GARDENCITY

Stormwater Management Local Design Manual

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Revised 2023

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1. INTRODUCTION

The City of Garden City Stormwater Management Local Design Manual (the Garden City LDM) has been developed to serve as a comprehensive guide to implementing stormwater management facilities, controls and systems in the City of Garden City. Additionally, the Garden City LDM has been developed to supplement the technical guidance information contained in the Georgia Stormwater Management Manual (GSMM) 2016 Edition and the Coastal Stormwater Supplement (CSS) to the GSMM, April 2009 edition. The GSMM and the CSS shall serve as technical reference guidance for the design, construction and maintenance of stormwater management systems within the City. Any conflicts or issues that may arise pertaining to information contained in the GSMM and the CSS should be addressed at the onset of the project through correspondence with the appropriate City Staff.

1.1. Stormwater Management Compliance Process

The following outlines the step by step process for complying with the applicable provisions of the City of Garden City Stormwater Management LDM and the Garden City Post-Construction Stormwater Management Ordinance. All projects differ with regard to the pertinent site-specific design and construction related issues and details. To that end, the step by step process outlined herein should be used as a general guide with the understanding that some variation to the process may be necessary to successfully complete a particular project.

1.1.1. Stormwater Management Site Planning and Design Criteria Process

<u>Concept Design Phase</u>

Step 1. Schedule and Attend a Pre-Design Meeting with the City

Step 2. Review Applicable Local, State and Federal Requirements & Guidelines

Step 3. Conduct Natural Resources Inventory

Step 4. Assess Potential Application of Green Infrastructure Practices

Step 4A. Apply Post-Construction Stormwater Management Criteria

- Criteria #1: Stormwater Runoff Reduction
- Criteria #2: Stormwater Quality Protection
- Criteria #3: Aquatic Resource Protection
- Criteria #4: Overbank Flood Protection
- Criteria #5: Extreme Flood Protection

Step 5. Prepare a Stormwater Management Concept Plan and Submit to City for Review and Approval

Step 6. Schedule and Attend Concept Plan and Consultation Meeting with City Staff to Review Concept Plan

Step 6A. Revise Concept Plan (if necessary)

Detailed Stormwater Management Design Phase

- Step 7. Prepare Stormwater Management Design Plan
- Step 7A. Perform Downstream Analysis
- Step 7B. Prepare Stormwater Management System Inspection & Maintenance Plan
- Step 7C. Prepare Erosion & Sedimentation Control Plan and Planting Plan
- Step 8. Submit Plans to City with Completed Checklist
- Step 9. Address City Comments and Re-Submit for Approval

Construction Phase

- Step 10. Post Performance Bond
- Step 11. Obtain Land Disturbance Activity (LDA) Permit from City
- Step 12. Install and Maintain Site Erosion & Sedimentation Controls
- Step 13. Commence Site Construction Activities
- Step 14. Coordinate Field Inspections with City Staff

Post-Construction Phase

- Step 15. Prepare As-Built Survey and As-Built Design Certification
- Step 16. Post Maintenance Bond, Letter of Credit (LOC), Escrow Amount or Certified Check for the Period Required
- Step 17. Finalize and Execute a Stormwater Management Inspection and Maintenance Agreement(s)
- Step 18. Secure Certificate of Acceptance / Final Plat

2. POST-CONSTRUCTION STORMWATER MANAGEMENT, SITE PLANNING & DESIGN CRITERIA

The following post-construction stormwater management and site planning and design criteria shall be applied to all new development and redevelopment activities that are subject to the provisions of this ordinance. The criteria have been designed to protect valuable local natural resources from the negative impacts of the land development process. If local natural resource protection and stormwater management goals and objectives warrant greater protection than that provided by the post-construction stormwater management and site planning and design criteria outlined below, Garden City may impose additional requirements on new development and redevelopment activities that it has determined are necessary to protect local aquatic and terrestrial resources from the negative impacts of the land development process.

2.1. Natural Resources Inventory

Prior to the start of any land disturbing activities, including any clearing and grading activities, acceptable site reconnaissance and surveying techniques should be used to complete a thorough assessment of the natural resources, both terrestrial and aquatic, found on a development site. The natural resources inventory shall be completed in accordance with the information presented within the April 2009 edition of the CSS to the GSMM. The Natural Resources Inventory data compilation effort shall be performed in general accordance with the CSS, or using a comparable methodology as approved by the City Manager or his designee.

The preservation and/or restoration of the natural resources found on a development site, through the use of green infrastructure practices, may, at the discretion of Garden City, be assigned quantifiable stormwater management “credits” that can be used when calculating the stormwater runoff volumes associated with the post-construction stormwater management criteria outlined in the applicable sections of the Garden City Stormwater Management Ordinance and the LDM. The green infrastructure practices that qualify for these “credits,” and information about how they can be used to help satisfy the post-construction stormwater management criteria outlined in the Garden City Stormwater Management Ordinance, is provided in the April 2009 edition of the CSS to the GSMM.

2.2. Use of Green Infrastructure Practices

Green infrastructure practices are encouraged to be used to the maximum extent practical during the creation of a stormwater management concept plan for a proposed development project. Green infrastructure practices can be used to help protect local terrestrial and aquatic resources from the direct impacts of the land development process, and to help maintain pre-development site hydrology and reduce post-construction stormwater runoff rates, volumes and pollutant loads.

All green infrastructure and stormwater management practices shall be selected, designed, constructed and maintained in general accordance with the information presented in the April 2009 edition of the CSS to the GSMM and the Garden City LDM. Applicants are referred to the GSMM, the CSS to the GSMM and the Garden City LDM, for guidance on selecting green infrastructure and stormwater management practices that can be used to satisfy the post-construction stormwater management criteria outlined in the applicable sections of the Garden City Stormwater Management Ordinance.

