to demonstrate that the discharge rates from the proposed development will still allow the detention pond to operate at a level commiserate with the site in an undeveloped state.

Detention facilities should be designed upon the basis of known or projected developments (proposed by the developer) for the contributing drainage basin. Although, the developer is only required to construct the facility with sufficient volume to provide detention for the proposed

development, a design shall be provided to the City demonstrating the ultimate configuration of the facility at full build-out. Additionally, the proposed site plan should have sufficient land around the facility reserved to construct the ultimate configuration without significant demolition.

2.1.2. Discharge Rates from Redevelopment Projects

Development plans including site grading and drainage plans should be developed to minimize disruption of natural drainage patterns on properties as well as to minimize impacts to downstream drainage infrastructure and structures. Whenever a Hydrologic & Hydraulic Report (as defined in Section 7 of the LDM) indicates a potentially adverse impact resulting from development of a property on a downstream property, that project shall incorporate stormwater detention facilities to reduce the discharge rate. The meaning of adverse impact shall apply to situations where the post-development discharge rates, up to and including the 100-year storm event, exceed those determined for the pre-developed conditions. Additionally, no increases in stormwater runoff rates shall be allowed at any discharge point from the site unless approved by the City.

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- 50-year 24-hour Design Storm
- 100-year 24-hour Design Storm

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development, a design shall be provided to the City demonstrating the ultimate configuration of the facility at full build-out. Additionally, the proposed site plan should have sufficient land around the facility reserved to construct the ultimate configuration without significant demolition.

2.2. Conveyance Systems

The following subsections outline the specifications for the design of stormwater conveyance systems. In no case, shall a drainage system be designed to directly or indirectly discharge stormwater runoff into a sanitary sewer line or system.

2.2.1. Bridges

All bridges shall be designed to accommodate the 100-year 24-hour design storm with the established 100-year flood elevation 1-foot below the low cord of the bridge (i.e. the lowest part of the bridge deck structure or girders whichever is lower).

2.2.2. Culverts & Pipe Systems

The level of service provided by culverts and pipe systems in the City is dependent on a number of different factors. These include the type of road that the system will service, the potential for upstream flooding, floodplain impacts and other service issues. Generally, the level of service to be provided by culverts in the City is outlined in the table below:

Roadway Classification / Use	Design Storm
Emergency Access Routes (To be Determined by City)	10-Year
Collector Roadways	10-Year
Local Roads	10-Year
Roads with No Other Outlet	10-Year
Parking Lots / Material Storage Areas / Landscape Areas	10-Year

The level of service standards outlined above are considered minimum standards, where warranted the level of service may be increased at the discretion of the designer. For determining the maximum allowable head at any structure, the hydraulic grade line (HGL) should be designed to no less than six inches below the elevation of the inlet (catch basins, yard inlets, drop inlets, hooded grate inlets, etc.). The HGL should be designed to no less than six inches below the rim elevation for all junction boxes. Other inlets such as headwalls, flared end sections, etc. should be designed based on the guidance outlined in Section 2.2.4 of the LDM.

Culverts with contributing drainage areas greater than 25 acres shall be designed to the 24-hour storm. For example, if a culvert is to be designed to convey stormwater runoff from a 25-acre drainage basin under a neighborhood road, the design storm shall be a 25-year 24-hour storm.

If a culvert is designed to connect to an existing system of a differing design level of service, then the system with the greater design requirement will be used to size the proposed system.

All pipes should be designed to maintain a minimum velocity of three feet per second during the 2-year design storm to promote sediment removal.

2.2.3. Inlets (Catch Basins, Yard Inlets, Drop Inlets, Hooded Grate Inlets and Flumes)
Inlets collecting stormwater runoff from street surfaces and area inlets shall be sized to capture the storm event specified for the pipe system to which it drains and a maximum flooding depth as determined by the following table:

Roadway Classification / Use	Design Storm	Flooding Depth
Emergency Access Routes	10-Year	8.0 ft. Maximum Gutter Spread
Collector Roads	10-Year	8.0 ft. Maximum Gutter Spread
Local Roads	10-Year	8.0 ft. Lane Width Open
Roads with No Other Outlet	10-Year	8.0 ft. Lane Width Open
Parking Lots (with a check of the 100-year storm flooding depth and maximum 1-foot depth)	10-Year	Maximum 0.5 ft. Depth
Detention Areas utilized for other purposes with general public access (i.e. parking lot detention, etc.) with flood warning sign	10-Year	Maximum 1.5 ft. Depth
Material Storage Areas / Landscape Areas with flood warning sign if area is utilized by the public (with a check of the 100-year storm flooding depth)	10-Year	Maximum 2.0 ft. Depth

Inlets and grading adjacent to habitable structures shall be designed to prevent stormwater runoff from entering the structure during the 100-year design storm.

In no case shall inlets located on public streets be spaced in excess of 400 feet.

