Appendix L

Clean Water Nashville Overflow Abatement Program

GUIDANCE FOR DESIGN

SUSTAINABLE DEVELOPMENT

Version 3.0

March 2018

cleanwater NASHVILLE
OVERFLOW ABATEMENT PROGRAM

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Section 1

Introduction: Integrating Sustainability

1.1 Intent

Sustainable development practices shall consistently be applied across all Clean Water Nashville Overflow Abatement Program (Program) projects. The Program provides the following guidance to be used by the Designer to achieve a consistent approach in designs and final products.

Since 2007, Metro Nashville has required LEED certification for most buildings and in 2008, the Metro Council noted the following reasons for sustainable development practices in its ordinance for Green Building Permits:

1. Development and construction practices are significant contributors to the depletion of natural resources and a major cause of air and water pollution, solid waste, deforestation, toxic wastes, health hazards, and global warming.

2. Buildings use one-quarter of all the world's wood harvest, consume two-fifths of all material and energy flows, and account for more than one-third of U.S. CO2 emissions.

3. Sustainable buildings are cost effective and make good business sense according to a recent study by the GSA that analyzed data from certified green building.

4. Sustainable buildings can boost employee productivity by 15%, provide stronger employee attraction and retention, and result in fewer illnesses and lower absenteeism, which reduces healthcare costs.

In his first year in office, Mayor Karl Dean formed a green ribbon committee to develop a report on how Nashville/Davidson County could achieve his goal of being the greenest city in the Southeast. The results of that effort was a report entitled "Together Making Nashville Green" that identified 16 goals and 71 recommendations as both a shared vision and series of action steps for the City. One of those goals and several recommendations were related to water, the improved protection of watersheds, and increased utilization of Low Impact Development (LID). In 2009, the Green Infrastructure Master Plan documented that approximately 45% of the area within our 7,878 acre combined sewer system is impervious, split almost equally between buildings, roads, and parking.

1.2 Sustainability Matrix

For the integration of sustainability within the project design, the Designer should reference Figure 1-1, the Sustainability Matrix by Project Type, which indicates the sustainability elements that should be considered for each type of project. For example, for a gravity sewer improvements project, the expectation of the Program is that siting, tree protection, reforestation, etc. are considered as part of the design. Each of the elements included in the matrix are further described in the following sections.

For those portions which are identified for consideration, the Designer should complete the applicable portions of the Sustainability Checklist, shown as Figure 2-1, with their first design submittal (*Preliminary Engineering Report* or 30% Design Submittal). The Designer should clearly indicate if the

minimum design criteria are not met and the reasons why. In addition, the Designer is encouraged to consider additional sustainability elements in the project's design that exceed the minimum criteria. Those elements should also be described in the Sustainability Checklist, along with estimated capital costs, estimated operations and maintenance costs, and the benefits of the element including community impacts. Sustainability elements that exceed the minimum criteria will be included in the design as approved by MWS. MWS may also request that a more detailed analysis of a proposed sustainability element be conducted as the design progresses. The intent of this additional analysis would be to more fully understand the element's environmental, social, and economic (triple bottom line) impacts.

If the Designer feels there are sustainability elements not listed in the matrix that are appropriate for consideration for a given project, these should be brought to the attention of the Program's Project Manager for discussion.

Upon completion of design, the Designer should submit an updated version of the Sustainability Checklist that confirms which minimum design criteria were or were not met and lists any additional sustainability elements that were included in the design that exceed the minimum criteria. This checklist will be used by the Construction Manager to monitor these elements during construction.

SUSTAINABILITY MATRIX
by Project Type

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		Rehabilitation	Linear Improvements - Gravity Sewer and Force Main	Pump Stations and/or Equalization Facilities
SECTION 1: SITE SUSTAINABILITY	**A. Site Planning**			
	A.1 Siting		■	■
	A.2 Passive Solar			■
	A.3 Community Amenities			■
	A.4 Education			■
	B. Landscape Design			
	B.1 Plant Material			■
	B.2 Tree Protection	■	■	■
	B.3 Landscape Buffers			■
	B.4 Water Quality Buffers	■	■	■
	B.5 Tree Density Requirements			■
	B.6 Reforestation		■	■
	B.7 Rights-of-Way/Easements	■	■	
	C. Stormwater Design			
	C.1 Bioretention			■
	C.2 Water Quality Swales/Detention		■	■
	C.3 Permeable Pavements			■
	D. Urban Heat Island			
	D.1 Minimize Hardscapes			■
	D.2 Light, Reflective Pavement and Roofs			■
	E. Exterior Site Lighting			
SECTION 2: WATER EFFICIENCY	A. Passive Irrigation			■
	B. Irrigation			■
	C. Water Harvesting			■
SECTION 3: ENERGY AND ATMOSPHERE	A. Geothermal Systems			■
	B. Energy Generation System			■
SECTION 4: MATERIALS	A. Construction Waste Management		■	■
	B. Recycled Content			■
	C. Regional Materials		■	■
SECTION 5: INDOOR ENVIRONMENTAL QUALITY	A. Indoor Environmental Quality			■