For green infrastructure or stormwater management practices that are not included in the CSS to the GSMM, or for which pollutant removal and runoff reduction rates have not been provided, the effectiveness of the green infrastructure or stormwater management practice must be documented through prior studies, literature reviews or other means, and receive approval from the City Manager or his designee before being included in a stormwater management system design.

2.3. Stormwater Runoff Reduction

The stormwater runoff volume generated by the runoff reduction storm event, as defined in the April 2009 edition of the CSS to the GSMM, shall be reduced on-site to the maximum extent practicable in order to help maintain pre-development site hydrology and help protect local aquatic resources from several indirect impacts of the land development process, including decreased groundwater recharge, decreased baseflow and degraded water quality. In general, a stormwater management system is presumed to comply with these criteria if:

1. It includes green infrastructure practices that provide for the interception, evapotranspiration, infiltration or capture and reuse of stormwater runoff, that have been selected, designed, constructed and maintained in accordance with the information presented in the latest edition of the CSS to the GSMM and the City of Garden City LDM; and
2. It is designed to provide the amount of stormwater runoff reduction specified in the April 2009 edition of the CSS to the GSMM.

The City Manager or his designee may vary the amount of stormwater runoff reduction needed to satisfy this criteria on development sites that are considered to be stormwater hotspots or that have site characteristics or constraints, such as high groundwater, impermeable soils, contaminated soils or confined groundwater aquifer recharge areas, that prevent the use of green infrastructure practices that provide for the interception, evapotranspiration, infiltration or capture and reuse of stormwater runoff. When seeking a variance in the amount of stormwater runoff reduction that needs to be provided in order to satisfy these criteria, applicants are encouraged to:

1. Use green infrastructure practices that provide for the interception, evapotranspiration, infiltration or capture and reuse of stormwater runoff, to provide the maximum amount of stormwater runoff reduction specified in the GSMM, the April 2009 edition of the CSS to the GSMM and the Garden City LDM; and,
2. Provide adequate documentation to Garden City to show that no additional runoff reducing green infrastructure practices can be used on the development site and that the reduction provided is all that can be provided in a practical manner.

2.4. Stormwater Quality Management and Protection

In order to protect local aquatic resources from water quality degradation, post-construction stormwater runoff shall be adequately treated before it is discharged from a development site. Applicants can satisfy these criteria by achieving the stormwater runoff reduction criteria set forth in Section 2.3 of the LDM and as required in the Garden City Stormwater Management Ordinance. However, if any of the stormwater runoff volume generated by the runoff reduction storm event, as defined in the April 2009 edition of the CSS to the GSMM, cannot be reduced on the development site, due to site characteristics or constraints, it shall be intercepted and treated in one or more stormwater management practices that provide at least an 80 percent reduction in total suspended solids (TSS) loads and that reduce nitrogen and bacteria loads to the maximum extent practical. When seeking to satisfy these criteria through the use of one or more stormwater management practices, applicants shall:

1. Intercept and treat stormwater runoff in stormwater management practices that have been selected, designed, constructed and maintained in accordance with the information presented in the GSMM, the April 2009 edition of the CSS to the GSMM and the Garden City LDM; and
2. Provide adequate documentation to the City Manager or his designee to show that total suspended solids, nitrogen and bacteria removal were considered during the selection of the stormwater management practices that will be used to intercept and treat stormwater runoff on the development site.

2.4.1. Stormwater Quality for New Development and Redevelopment Sites

All stormwater runoff generated by the designated design storm or storms from a new development or redevelopment site shall be adequately treated before discharge unless otherwise directed by the City Manager or his designee. Stormwater management systems should be designed to accomplish the following for each site as a minimum:

1. Utilize applicable practices in an effort to reduce, at a minimum, the stormwater runoff volume generated by the 0.6 inch rainfall event (and the first 0.6 inches of all larger rainfall events) on the development site;

2. Capture and treat any of the stormwater runoff generated by the 1.2 inch storm event (and the first 1.2 inches of all larger events) that is not reduced under Item 1 above such that:
    i. 80% of the total suspended solids (TSS) loading are removed;
    ii. nitrogen and bacteria loadings are reduced to the maximum extent practicable; and
    iii. stormwater runoff pollutant reduction efforts comply with other watershed-specific, service area-specific or site-specific water quality requirements, if applicable.

It is presumed that a stormwater management system design complies with these criteria if the proposed stormwater controls are selected, designed, constructed and maintained according to this LDM and the CSS. Additional, water quality requirements may be specified for hotspot land uses and activities.

2.5. Aquatic Resources Protection and Energy Dissipation

In order to protect local aquatic resources from several other negative impacts of the land development process, including complete loss or destruction, stream channel enlargement and increased salinity fluctuations, applicants shall provide aquatic resource protection in accordance with the information provided in the April 2009 edition of the CSS to the GSMM.

2.5.1. Aquatic Resources Protection for New Development and Redevelopment Projects

Aquatic resources protection shall be provided for each site through management and extended detention of the 1-year 24-hour storm event released over a period of 24-hours to reduce the frequency and duration of channel forming events.

2.5.2. Energy Dissipation

Velocity control and energy dissipation measures shall be installed at all new and existing stormwater outfalls in accordance with criteria and guidance provided in Section 4.5 of the GSMM (Volume 2) and applicable sections of the CSS.