2.2.4. Inlets (Headwalls, Flared End Sections, etc.)
Inlets that utilize the opening of the pipe as the inlet (i.e. headwalls, flared end sections, etc.) shall be sized to capture the storm event specified for the pipe system to which it drains. The HGL should be designed to be no less than six inches below the edge of pavement or the point at which water would bypass the inlet (i.e. bypass to another inlet, etc.) whichever is less. Additionally, the headwater conditions induced by the inlet should not cause an impact on any upstream drainage structures such that the upstream structure will realize a loss in performance. In simpler terms, the headwater from an inlet should not back water into another culvert or drainage system. This requirement can be waived by the City in situations where it would be infeasible to design the culverts due to proximity of the culverts or extremely shallow grades between the culverts.

2.2.5. Roadside Ditches
Roads constructed without curb and gutter shall incorporate ditches that are designed to the specific design storms. The level of service provided by the ditches shall match the level of service provided by a comparable pipe system as outlined in Section 2.2.2 of the LDM above.

The level of service standards are considered minimum standards, where warranted the level of service may be increased at the discretion of the designer.
Ditches with contributing drainage areas greater than 25 acres shall be designed to the 24-hour storm. For example, if a ditch is to be designed to convey stormwater runoff from a 25-acre drainage basin along a neighborhood road, the design storm shall be a 25-year 24-hour storm.

2.2.6. Drainage Channels

For drainage channels designed to convey stormwater runoff either from or to a culvert, the channel should be sized to accommodate the same storm event specified for the pipe system at a minimum. Channels designed to convey stormwater runoff to detention ponds shall be sized to accommodate the 100-year design storm.

2.2.7. Groundwater Dewatering

Sub-drainage will be installed to control the surplus groundwater by intercepting seepage or by lowering or regulating the groundwater level where such conditions exist.

2.2.8. Flood Elevation Impacts

It is the policy of the City that raising the elevation of flooding on an adjacent property shall not be acceptable. As such, the level of service standards outlined in Section 2.2 of the LDM shall be considered minimum standards. Where flood elevations on an adjacent property will be increased due to development and / or construction of a drainage system, the level of service may be increased by the City to result in no impact to the adjacent property. This requirement may be waived at the City's discretion if the adjacent property owner provides a permanent drainage easement between the two property owners. The easement shall provide that the owner of the impacted property acknowledges that an increase in flood elevations will occur on their property as a result of the proposed development. Additionally, the easement shall include at a minimum a map showing the extent of the pre-development and post-development 100-year floodplains. Finally, the easement must be recorded with the City as an attachment to the affected property's land deed and shall be binding on all future property owners.

2.3. Stormwater Quality Treatment

2.3.1. Stormwater Quality in New Development

Stormwater runoff generated from a site shall be adequately treated before discharge. Stormwater management systems must be designed to remove 80% of the average annual post-development total suspended solids (TSS) load and be able to meet any other additional watershed or site-specific water quality requirements. It is presumed that a stormwater management system complies with this performance standard if:

- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first 1.2 inches of rainfall from a site.
- Appropriate structural controls are selected, designed, constructed, and maintained according to the specific criteria in this manual, the GSMM and the Operations & Maintenance schedule developed for the proposed development.

The City encourages the designer to implement specific stormwater credits for reducing the water quality treatment requirements on site. These credits can be found in Section 2.3 of Volume 2 of the 2016 edition of the GSMM. However, the City recognizes that water quality treatment of stormwater runoff from certain areas of a site is infeasible. As such, the following areas are exempt from water quality treatment:

- Portions of the site that lie within City mandated undisturbed buffers.
- Portions of the site that lie within 50 feet of the property line and drain away from the site assuming that no impervious surfaces (including compacted gravel / rock) lie within the 50 foot zone except retaining walls.
- Impervious surfaces associated with the driveway for the first 50 feet as measured from the edge of pavement of the public street to which it connects.
- Portions of the site which will remain undisturbed and which does not drain to a water quality or detention facility / BMP. These undisturbed areas must contain at least 10,000 square feet of contiguous area. Additionally, these areas must not be used for any purposes during construction and must be protected from such activities by construction fencing or other means to prevent construction personnel ingress.

Additional, water quality requirements may be specified for hotspot land uses and activities.

2.3.2. Stormwater Quality in Redevelopment

Stormwater runoff generated from the disturbed area of the site shall be adequately treated before discharge. Stormwater management systems must be designed to remove 80% of the average annual post-development TSS load and be able to meet any other additional watershed or site-specific water quality requirements.

It is presumed that a stormwater management system complies with this performance standard if:

- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first 1.2 inches of rainfall from a site.
- Appropriate structural controls are selected, designed, constructed, and maintained according to the specific criteria in this manual, the GSMM and the Operations & Maintenance schedule developed for the proposed development.

The City encourages the designer to implement specific stormwater credits for reducing the water quality treatment requirements on site. These credits can be found in Section 2.3 of Volume 2 of the 2016 edition of the GSMM. However, the City recognizes that water quality treatment of stormwater runoff from certain areas of a site is infeasible. As such, the following areas are exempt from water quality treatment:

- Portions of the site that lie within 50 feet of the property line and drain away from the site assuming that no impervious surfaces (including compacted gravel / rock) lie within the 50 foot zone except retaining walls.
- Impervious surfaces associated with any new driveway for the first 50 feet as measured from the edge of pavement of the public street to which it connects.

Additional, water quality requirements may be specified for hotspot land uses and activities.

2.3.3. Stormwater Quality Requirements for Hotspot Land Uses

Stormwater hotspots are land uses that often produce higher concentrations of certain pollutants, such as hydrocarbons or heavy metals, than are normally found in urban stormwater runoff. For the purposes of stormwater regulation, the City defines the following land uses / activities as hotspots.

- Gas / Fueling Stations
- Large Parking Lots with Greater than 200 Parking Spaces
- Vehicle Maintenance Areas
- Vehicle Washing / Steam Cleaning
- Auto Recycling Facilities
- Outdoor Material Storage Areas
- Loading and Transfer Areas
- Landfills
- Construction Sites
- Industrial Sites (NPDES Industrial Stormwater Permitted Sites Only)

For the purposes of this regulation, activities that are required to be compliant with National Pollutant Discharge Elimination System (NPDES) Permits issued by the Georgia Environmental Protection Division (EPD) will be considered compliant with the water quality requirements of this section if the requirements for the EPD permit are fully met unless noted below. These activities typically include construction site activities and certain industrial activities. Those sites, which do not meet these exemption criteria, will be required to implement additional requirements.

Gas / fueling stations are required to construct and maintain oil / water separators to collect and treat stormwater runoff from those areas where gas / fuel will be dispensed or loaded to underground and / or above ground storage tanks.

Large parking lots with greater than 200 parking spaces are required to construct and maintain oil / water separators to collect and treat stormwater runoff from those areas where vehicles will be parked.

Vehicle maintenance areas are required to construct and maintain oil / water separators to collect and treat stormwater runoff from those areas where vehicle maintenance will occur and vehicles will be parked awaiting maintenance.

Vehicle washing / steam cleaning areas are required to construct and maintain oil / water / grit separators to collect and treat stormwater runoff from those areas where washing will occur. Sand filters may be utilized in lieu of oil / water / grit separators with prior approval from the City.

Auto recycling facilities are required to construct and maintain oil / water separators to collect and treat stormwater runoff from those areas where vehicles will be stored, as well as areas where active recycling is occurring.

Outdoor material storage areas are required to construct and maintain sedimentation basins meeting the minimum standards outlined in the Georgia Manual for Sedimentation

and Erosion (current edition) to collect and treat stormwater runoff from those areas where materials will be stored.

Loading and transfer areas other than truck docks which shall be considered exempt will be evaluated on a case by case basis. Generally, where the primary concern will be solids transport to nearby streams and drainage structures, the area will be required to construct and maintain sedimentation basins meeting the minimum standards outlined in the Georgia Manual for Sedimentation and Erosion (the Green Book, current edition). If the primary concern will be hydrocarbons and other floatable contaminants, the area will be required to construct and maintain oil / water separators to collect and treat stormwater runoff.

All oil / water separators should be designed to the following criteria:

- Sized to treat the Water Quality Volume.
- Designed as an off-line system.
- Designed to pre-treat stormwater runoff before entering other Water Quality BMPs.

2.4. Energy Dissipation

Energy dissipation shall be employed whenever the velocity of flows leaving a new stormwater facility exceeds the erosion velocity of the downstream area.

3. APPROVED CONSTRUCTION MATERIALS & BMPs

3.1. Conveyance Structures

3.1.1. Pipes within the Public Right-of-Way & Dedicated City Easements

All pipes located under roadways and within the public right-of-way or dedicated City easements, and that are accepted by the City for long-term maintenance, shall be constructed of reinforced concrete pipe (RCP – Class 3) meeting Georgia Department of Transportation Standards. All pipes must have a minimum diameter of 18 inches and 12 inches of cover from the exterior crown of the pipe, and in accordance with manufacturer's specifications. Pipes under pavement must have a minimum of 12 inches of cover from the exterior crown of the pipe to the bottom of the roadway base.

In situations where the City has reason to suspect that a pipe system may have not been installed properly, the City may require at their discretion, video inspections of pipe systems to be provided at the Owner's expense prior to acceptance of the system.

3.1.2. Other Pipe Systems

All other pipe systems not within the public right-of-way shall be constructed of reinforced concrete pipe (RCP – Class 3) or HDPE meeting Georgia Department of Transportation Standards. Minimum bedding standards for HDPE pipe shall be such that stone bedding (i.e. No. 57 stone) shall be placed to half of the pipe diameter for all depths greater than four feet and/or in accordance with manufacturer's specifications, whichever is greater. All pipes must have a

minimum of 12-inches of cover from the crown of the pipe, and in accordance with manufacturer's specifications, provided the Owner and/or designer coordinates easement requirements with the City in advance.

In the case where HDPE pipe originating from private property is joined to RCP, in the right-of-way, a transition structure, approved by the City, must be provided at the right-of-way by the Owner.

All pipes must have a minimum of 12 inches of cover from the exterior crown of the pipe, and in accordance with manufacturer's specifications. Pipes under pavement must have a minimum of 12 inches of cover from the exterior crown of the pipe to the bottom of the roadway base. The minimum cover for pipes, which run along individual lot property lines in residential developments, shall be increased to three feet to account for the potential for damage due to residential fence construction.

In situations where the City has reason to suspect that a pipe system may have not been installed properly, the City may require at their discretion, video inspections of pipe systems to be provided at the Owner's expense prior to acceptance of the system.