2.6. Overbank Flood Protection

All stormwater management systems shall be designed to control the peak discharge generated by the overbank flood protection storm event, as defined in the April 2009 edition of the CSS to the GSMM, to prevent an increase in the duration, frequency and magnitude of downstream overbank flooding. A stormwater management system is presumed to comply with these criteria if it is designed to provide overbank flood protection in accordance with the information provided in the April 2009 edition of the CSS to the GSMM.

The City Manager or his designee may modify or waive this criteria on development sites where both the on-site and downstream stormwater conveyance systems are designed to safely convey the peak discharge generated by the overbank flood protection storm event to a receiving stream, tidal creek or other aquatic resource without causing additional downstream flooding or other environmental impacts, such as stream channel enlargement or degradation of habitat.

2.7. Extreme Flood Protection

All stormwater management systems shall be designed to control or safely pass (as a minimum) the peak discharge generated by the extreme flood protection storm event, as defined in the April 2009 edition of the CSS to the GSMM, to prevent an increase in the duration, frequency and magnitude of downstream extreme flooding and protect public health and safety. A stormwater management system is presumed to comply with these criteria if it is designed to provide extreme flood protection in accordance with the information provided in the April 2009 edition of the CSS to the GSMM.

The City Manager or his designee may modify or waive this criteria on development sites where both the on-site and downstream stormwater conveyance systems are designed to safely convey the peak discharge generated by the extreme flood protection storm event to a receiving stream, tidal creek or other aquatic resource without causing additional downstream flooding or other environmental impacts, such as stream channel enlargement or degradation of habitat.

2.8. Redevelopment Criteria

Development activities that are considered to be redevelopment activities shall meet at least one of the following criteria:

1. **Reduce Impervious Cover**: Reduce existing site impervious cover by at least 20%, unless otherwise approved by the City Manager or his designee.
2. **Provide Stormwater Management**: Manage the stormwater runoff from the site's existing impervious cover and any new impervious cover in accordance with the

post-construction stormwater management criteria outlined in the applicable sections of the Garden City Stormwater Management Ordinance and the LDM. The green infrastructure and stormwater management practices used to comply with these criteria shall be selected, designed, constructed and maintained in accordance with the information presented in the April 2009 edition of the CSS to the GSMM and Garden City LDM.

3. **Provide Off-Site Stormwater Management**: Provide, through the use of off-site stormwater management practices, a level of stormwater quality and quantity control that is equal to or greater than that which would be provided by satisfying the post-construction stormwater management criteria outlined in the applicable sections of the Garden City Stormwater Management Ordinance and the LDM.
4. **Combination of Measures**: Any combination of (1) through (3) above that is acceptable to Garden City.

3. HYDROLOGIC & HYDRAULIC METHODS

3.1. Hydrologic Methods

3.1.1. Rational Method

The rational method may be used with the approval of the City Manager or his designee to develop peak runoff flows for culverts or stormwater drainage systems with contributing drainage areas less than 10 acres in size and for detention ponds with contributing drainage areas less than 1 acre in size. All computations shall be in accordance with Section 2.1.4 of the GSMM (Volume 2) and Section 5.0 of the CSS. Rainfall intensities shall be derived from Table A-13 (Savannah) of Appendix A of the GSMM (Volume 2).

As specified above, the rational method may be used to size detention facilities draining less than 1 acre. If the rational method is utilized, the petitioner must utilize a method approved by the City Manager or his designee to develop runoff hydrographs. Triangular rational method runoff hydrographs may not be utilized in the design of detention facilities.

3.1.2. SCS Method

The Soil Conservation Service (SCS) method must be utilized to size detention ponds with a contributing area of 1 acre or more and culverts or other drainage systems with contributing drainage areas greater than 10 acres. All computations shall be in accordance with Section 2.1.5 of the GSMM (Volume 2) and Section 5.0 of the CSS. Rainfall depths shall be derived from Table A-13 (Savannah Rainfall Data) of Appendix A of the GSMM (Volume 2), or other appropriate rainfall data reference resources. Table 1 provides the rainfall depths for use in City of Garden City from the GSMM:

Table 1: Garden City Rainfall Data

Design Storm	Rainfall Depth
1-Year 24-Hour	3.60”
10-Year 24-Hour	6.72”
50-Year 24-Hour	8.88”
100-Year 24-Hour	9.84”

3.2. Hydraulic Methods

All hydraulic calculations shall be made in accordance with Chapter 4 of the GSMM (Volume 2) and applicable sections of the CSS.

4. CONVEYANCE LEVEL OF SERVICE (LOS) STANDARDS

4.1. General

The designer should endeavor to meet the applicable stormwater management design criteria outlined herein to the maximum extent possible for each design project. Successful incorporation of these criteria into the overall design process should: (1) help maintain pre-development site hydrology; (2) protect natural resources; and (3) minimize the impacts of post construction stormwater runoff.

4.2. Stormwater Runoff Detention and Discharge Rate Requirements

Chapter 3.0 of the GSMM and applicable sections of the CSS should be consulted with regard to the design of stormwater runoff detention and discharge rate requirements for new development and redevelopment projects.

4.2.1. Discharge Rates for New Development and Redevelopment Projects

Development plans including site grading and drainage plans should be developed to mimic natural site drainage patterns. Additionally, no increases in stormwater runoff rates shall be allowed at any discharge point from the site unless approved by the City. As a general rule, the "baseline" or pre-developed site condition shall be equivalent to a wooded undisturbed/ undeveloped site regardless of whether any clearing or other development activity has occurred in the past. The City Manager or his designee, may allow for the designer to account for existing site conditions in the pre-developed analysis provided that the designer is able to present sufficient technical information to clearly support deviation from the "baseline" condition stated above.