3.1.3. Channels

All channels with erosive velocities must be protected from erosion through the use of rip-rap, concrete, erosion control matting or similar method acceptable to the City. All channel side slopes shall have a 3-foot horizontal to 1-foot vertical (3:1) slope. Inverts should match at intersections, or the intersection will be designed/modified to accommodate the erosive forces at the transition.

3.1.4. Inlets

All inlets shall be constructed of materials and methods approved by the Georgia Department of Transportation and / or designs pre-approved by the City. Inlet covers (where appropriate) shall be designed and manufactured in accordance with local construction standards related to storm drain stenciling and pollution prevention education. The Owner and / or designer shall consult the City regarding specific requirements for storm drain covers and inlets.

Headwalls or flared end sections shall be required on inlet and outlet ends of any pipe culvert system.

3.2. Detention Ponds

All detention facilities constructed in accordance with the requirements of this manual shall be constructed on subdivided parcels deeded to the property owner or the homeowners association. No detention facility for residential subdivisions shall be constructed in whole or part on a parcel or lot intended for sale to a future resident.

All outlet structures for controlling discharge rates from detention facilities shall be constructed of pre-cast concrete or cast-in-place concrete. The only exception to this rule shall be in situations where a pipe is utilized as the primary outlet control. In these situations, the pipe must be protected from scour through the use of a concrete headwall or flared-end-

section. Emergency spillways may utilize rip-rap or concrete to prevent erosion if the invert of the spillway is set at or above the 100-year maximum stage of the facility.

3.2.1. Dry Earthen Detention Ponds

Dry detention ponds shall be designed to provide for positive drainage on the pond floor to the outlet of the pond. Side slopes for the dam shall be designed to have a maximum of 3-feet horizontal to 1-foot vertical (3:1) slopes.

A six-foot chain link fence will be required for above ground stormwater detention facilities that exceed six feet in depth measured from the bottom of the pond to the top of the berm. In the front yard, the fence height may be reduced to four feet. The fence shall include a double drive-thru gate of sufficient size to permit entrance of equipment necessary to allow periodic maintenance activities.

Acceptable backfill and fill materials shall consist of suitable soils for dam construction as determined by the City; free of rock or gravel larger than one inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Backfill and fill materials should be placed in layers not more than eight inches in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers. Each layer should be uniformly moistened or aerated before compaction to within 3% of optimum moisture content. Layers should not be placed on surfaces that are muddy, frozen, or contain frost or ice. All backfill and fill materials should be placed evenly to required elevations, and uniformly along the full length of the embankment. Additionally, soils should be compacted to at least 95% maximum dry unit weight according to ASTM D 698.

3.2.2. Dry Underground Detention Ponds

No underground detention pond shall be constructed on residential development projects. Underground detention ponds may be considered on non-residential development projects after the designer has shown that construction of an aboveground detention pond is infeasible to the satisfaction of the City. If allowed, all structures, which are designed to store water, shall be constructed of reinforced concrete or HDPE. Additionally, the structures should be designed such that vehicular traffic meeting an H-20 loading standard could traverse the area over the detention pond once backfilled or completed without resulting in structural failure of the pond. When designing the pond, the designer should design the structure such that routine maintenance can be accommodated without unreasonable demands being placed on future property owners.

3.2.3. Stormwater Ponds With Permanent Pools

Stormwater ponds with permanent pools may be constructed if the facilities are designed to the criteria outlined in Section 4.25 of Volume 2 of the 2016 edition of the GSMM. However, the designer will be required to submit a water balance simulation as part of the Hydrologic and Hydraulic Report Submittal.

3.3. Water Quality Best Management Practices

3.3.1. Best Management Practices

The following general application structural stormwater controls shall be acceptable to meet the water quality requirements for the contributing drainage areas. For design, construction and maintenance specifications for each control, the designer is directed to Section 4 of Volume 2 of the 2016 edition of the GSMM.

- Bioretention Areas
- Bioslope
- Downspout Disconnects
- Dry Detention Basins
- Dry Extended Detention Basins
- Dry Wells
- Dry Enhanced Swales/Wet Enhanced Swales
- Grass Channel
- Gravity (Oil-Grit) Separator
- Green Roof
- Infiltration Practices
- Multi-Purpose Detention Areas
- Organic Filter
- Permeable Paver Systems
- Pervious concrete
- Porous Asphalt
- Proprietary systems
- Rainwater Harvesting
- Regenerative Stormwater Conveyance
- Sand Filters
- Site Reforestation/Revegetation
- Soil Restoration
- Stormwater Planters/Tree Boxes
- Stormwater Ponds
- Stormwater Wetlands
- Submerged Gravel Wetlands
- Underground Detention
- Vegetated Filter Strip

As stated earlier, the controls listed herein are designed to meet a portion of the water quality requirements. The accepted water quality treatment rates for TSS for these controls shall as follows:

- Bioretention Areas – 50%
- Bioslopes Filter Strip – 50%
- Grass Channel – 50%

- Organic Filter – 80%
- Sand Filter – 80%
- Submerged Gravel Wetlands – 80%
- Gravity Separators – 40%
- Stormwater Ponds – 25%

Structural BMPs should be designed so that 80% of the average annual post development total suspended solids load (TSS) is removed before entering the municipal separate stormwater system or channel. The following formula should be used to determine water quality volume (WQ_v):

$$WQ_v = \frac{(P)(R_v)(A)}{12}$$

Where,
P = Rainfall depth in inches, using the Water Quality Storm Event (e.g. 1.2 inches).
A = Project area in acres.
R_v = Volumetric runoff coefficient [0.05 + 0.009(I)], where I is the impervious surface percentage (impervious area ÷ total project area) x 100.

3.3.2. Proprietary Structural Controls

The City may at their discretion allow proprietary structural controls. Prior to specification of such a device, the designer shall consult the City to determine if the control will be acceptable.

4. APPROVED HYDROLOGIC & HYDRAULIC METHODS

4.1. Hydrologic Methods

4.1.1. Rational Method

The rational method may be used to develop peak runoff flows for culverts with contributing drainage areas less than 25 acres in size and for detention ponds with contributing drainage areas less than one acre in size. All computations shall be in accordance with Section 3.1.4 of the GSMM (Volume 2) Rainfall intensities shall be derived from Appendix A of the 2016 edition of the GSMM (Volume 2), which references the National Oceanic and Atmospheric Administration provided rainfall tables for the State of Georgia on their website: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ga

As specified above, the rational method may be used to size detention facilities. If the rational method is utilized, the DeKalb Method or the Baumgardner / Morris Method (Terramodel) must be utilized to develop runoff hydrographs. Triangular rational method runoff hydrographs may not be utilized in the design of detention facilities.

4.1.2. SCS Method

In most cases, the Soil Conservation Service (SCS) method must be utilized to size detention ponds with contributing drainage areas greater than one acre and culverts with contributing drainage areas greater than 25 acres. All computations shall be in accordance with Section 3.1.4 of the GSMM (Volume 2) Rainfall intensities shall be derived from Appendix A of the 2016 edition of the GSMM (Volume 2), which references the National Oceanic and Atmospheric Administration provided rainfall tables for the State of Georgia on their website: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ga

The following table also provides the rainfall depths for use in the City:

Design Storm	Rainfall Depth
1-Year 24-Hour	3.50”
2-Year 24-Hour	4.00”
5-Year 24-Hour	5.50”
10-Year 24-Hour	6.50”
25-Year 24-Hour	7.50”
50-Year 24-Hour	8.20”
100-Year 24-Hour	9.00”

4.2. Hydraulic Methods

All hydraulic calculations shall be made in accordance with Chapter 5 of the 2016 edition of the GSMM (Volume 2).

5. SPECIAL DISTRICTS

The City of Albany may establish special design criteria for select areas based on the findings of watershed assessments, hydrologic and hydraulic reports, and known flooding issues. The designer is encouraged to consult with the City to determine if any special districts exist within the City. At the time of publication of this manual, no special districts have been established.

6. STORMWATER CONCEPT PLAN REQUIREMENTS

The City recognizes that some sites will require a substantial investment in time and effort to develop a comprehensive stormwater management plan that will address the requirements contained within this manual. As such, some developments are required to develop a concept plan prior to submittal of the land disturbance application. This requirement is aimed at reducing the amount of effort required to develop the final plan and permit the project. Concept plans are required to be submitted for all developments that meet one or more of the following criteria:

- Any residential subdivision with greater than 50 lots, unless such development is comprised of lots which are all 2-acres or greater in area.
- Any non-residential development with a disturbed area of 10 acres or greater.
- Any non-residential development regardless of size which has an impervious surface coverage that covers 50% or more of the property excluding those lands contained within undisturbed buffers including but not limited to floodplains, stream buffers and undisturbed buffers between dissimilar zonings.
- Any non-residential development regardless of size, which is defined as a hotspot land use.

As stated earlier, all developments that meet one or more of the requirements listed above are required to submit a stormwater concept plan. However, all developments may submit a plan for a preliminary evaluation. If a stormwater concept plan is submitted to the City, the plan should contain the following sections.

6.1. Project Narrative

A brief narrative should be provided with the report outlining the project goals, location and provide a location map such that the project location can be identified by City staff.

6.2. Existing Conditions Hydrologic Analysis

The existing conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions prior to development of the project. The designer should provide the following information with this element of the report:

6.2.1. Existing Conditions Narrative

A written description of the existing conditions found at the site should be provided. Additionally, the narrative should describe the methodologies, assumptions and other pertinent discussions of how the existing conditions were analyzed by the designer.

6.2.2. Existing Conditions Map

An existing conditions map should be provided with the report including but not limited to following:

- Topography (2-ft. or less contour interval) of existing site conditions.
- Perennial / intermittent streams, wetlands, lakes and other surface water features.
- Drainage basin delineations showing the location of each drainage sub-basin.
- Drainage basin delineations for each contributing drainage basin upstream of the project site on an appropriate map (USGS Quadrangle, etc.).
- Existing stormwater conveyances and structural control facilities.
- Direction of flow and discharge points from the site including sheet flow areas.
- Any area of significant depression storage.
- Federal, state and local buffers.