The development shall be analyzed for the following storm events as a minimum:

- 1-year 24-hour Design Storm
- 10-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. If detention facilities are to be designed and constructed in series, the 24-hour storm criteria will apply regardless of the drainage area.

The post developed peak rate of runoff cannot exceed the pre-developed peak rate of runoff for the 10-year and 50-year, 24 hour design storm events. The City requires that the site detention pond facilities shall be designed based on the 10-year and 50-year storm events. The

principal spillway system/outlet must be capable of discharging the calculated peak flow rate without use of the emergency overflow spillway. The emergency overflow spillway should be designed to safely handle a 100-year storm event. In no case will stormwater stored in road/street rights of way or on residential lots be counted toward the required storage volume of the detention facility.

Where downstream conditions indicate that the conveyance and/or storage capacity of existing infrastructure could be impacted by the post development 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 commensurate 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 proposed detention facility at full site build-out. Additionally, the proposed site plan should have sufficient land around the facility reserved to construct the ultimate configuration without significant demolition.

If a proposed development project discharges stormwater runoff into an undersized stormwater conveyance system that is a part of the Garden City municipal storm sewer system (MS4), then either:

1. The post developed peak rate shall be limited to the pro-rata share of the capacity of the downstream conveyance system as established by the City Manager or his designee; or
2. The site stormwater management plan should provide other engineering solutions that are designed to mitigate adverse impacts on the conveyance system. The proposed solutions should be submitted for review and approval by the City Manager or his designee prior to implementation.

4.3. Drainage Stormwater Conveyance Practices

Stormwater conveyance practices, which may include, but are not limited to, storm drain pipes, culverts, catch basins, drop inlets, junction boxes, headwalls, gutters, ditches, open channels, swales and energy dissipaters, shall be provided when necessary to convey post-construction stormwater runoff and protect private properties adjoining development sites and/or public rights-of-way. Stormwater conveyance practices that are used to convey post-construction stormwater runoff on development sites shall meet the following requirements:

1. Methods used to calculate stormwater runoff rates and volumes shall be in accordance with the information presented in the GSMM, the CSS and the Garden City LDM;
2. All culverts, pipe systems and open channel flow systems shall be sized in accordance with the information presented in the GSMM, the CSS and the Garden City LDM; and
3. Planning and design of stormwater conveyance practices shall be completed in accordance with the information presented in the GSMM, the CSS and the Garden City LDM.

4.3.1. Bridges

All bridges that will serve as an evacuation route shall be designed to accommodate the 100-year 24-hour design storm with no over topping of the roadway/street. A bridge that is not identified for an evacuation route can be designed to a reduced conveyance LOS with the approval of the City.

4.3.2. Culverts & Pipe Systems

Table 2: Culvert & Pipe LOS Criteria

Roadway Classification / Use	Design Storm LOS	Minimum Allowable LOS
Arterial/Emergency Evacuation Route	100-Year	50-Year
Collector Roads	50-Year	25-Year
Neighborhood Roads	25-Year	10-Year
Roads with No Other Outlet	50-Year	25-Year
Parking Lots / Material Storage Areas / Landscape Areas	10-Year	10-Year

Note: *The City Manager or his designee can modify these requirements if the designer demonstrates that an alternate design criterion is acceptable.*

Culverts with contributing drainage areas greater than 10 acres shall be designed using the SCS TR-55; 24-hour storm. If a proposed culvert system will connect to an existing culvert system that does not achieve the design storm event LOS depicted in Table 2 above, then the proposed system shall be designed with an equivalent LOS to the existing system, but the LOS shall not be less than the minimum allowable shown in Table 2 unless approved by the City Manager or his designee. In situations where emergency evacuation issues arise during the Concept Design Phase, the City may require that the conveyance LOS for both the proposed culvert system and the existing culvert system to be increased. The designer should consult with the City during the Concept Design Phase of the project to ascertain the applicable design and LOS requirements.

4.3.3. 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:

Table 3: Flooding LOS Criteria

Roadway Classification / Use	Allowable Flooding LOS
Arterial / Emergency Evacuation Route	One Lane Width Open
Collector Roads	One Lane Width Open
Neighborhood Roads	8.0 ft Lane Width Open
Roads with No Other Outlet	One Lane Width Open
Parking Lots	Maximum 0.5 ft Depth
Detention Areas utilized for other purposes (i.e. parking lot detention, etc.) with flood warning sign	Maximum 1.5 ft Depth
Material Storage Areas / Landscape Areas	Maximum 2.0 ft Depth

Note: *The City Manager or his designee can modify these requirements if the designer demonstrates that an alternate design criterion is acceptable.*

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

4.3.4. 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 and a maximum flooding depth that will not result in bypass of the inlet or cause structural flooding. The headwater conditions induced by the inlet should minimize impacts to any upstream drainage structures. The designer should consult with the City during the Concept Phase to determine if any unacceptable flooding will occur and if such a condition is acceptable/allowable.

4.3.5. Roadside Ditches

Roads constructed without curb and gutter shall incorporate ditches that are designed to the specific design storms as shown in the following table:

Table 4: Roadside Ditch LOS Criteria

Roadway Classification / Use	Design Storm LOS	Minimum Allowable LOS
Arterial/Emergency Evacuation Route	100-Year	50-Year
Collector Roads	50-Year	25-Year
Neighborhood Roads	25-Year	10-Year
Roads with No Other Outlet	50-Year	25-Year

Note 1: *Drainage structures internal to the proposed land development activity will be designed for no less than the 10-year, 24-hour storm event.*
Note 2: *The City Manager or his designee can modify these requirements if the designer demonstrates that an alternate design criterion is acceptable.*

If a proposed roadside ditch system will connect to an existing drainage system (i.e. open ditch, pipe, etc) that does not achieve the design storm LOS depicted in Table 4 above, then the proposed ditch system may be designed with an equivalent LOS to the existing system to which it will connect, but the LOS shall not be less than the minimum allowable shown in Table 4 unless approved by the City Manager or his designee. In situations where emergency evacuation issues arise during the Concept Design Phase, the City may require that the conveyance LOS for both the proposed ditch system and the existing culvert system be improved. This may require that the conveyance capacity of the proposed ditch system be increased to provide storage of rainfall to minimize flooding, or that the existing pipe system conveyance LOS be increased, or that a combination of these stormwater runoff management measures be implemented. The designer should consult with the City during the Concept Design Phase of the project to ascertain the applicable design requirements.