The map should provide a clear understanding of the various drainage patterns located throughout the site as well as drainage onto the site from upstream areas. Additionally, the map should provide a clear view of the natural features of the site that may impact development.

6.2.3. Existing Conditions Tables

A set of tables should be included in the report that will allow the reader to understand how various parameters utilized in modeling the existing conditions were developed. Additionally, tables should be included documenting the results of the modeling.

- A table listing the acreage, soil types and land cover characteristics for each sub-basin.
- A table listing the total acreage, composite curve number and time of concentration for each sub-basin.
- A table listing the peak runoff rates and total runoff volumes from each sub-basin.
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site.
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the existing conditions analysis.

6.2.4. Existing Conditions Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

6.3. Preliminary Downstream Analysis

The downstream analysis should provide the reader with a comprehensive picture of the downstream areas and their capacity to accommodate stormwater runoff from the proposed development.

6.3.1. Maps

- Drainage basin delineations showing the point at which the contributing area of the project represents 10% of the total drainage basin area as defined in Section 3.1.9.2 of the 2016 edition of Volume 2 the GSMM.
- Identify culverts, channels and other structural stormwater controls that the stormwater runoff must pass through prior to the 10% point identified previously.

6.3.2. Narratives

Provide a narrative with associated calculations demonstrating the downstream analysis at various points showing existing conditions and future conditions without detention or other onsite stormwater controls.

6.3.3. Downstream Analysis Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

6.4. Preliminary Stormwater Management Plan

A preliminary stormwater management plan should be included with the concept plan submittal. The purpose of a preliminary stormwater management plan will be to show that the proposed controls will be sufficient to meet the requirements outlined in this manual. As such the following should be provided with the concept plan.

6.4.1. Narratives

A written description of the proposed conditions at the site should be provided. Additionally, the narrative should describe the means by which stormwater runoff will be managed by the designer including proposed stormwater quality BMPs and detention facilities.

6.4.2. Proposed Conditions Maps

A proposed conditions map should be provided with the report including but not limited to following:

- A general proposed conditions drainage map. It is not necessary to produce a full grading plan as part of this submittal. The detail should be sufficient to show how the designer proposes to grade the site and drainage will be managed on site. This should be accomplished at a minimum with flow arrows and spot elevations to indicate a feasible grading concept.
- Drainage basin delineations for each discharge point from the site.
- Drainage basin delineations for each water quality BMP and detention facility indicating the approximate drainage area for each.
- Location and type of each water quality BMP.
- Location of each detention facility.

The map should provide a clear understanding of the various drainage patterns located throughout the site, as well as drainage onto the site from upstream areas. Additionally, the map should provide a clear view of the natural features of the site that will be impacted by development.

7. HYDROLOGIC & HYDRAULIC REPORT REQUIREMENTS

All development projects must submit a hydrologic and hydraulic report outlining the impacts of the site on the stormwater system. At a minimum, this report must include the following sections:

- Certification by Registered Professional
- Project Narrative
- Existing Conditions Hydrologic Analysis
- Post-Development Hydrologic Analysis
- Stormwater Management System Design
- Downstream Analysis
- Erosion & Sedimentation Control Plan
- Planting Plan (if applicable)

- Operations & Maintenance Plan

The following subsections outline the requirements for each of the elements outlined above.

7.1. Professional Certification

Each report should begin with the following statement and be signed and sealed by the professional who prepared the report and analysis:

> "I, (Name of Professional), a Registered (Professional Engineer / Land Surveyor) in the State of Georgia, hereby certify that the grading and drainage plans for the project known as (Project Name), lying in Land Lot (XXX), of the (XX) District, Dougherty County, Georgia, have been prepared under my supervision, and, state that in my opinion, the construction of said project will not produce storm drainage conditions that will cause damage or adversely affect the surrounding properties for the storm events specified in City of Albany Land Development Regulations. This (day) day of (Month), (Year)."

7.2. Project Narrative

A brief narrative should be provided with the report outlining the project goals, location and provide a location map such that the project location can be identified by City staff.

7.3. Existing Conditions Hydrologic Analysis

The existing conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions prior to development of the project. The designer should provide the following information with this element of the report:

7.3.1. Existing Conditions Narrative

A written description of the existing conditions found at the site should be provided. Additionally, the narrative should describe the methodologies, assumptions and other pertinent discussions of how the existing conditions were analyzed by the designer.

7.3.2. Existing Conditions Map

An existing conditions map should be provided with the report including, but not limited to, the following:

- Topography (2-ft. or less contour interval) of existing site conditions.
- Perennial / intermittent streams, wetlands, lakes and other surface water features.
- Drainage basin delineations showing the location of each drainage sub-basin.
- Drainage basin delineations for each contributing drainage basin upstream of the project site on an appropriate map (USGS Quadrangle, etc.).
- Existing stormwater conveyances and structural control facilities.
- Direction of flow and discharge points from the site including sheet flow areas.
- Any area of significant depression storage.
- Federal, state, and local buffers.

The map should provide a clear understanding of the various drainage patterns located throughout the site, as well as drainage onto the site from upstream areas. Additionally, the map should provide a clear view of the natural features of the site that may impact development.

7.3.3. Existing Conditions Tables

A set of tables should be included in the report that will allow the reader to understand how various parameters utilized in modeling the existing conditions were developed. Additionally, tables should be included documenting the results of the modeling.

- A table listing the acreage, soil types and land cover characteristics for each sub-basin.
- A table listing the total acreage, composite curve number and time of concentration for each sub-basin.
- A table listing the peak runoff rates and total runoff volumes from each sub-basin.
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site.
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the existing conditions analysis.

7.3.4. Existing Conditions Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

7.4. Post-Development Hydrologic Analysis

The proposed conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions following development of the project. The designer should provide the following information with this element of the report:

7.4.1. Proposed Conditions Narrative

A written description of the proposed conditions to be found at the site after construction should be provided. Additionally, the narrative should describe the methodologies, assumptions and other pertinent discussions of how the proposed conditions were analyzed by the designer.

7.4.2. Proposed Conditions Map

A proposed conditions map should be provided with the report including, but not limited to, the following:

- Topography (2-ft or less contour interval) of proposed site conditions.
- Perennial/intermittent streams, wetlands, lakes and other surface water features.
- Drainage basin delineations showing the location of each drainage sub-basin.
- Proposed stormwater conveyances and structural control facilities.
- Direction of flow and discharge points from the site including sheet flow areas.
- Location and boundaries of proposed natural feature protection areas.

The map should provide a clear understanding of the various drainage patterns located throughout the site, as well as drainage onto the site from upstream areas. Additionally, the map

should provide a clear view of the natural features of the site that will be impacted development, as well as features that will not be impacted.

Proposed Conditions Tables

A set of tables should be included in the report that will allow the reader to understand how various parameters utilized in modeling the proposed conditions were developed. Additionally, tables should be included documenting the results of the modeling.

- A table listing the acreage, soil types and land cover characteristics for each sub-basin.
- A table listing the total acreage, composite curve number and time of concentration for each sub-basin.
- A table listing the peak runoff rates and total runoff volumes from each sub-basin.
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site.
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the proposed conditions analysis.

7.4.3. Proposed Conditions Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

7.5. Stormwater Management System Design

The stormwater management system design should provide the reader with a comprehensive description of the proposed stormwater management system components on site. The designer should provide the following information with this element of the report:

7.5.1. Stormwater Management System Map

The stormwater management system map should document the various structural components of how stormwater runoff will be moved around the site.

- Location of all non-structural stormwater controls
- Location of all existing stormwater controls to remain after development
- Location of all proposed stormwater controls
- Location of all proposed impoundment type controls (i.e. detention ponds, stormwater ponds, stormwater wetlands, etc.)
- Location of all conveyance structures
- All impoundment type controls should be labeled with the following information:
    - Maximum water surface elevation
    - Depth and storage volumes for the design storm
    - Depth and storage volumes maximum water surface if the design storm event is exceeded (i.e. top of dam)
- All inlets to conveyance structures should be labeled with the following information:
    - Maximum design water surface
    - Maximum potential water surface

- All pipes should be labeled with:
  - Length
  - Material
  - Slope
- All pipes should be profiled and labeled with:
  - Length
  - Material
  - Slope
  - Hydraulic grade line
- Map showing all contributing drainage areas/sub-basin delineations

7.5.2. Narratives

- Narrative describing that appropriate and effective structural stormwater controls have been selected.
- Design calculations and elevations for all existing and proposed stormwater conveyance elements including stormwater drains, pipes culverts catch basins, channels, swales and areas of overland flow.
- Design calculations and elevations for all structural water quality BMPs to be utilized for water quality improvement.
- Design calculations showing that the design meets the requirements of the water quality improvements as outlined in the ordinance and local design manual. The City encourages the designer to utilize the site design tool provided by the North Georgia Water Planning District to meet this requirement. The tool can be acquired from the following website: http://www.northgeorgiawater.com/.

7.6. Downstream Analysis

The downstream analysis should provide the reader with a comprehensive picture of the downstream areas and their capacity to accommodate stormwater runoff from the proposed development.

7.6.1. Maps

- Drainage basin delineations showing the point at which the contributing area of the project represents 10% of the total drainage basin area as defined in Section 3.1.9.2 of the 2016 edition of Volume 2 the GSMM.
- Identify culverts, channels and other structural stormwater controls that the stormwater runoff must pass through prior to the 10% point identified previously.

7.6.2. Narratives

Provide a narrative with associated calculations demonstrating the downstream analysis at various points showing existing conditions, future conditions without detention or other onsite stormwater controls and future conditions with detention or other onsite stormwater controls.

7.7. Erosion & Sedimentation Control Plan

The erosion and sedimentation control plan should be included in the report demonstrating the plan to effectively mitigate stormwater impacts during construction. The following elements should be included in this section of the report.

- All elements specified in the Georgia Erosion and Sediment Control Act and local ordinances and regulations.
- Sequence/phasing of construction and temporary stabilization measures.
- Temporary structures that will be converted into permanent stormwater controls.

7.8. Planting Plan

A planting plan should be included in the report for all water quality BMPs that utilize vegetation as a pollutant removal method. Examples of these types of controls include but are not limited to stormwater wetlands, enhanced swales, etc.