4.3.6. Drainage Channels

For a proposed drainage channel designed to convey stormwater runoff either from or to an existing culvert system, the proposed channel should be designed to the LOS established for the existing pipe system, unless directed otherwise by the City.

4.3.7. Flood Elevation Impacts

All design work should be performed in strict conformance with applicable local, state and federal government agency requirements pertaining to floodplain management. All development activity shall be designed to maintain the flooding capacity of the flood hazard area, unless:

1. It can be demonstrated that the post construction increase in the base flood elevation either upstream or downstream of the proposed development is less than 0.005 feet; or

2. Compensating storage is provided for all flood volume displaced by the proposed development or redevelopment activities below the base flood elevation.

It shall be the policy of Garden City that raising the flood water elevation on an adjacent property shall not be acceptable. As such, the LOS standards outlined in the Garden City LDM shall be considered minimum standards. Where flood elevation(s) on an adjacent property will be increased due to development and/or construction of a drainage system, the LOS may be increased by the City in an effort to minimize impacts 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 and the party responsible for causing the impacts to the floodplain shall address any applicable FEMA or other regulatory requirements as part of the design and permitting effort. 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. Long term maintenance of the easement shall be the responsibility of the private property owners in accordance with the provisions outlined in the easement.

5. CONSTRUCTION MATERIALS

5.1. Conveyance Structures

5.1.1. Pipes Under Roads and Pavement

All pipes under roadways, parking lots and other surfaces designed for vehicular traffic shall be constructed of reinforced concrete pipe (RCP) or High Density Polyethylene (HDPE) pipe meeting Georgia Department of Transportation Standards. Longitudinal pipes with diameters of 36-inches or smaller may utilize HDPE Pipe if the depth of the pipe is five feet or less (as measured from the invert of the pipe to the finished grade). Bedding standards for HDPE pipe shall be such that stone bedding, or equivalent, shall be placed in accordance with manufacturer's specifications. All pipes shall be installed with a minimum of 12-inches of cover from the crown of the pipe and be installed per manufacturer's specifications unless prior approval of the City Manager or his designee has been obtained.

5.1.2. Pipes Not Under Roads and Pavement

Pipes not under roadways, parking lots and other surfaces meant for vehicular traffic shall be constructed of RCP or HDPE meeting Georgia Department of Transportation Standards and approved by the City Manager or his designee. Bedding standards for HDPE pipe shall be such that stone bedding, or equivalent, shall be placed in accordance with manufacturer's specifications. All pipes shall be installed with a minimum of 12-inches of cover from the crown of the pipe and be installed per manufacturer's specifications unless prior approval of the City Manager or his designee has been obtained.

5.1.3. Channels

All channels must be protected from erosion through the use of rip-rap, concrete, erosion control matting or similar method acceptable to the City Manager or his designee. All channel side slopes shall have a 3-foot horizontal to 1-foot vertical (3:1) slope or less, unless otherwise approved by the City Manager or his designee.

5.1.4. Inlets

All inlets shall be constructed of materials and methods approved by the Georgia Department of Transportation (GDOT) and designs pre-approved by the City Manager or his designee.

5.2. Detention Ponds

All stormwater management and detention facilities constructed in accordance with the requirements of the LDM shall be constructed on subdivided parcels deeded to the property owner (for non-residential parcels) or the homeowners association (for residential parcels). Detention ponds constructed on non-residential parcels can also be located on common area property with the prior approval from the City Manager or his designee. No stormwater management or detention facility for residential subdivisions shall be constructed in whole or part on a parcel or lot intended for future sale or use as a residential property.

5.2.1. Dry Earthen Detention Ponds

Dry detention ponds shall be designed to provide for positive drainage to the outlet of the pond. Side slopes shall be designed to have a maximum of 3-feet horizontal to 1-foot vertical (3:1) slopes or steeper slopes if approved by the City Manager or his designee. If the 100-year maximum water surface depth is equal to or greater than four feet, then a standard four foot high chain link fence shall be constructed around the detention pond with a 20-foot gate provided to allow access. A chain link fence may not be required when the site in which the pond is to be constructed is zoned non-residential and is a sufficient and safe distance from properties zoned residential or publicly owned property (excluding right-of-way). The City should be consulted on any waiver regarding erection of a fence around the detention pond.

Acceptable backfill and fill materials shall consist of suitable soils for earthen embankment construction. The material should be free of rock or gravel larger than three inch in any dimension, debris, waste, 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 achieve optimum moisture and density per ASTM D698. 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 per ASTM D 698.

5.2.2. 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 sufficiently demonstrated to the City Manager or his designee that construction of an aboveground detention pond is infeasible.

5.2.3. Wet Detention Ponds

Wet detention ponds may be constructed if the facilities are designed to the criteria outlined in Section 3.2.1.5 of the GSMM (Volume 2) and Section 8.0 of the CSS.