7.9. Operations & Maintenance Plan

A narrative of what maintenance tasks will be required for the stormwater controls specified for the site as well as the responsible parties. Additionally, the report will need to identify access and safety issues for the site. Maintenance issues for various BMPs and other stormwater controls can be found in the GSMM.

8. REQUIREMENTS FOR WAIVER REQUEST

The City does not intend to waiver from the requirements outlined in this manual. However, the City recognizes that situations exist such that strict adherence to the requirements may result in degradation of upstream or downstream areas from a development project. As such, the City may from time to time allow a variance from the procedures and requirements outlined in this manual. The following documents the minimum criteria that will apply to all variance requests.

8.1. Waiver Narrative

A brief narrative should be provided with each waiver request describing the project, location, and provide a location map such that the project location can be identified by City staff. Additionally, a narrative should be provided outlining the standards for which the applicant is seeking a waiver, as well as a description of the impacts that will result from a granting of the waiver.

8.2. Existing Conditions Hydrologic Analysis

The existing conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions prior to development of the project. The designer should provide the following information with this element of the waiver request:

8.2.1. Existing Conditions Narrative

A written description of the existing conditions found at the site should be provided. Additionally, the narrative should describe the methodologies, assumptions and other pertinent discussions of how the existing conditions were analyzed by the designer.

8.2.2. Existing Conditions Map

An existing conditions map should be provided with the report including, but not limited to, the following:

- Topography (2-ft. or less contour interval) of existing site conditions.
- Perennial / intermittent streams, wetlands, lakes and other surface water features.
- Drainage basin delineations showing the location of each drainage sub-basin.
- Drainage basin delineations for each contributing drainage basin upstream of the project site on an appropriate map (USGS Quadrangle, etc.).
- Existing stormwater conveyances and structural control facilities.
- Direction of flow and discharge points from the site including sheet flow areas.
- Any area of significant depression storage.
- Federal, state and local buffers.

The map should provide a clear understanding of the various drainage patterns located throughout the site, as well as drainage onto the site from upstream areas. Additionally, the map should provide a clear view of the natural features of the site that may impact development.

8.2.3. Existing Conditions Tables

A set of tables should be included in the report that will allow the reader to understand how various parameters utilized in modeling the existing conditions were developed. Additionally, tables should be included documenting the results of the modeling.

- A table listing the acreage, soil types and land cover characteristics for each sub-basin.
- A table listing the total acreage, composite curve number and time of concentration for each sub-basin.
- A table listing the peak runoff rates and total runoff volumes from each sub-basin.
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site.
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the existing conditions analysis.

8.2.4. Existing Conditions Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

8.3. Downstream Analysis

The downstream analysis should provide the reader with a comprehensive picture of the downstream areas and their capacity to accommodate stormwater runoff from the proposed development.

8.3.1. Maps

- Drainage basin delineations showing the point at which the contributing area of the project represents 10% of the total drainage basin area as defined in Section 3.1.9.2 of the 2016 edition of Volume 2 the GSMM.
- Identify culverts, channels and other structural stormwater controls that the stormwater runoff must pass through prior to the 10% point identified previously.

8.3.2. Narratives

Provide a narrative with associated calculations demonstrating the downstream analysis at various points showing existing conditions, future conditions without detention or other onsite stormwater controls, future conditions with appropriate detention or other onsite stormwater controls, and future conditions with controls that would be put in place if the waiver were granted.

8.3.3. Downstream Analysis Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.

8.4. Post-Development Hydrologic Analysis

The proposed conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions following development of the project. The designer should provide the following information with this element of the report:

8.4.1. Proposed Conditions Narrative

A written description of the proposed conditions to be found at the site after construction assuming the waiver is granted should be provided. Additionally, the narrative should describe the methodologies, assumptions and other pertinent discussions of how the proposed conditions were analyzed by the designer.

8.4.2. Proposed Conditions Map

A proposed conditions map should be provided with the report including, but not limited to, the following:

- Topography (2-ft or less contour interval) of proposed site conditions.
- Perennial/intermittent streams, wetlands, lakes and other surface water features.
- Drainage basin delineations showing the location of each drainage sub-basin.
- Proposed stormwater conveyances and structural control facilities.
- Direction of flow and discharge points from the site including sheet flow areas.
- Location and boundaries of proposed natural feature protection areas.

The map should provide a clear understanding of the various drainage patterns located throughout the site, as well as drainage onto the site from upstream areas. Additionally, the map should provide a clear view of the natural features of the site that will be impacted by development, as well as features that will not be impacted.

8.4.3. Proposed Conditions Tables

A set of tables should be included in the report that will allow the reader to understand how various parameters utilized in modeling the proposed conditions were developed. Additionally, tables should be included documenting the results of the modeling.

- A table listing the acreage, soil types and land cover characteristics for each sub-basin.
- A table listing the total acreage, composite curve number and time of concentration for each sub-basin.
- A table listing the peak runoff rates and total runoff volumes from each sub-basin.
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site.
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the proposed conditions analysis.

8.4.4. Proposed Conditions Model Diagram

A diagram of the hydrologic model should be provided with the report showing how the model was developed and each node is connected.