5.3. Water Quality Best Management Practices (BMPs)

5.3.1. Green Infrastructure Practices

The designer is encouraged to review and consult the information contained in Section 7.0 of the CSS and the Green Growth Guidelines (http://crd.dnr.state.ga.us/content/displaycontent.asp?txtDocument=969) regarding the recommended green infrastructure practices.

5.3.2. Recommended Stormwater Management Practices

The designer is encouraged to review and consult Section 8.0 of the CSS for guidance regarding the recommended stormwater management practices and selection of appropriate stormwater management practices.

5.3.3. Proprietary Stormwater Management Practices

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

6. SPECIAL DISTRICTS

The City Manager or his designee may establish special design criteria for select areas based on the findings of watershed assessments, hydrologic and hydraulic reports, known flooding issues, or geographic-specific service delivery considerations. The designer is should consult with the City Manager or his designee to determine if any special drainage districts exist within Garden City. At this time, no special districts have been established.

7. PROCEDURES AND REQUIREMENTS

All development projects must submit the required information as indicated in the Garden City Stormwater Management Ordinance. The following subsections outline the basic requirements.

7.1. Stormwater Management Concept Plan

The Stormwater Management Concept Plan should include the information stipulated in the Garden City Stormwater Management Ordinance and this LDM. Prior to preparation of the concept plan, the designer should consult with the City Manager or his designee regarding the existence and/or applicability of any existing City developed drainage master plans or special district requirements. As part of the concept design process, a consultation meeting shall be scheduled with the City to review the pertinent site design issues in accordance with the Garden City Stormwater Management Ordinance.

The stormwater management concept plan shall include the following information:

1. Project Narrative: The project narrative shall include a vicinity map, the common address of the development site and a legal description of the development site**.** The concept plan stormwater management system narrative shall also include information about how post-construction stormwater runoff will be managed on the development site, including a list of the low impact development and stormwater management practices that will be used. It shall also include preliminary calculations showing how initial estimates of the post-construction stormwater management criteria that apply to the development project were obtained, including information about the existing and proposed conditions of each of the drainage areas found on the development site (e.g., size, soil types, and land cover characteristics).

2. Site Fingerprint: The site fingerprint shall illustrate the results of the natural resources inventory, which is used to identify and map the natural resources found on the development site, as they exist prior to the start of any land disturbing activities.

3. Existing Conditions Map: The existing conditions map shall include all of the information shown on the site fingerprint and shall illustrate:

    (a) Existing roads, buildings, parking areas and other impervious surfaces;
    (b) Existing utilities (e.g., water, sewer, gas, electric) and utility easements;
    (c) Existing primary and secondary conservation areas;
    (d) Existing low impact development and stormwater management practices;
    (e) Existing storm drain infrastructure (e.g., inlets, manholes, storm drains); and,
    (f) Existing channel modifications (e.g., bridge or culvert installations).

4. Proposed Conditions Map: The proposed conditions map shall illustrate:

   (a) Proposed drainage divides and patterns;
   (b) Proposed roads, buildings, parking areas and other impervious surfaces;
   (c) Proposed limits of clearing and grading;
   (d) Proposed primary and secondary conservation areas;
   (e) Proposed low impact development and stormwater management practices;
   (f) Proposed storm drain infrastructure (e.g., inlets, manholes, storm drains); and,
   (g) Proposed channel modifications (e.g., bridge or culvert installations).

   Note: *For a multi-phase project, a stormwater master plan is required to conceptually indicate how the minimum requirements of the ordinance will be met. This does not preclude the requirement of a stormwater management design plan for each phase as it is being developed. The master plan of multi-phased project shall consolidate detention facilities to as much as practical.*

7.2. Stormwater Management Design Plan

The Stormwater Management Design Plan should include the information stipulated in the Garden City Stormwater Management Ordinance. The Stormwater Management Design Plan shall be designed and certified by a qualified Professional Engineer registered in the State of Georgia and include the required certifications. The Stormwater Management Design Plan shall include all of the information contained in the Stormwater Management Concept Plan, plus:

7.2.1. Existing Conditions Hydrologic Analysis: The existing conditions hydrologic analysis shall include:

   (a) Existing conditions map including existing topography shown with adequate spot elevations or one foot proposed contours;
   (b) Information about the existing conditions of each of the drainage areas found on the development site (e.g., size, soil types, land cover characteristics);
   (c) Information about the existing conditions of any off-site drainage areas that contribute stormwater runoff to the development site (e.g., size, soil types, land cover characteristics);
   (d) Information about the stormwater runoff rates and volumes generated, under existing conditions, in each of the drainage areas found on the development site;
   (e) Information about the stormwater runoff rates and volumes generated, under existing conditions, in each of the off-site drainage areas that contribute stormwater runoff to the development site; and

(f) Documentation (e.g., model diagram) and calculations showing how the existing conditions hydrologic analysis was completed.

7.2.2. Proposed Conditions Hydrologic Analysis: The proposed conditions hydrologic analysis shall include:

(a) Proposed conditions map;

(b) Information about the proposed conditions of each of the drainage areas found on the development site (e.g., size, soil types, land cover characteristics);

(c) Information about the existing conditions of any off-site drainage areas that contribute stormwater runoff to the development site (e.g., size, soil types, land cover characteristics);

(d) Information about the stormwater runoff rates and volumes generated, under proposed conditions, in each of the drainage areas found on the development site;

(e) Information about the stormwater runoff rates and volumes generated, under existing conditions, in each of the off-site drainage areas that contribute stormwater runoff to the development site; and

(f) Documentation (e.g., model diagram) and calculations showing how the proposed conditions hydrologic analysis was completed.

7.2.3. Post-Construction Stormwater Management System Plan: The post-construction stormwater management system plan shall illustrate:

(a) Proposed topography shown with adequate spot elevations or one foot proposed contours;

(b) Proposed drainage divides and patterns;

(c) Existing and proposed roads, buildings, parking areas and other impervious surfaces;

(d) Existing and proposed primary and secondary conservation areas;

(e) Plan view of existing and proposed low impact development and stormwater management practices;

(f) Cross-section and profile views of existing and proposed low impact development and stormwater management practices, including information about water surface elevations, storage volumes and inlet and outlet structures (e.g., orifice sizes);

(g) Plan view of existing and proposed storm drain infrastructure (e.g., inlets, manholes, storm drains);

(h) Cross-section and profile views of existing and proposed storm drain infrastructure (e.g., inlets, manholes, storm drains), including information about

invert and water surface elevations as well as hydraulic grade line (HGL) information; and

(i) Existing and proposed channel modifications (e.g., bridge or culvert installations);

(j) Proposed utilities and utility easements;

(k) Project Narrative.

7.2.4. Post-Construction Stormwater Management System Narrative

The post-construction storm water management system narrative shall include information about how post construction storm water runoff will be managed on the development site, including a list of the low impact development and storm water management practices that will be used. It shall also include documentation and calculations that demonstrate how the selected low impact development and storm water management practices satisfy the post-construction storm water management criteria that apply to the development site, including information about the existing and proposed conditions of each of the drainage areas found on the development site (e.g. size, soil types, land cover characteristics, etc).

7.3. Downstream Analysis

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

7.3.1. Drainage Basin Maps

(a) Develop and provide 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 2.1.9.2 of the GSMM;

(b) Identify culverts, channels and other structural stormwater controls from readily available information and sources that the stormwater runoff must pass through prior to the 10% point identified previously and analyze the LOS of each affected system. In the absence of readily available information, it shall be assumed that all runoff reaches the 10% point.

7.3.2. Project Narratives

(a) Develop and provide supporting calculations for a downstream peak flow analysis using the 10% rule necessary to show safe passage of the post-development design flows downstream

7.4. Certification by Plan Preparer

The stormwater management design plan shall be prepared by a certified and qualified design professional who must certify that the design of the stormwater management system meets the requirements of the ordinance and the April 2009 edition of the CSS to the GSMM, and any relevant local addenda.

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

"I, (Name of Professional), a Registered Professional Engineer in the State of Georgia, hereby certify that this stormwater management plan for the project known as (Project Name), lying in Land Lot (XXX), of the (XX) District, City of Garden City, Georgia, has been prepared under my supervision, and, in my opinion, meets the stormwater management and site planning and design criteria presented in the CSS and the GSMM. This (day) day of (Month), (Year)."

(b) Each report should begin with the following certification statement and be signed and sealed by the owner/developer for the project:

"I, (Name of Owner/Developer), a hereby certify that all clearing, grading, construction, and land disturbing activities for the project known as (Project Name), lying in Land Lot (XXX), of the (XX) District, City of Garden City, Georgia, will be performed according with this stormwater management design plan. This (day) day of (Month), (Year)."

7.5. 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.

(a) All elements specified in the Georgia Erosion and Sediment Control Act and local ordinances and regulations;

(b) Sequence/phasing of construction and temporary stabilization measures;

(c) Temporary structures that will be converted into permanent stormwater controls.

7.6. 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.

7.7. As-Built Plans and Design Certification

As-built plans and a design certification shall be required on any completed development project which is covered under the provisions of the Garden City Stormwater Management Ordinance (Section 30-241(c)). The approval of as-built documentation shall be a prerequisite to a final construction acceptance, bond release and/or issuance of a certificate of occupancy. Copies of the as-built plans and the design certification shall be prepared by a registered professional engineer and submitted to the Director of Planning and Economic Development at the appropriate time. Final inspections by the City will not be made unless the as-built plans and accompanying documentation are available to the City for use. As a minimum, the following information shall be included on the as-built plans:

(a) Horizontal locations of all storm sewers with invert elevations and top of structure elevations (NAVD 1988 datum);
(b) Length, size and type of material used for all storm sewer pipes;
(c) As-built topography on stormwater detention basins and verification of storage volumes and discharge rates;
(d) Pertinent information documenting the proper installation of stormwater management Best Management Practices (BMPs) or controls that address stormwater runoff reduction and stormwater quality management for the site.
(e) Spot elevations in 100 foot increments showing inverts of improved channels and swales located onsite.
(f) All dedicated easements. The cover sheet shall include the deed book and page number in which the easement is located.
(g) A graphic scale.
(h) Any changes or deviations from the approved plans must be clearly indicated.
(i) Measurement of impervious surface for the site.
(j) A certification statement from the registered professional engineer that the as-built plans and supporting calculations are in conformance with the approved plans for the site. The following certification statement shall be used and provided:

"I, (Name of Professional), a Registered Professional Engineer in the State of Georgia, have reviewed this physical survey, and in my professional opinion, based on my knowledge, information and belief, the design elements measured by the physical survey and the subsequent calculations thereof are in substantial conformance with the approved plans. This review does not: (1) imply that inspections were made during construction, (2) vouch for the quality of the work, (3) address any element or structure not visible or depicted on the physical survey."

7.8. Stormwater Management System Inspection and Maintenance Plan Agreement

The owner shall comply with all applicable requirements as set forth in the Garden City Development Regulations. A sample copy of the Garden City Stormwater Facility Inspection & Maintenance Agreement and Plan is provided in Appendix A.

7.8.1. The inspection and maintenance plan agreement shall include the following information:

(a) Identification by name or official title the person(s) responsible for carrying out the inspection and maintenance;

(b) A statement confirming that responsibility for the operation and maintenance of the stormwater management system, unless assumed by City of Garden City, shall remain with the property owner and shall pass to any successive owner;

(c) A provision stating that, if portions of the development site are sold or otherwise transferred, legally binding arrangements shall be made to pass responsibility for the operation and maintenance of the stormwater management system to the appropriate successors in title; these arrangements shall designate, for each portion of the stormwater management system, the person(s) to be permanently responsible for its inspection and maintenance;

(d) A maintenance schedule stating when and how often routine inspection and maintenance will occur to ensure proper function of the stormwater management system; and,

(e) Plans for annual inspections to ensure proper performance of the stormwater management system between scheduled maintenance activities.

7.8.2. The inspection and maintenance agreement and plan shall be approved by the City Manager or his designee prior to approval of the Stormwater Management Design Plan and recorded with the deed upon approval of the stormwater management design plan.

7.8.3. In addition to enforcing the terms of the inspection and maintenance agreement and plan, Garden City may also enforce all of the provisions for ongoing inspection and maintenance contained in Section 30-242 of the Garden City Stormwater Management Ordinance.

7.8.4. The terms of the stormwater management system inspection and maintenance agreement and plan shall provide for the City Manager or his designee to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. These terms include the right to enter a property when the City Manager or his designee has a reason to believe that a violation of an approved stormwater management system inspection and maintenance agreement and plan has occurred and when necessary for abatement of a public nuisance or correction of a violation of this ordinance or an approved stormwater management system inspection and maintenance agreement and plan.

Appendix A: Stormwater Facility Inspection & Maintenance Agreement

This AGREEMENT, made and entered into this __ day of _____, 20_____, by and between (*Insert Full Name of Owner*)_____ his/her successors and assigns, including but not limited to any homeowners association, commercial developer, holder of any portion of the below described property, and/or similar (hereinafter called the "Landowner"), and the City of Garden City, Georgia; hereinafter called the "City".

WITNESSETH, that WHEREAS, the Landowner is the owner of certain real property described as (*Chatham County Tax Map /Parcel Identification Number*) _____ and recorded by deed in the land records of Chatham County, Georgia, Deed Book _____ Page _____, hereinafter called the "Property".

WHEREAS, the Landowner is proceeding to develop the property and/or build upon the property; and

WHEREAS, the Stormwater Management and Operations and Maintenance (O&M) Plan; hereinafter called "the Plan", which is expressly made a part hereof, as approved or to be approved by the City, provides for management of stormwater runoff for the property; and

WHEREAS, the City and the Landowner, its successors and assigns, agree that the health, safety, and welfare of the residents of Garden City, Georgia, require that stormwater management facilities be constructed and maintained on the Property and in accordance with the Plan; and

WHEREAS, the City requires that stormwater management facilities as shown within the Plan be constructed and adequately maintained by the Landowner, its successors and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The stormwater management facilities shall be constructed and/or upgraded as well as maintained by the Landowner, its successors and assigns, in accordance with the specifications identified in the Plan.

2. The Landowner, its successors and assigns, shall adequately maintain the stormwater management facilities and perform the work necessary to keep those facilities in good working order at all times, as described in the Plan. This includes all pipes, channels or other conveyances built to convey stormwater to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the stormwater runoff. Adequate maintenance is herein defined as good working condition so that these facilities are performing their approved design functions.

3. The Landowner, its successors and assigns, shall inspect the stormwater management facility and submit an inspection report annually to the City Manager (or his designee). The purpose of the inspection is to ensure safe and proper functioning of the stipulated facilities. The inspection shall cover all applicable stormwater management facilities, including but not limited to, conveyance measures, berms, outlet structures, pond areas, etc. Deficiencies shall be noted in the inspection report along with a schedule for repair.

The inspection procedures, frequency and report shall follow the procedures established and approved in the Plan.

4. The Landowner, its successors and assigns, hereby grant permission to the City, its authorized agents and employees, to enter upon the Property and to inspect the stormwater management facilities whenever the City deems necessary and with reasonable notice having been given to the Landowner. The City shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary.

5. In the event the Landowner, its successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the City, the City may issue citations to the Landowner for resulting, continuing ordinance violations (as set forth in the Garden City Code of Ordinances), until such time as the issues are satisfactorily resolved. Additionally, the City may enter upon the Property and implement the necessary measures to correct deficiencies identified in the inspection report and to recover the costs of such repairs from the Landowner, its successors and assigns through the appropriate means. This provision shall not be construed to allow the City to erect any structure of permanent nature on the land of the Landowner outside of the easement for the stormwater management facilities. It is expressly understood and agreed that the City is under no obligation to routinely maintain or repair said facilities, and in no event shall this AGREEMENT be construed to impose any such obligation on the City.

6. Landowner, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plan, the schedule will be followed.

7. In the event the City, pursuant to this AGREEMENT, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the City upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the City hereunder.

8. This Agreement imposes no liability of any kind whatsoever on the City and the Landowner agrees to hold the City harmless from any liability in the event the stormwater management facilities fail to operate properly.

9. This AGREEMENT shall be recorded among the land records of Chatham County, Georgia, and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests, including any homeowners association.

CERTIFICATION

OWNER:

WITNESS the following signatures and seals:

_____
Company/ Corporation/Partnership Name (Seal)

By: _____

_____
(Type Name and Title)

GARDEN CITY, GEORGIA:

By: _____

_____
(Type Name and Title)

Date:_____

The foregoing AGREEMENT was acknowledged before me this ___ day of _____, 20___, by

_____.

_____
NOTARY PUBLIC

My Commission Expires: _____