Figure 1-1 – Sustainability Matrix by Project Type

SUSTAINABILITY CHECKLIST

PROJECT NAME: Example Project 1
ADDRESS: 123 Example Road
CONSULTANT: Example Firm Name
DATE: xx.xx.xxxx

SIGNATURE
Engineer: Name of Engineer
Company: Name of Company

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		Are Minimum Design Criteria Met? Yes	No	N/A	Comments	Options to Exceed Minimum Criteria	Estimated Capital Cost	Estimated O & M Cost	Benefits
1	**SITE SUSTAINABILITY**								
A	**Site Planning**								
A.1	Siting								
A.2	Passive Solar Heating								
A.3	Community Amenities								
A.4	Education								
B	**Landscape Design**								
B.1	Plant Material								
B.2	Tree Protection								
B.3	Landscape Buffers								
B.4	Water Quality Buffers								
B.5	Tree Density								
B.6	Reforestation								
B.7	ROW and Easements								
C	**Stormwater Design**								
C.1	Bioretention								
C.2	Water Quality Swales and Grass Channels								
C.3	Permeable Pavements								
D	**Urban Heat Island**								
D.1	Minimize Hardscapes								
D.2	Light, Reflective Pavement and Roofs								
E	**Exterior Site Lighting**								
2	**WATER EFFICIENCY**								
A	Passive Irrigation								
B	Irrigation								
C	Water Harvesting								
3	**ENERGY**								
A	Geothermal Systems								
B	Energy Generation Systems								
4	**MATERIALS AND RESOURCES**								
A	Construction Waste Management								
B	Recycle Content								
C	Regional Materials								
5	**INDOOR ENVIRONMENTAL QUALITY**								

Figure 1-2 – Sustainability Checklist

Section 2

Site Sustainability

2.1 Site Planning

2.1.1 Intent

To meet Metro's goals for green initiatives, low impact development measures should be incorporated into site planning where feasible. Site planning should also seek to minimize the total impervious site areas by efficiently minimizing parking and laying out access drives to facilitate maintenance access.

Site constraints should be determined and evaluated with potential best management practices. Site constraints may include site area, topography, soils, water table and bedrock, and proximity to building foundations. All options should consider low maintenance as a criterion for use.

2.1.2 Strategies

2.1.2.1 Siting

An important step in incorporating sustainability measures involves efficient site planning to minimize site disturbance from building and grading operations. When siting facilities on parcels, visibility to and from adjacent parcels and public lands, scenic topography and the presence of sensitive environmental conditions such as wetlands, floodplains, floodway, and mature forests should be considered. Building facilities should be located outside floodway-designated lands to the degree possible. The design should allow required greenway and stream buffers to be provided, if feasible. Pipelines and buried structures may need to be in the buffer and floodway areas due to site constraints.

2.1.2.2 Passive Solar Design

Passive solar design may be applied to occupied building space based on proper orientation, storing created thermal mass, and distributing stored solar energy back into the occupied space. Passive solar design for projects may include day-lighting work spaces; incorporating high performance glazing for windows to reduce heat gain and admit visible light; selecting high-efficiency heating, ventilation, and air conditioning systems; and providing adequate shade through vegetation or building structures to avoid summer sun.

2.1.2.3 Community Amenities

Where available land area exists and a need for open space is identified in a community plan or parks and greenways master plan, the Program will endeavor to enhance a project by providing community amenities. The determination of community amenity potential will be determined by the Program Management Team prior to project assignment.

2.1.2.4 Education

Where planned facilities and grounds have public access, the Designer shall review opportunities for the inclusion of environmental graphics or signage, which interprets the implementation of sustainable elements used on the site.

2.2 Landscape Design

2.2.1 Intent

The current site planning and landscape approval process within Metro Nashville is administered by the Metro Codes Departments through *Title 17 – Zoning* and more specifically through *Chapter 17.24 – Landscaping, Buffering, and Tree Replacement* within the Metro Zoning Code. This ordinance generally provides requirements for overall site landscape requirements, tree protection and replacement, parking area screening and landscape, and landscape buffer yard requirements. All existing *Zoning Code Chapter 17.24 – Landscaping, Buffering and Tree Replacement* requirements shall be met or exceeded as further enumerated in this document. Completed plans are approved through the Metro Urban Forester at Metro Codes Department.

The immediate area where site development occurs should be reviewed for contextual site conditions including adjacent land uses, soils, slopes, and plant material species. In locations where projects occur adjacent to residential and mixed-use land uses, the requirements of the Zoning Code shall be exceeded to address and mitigate potential visual impacts toward the site. Material selection and placement shall be made to reduce operations and maintenance cost for plant material and required irrigation. In addition to this document, it is recommended that Designers reference the *Metropolitan Nashville Landscape Guidelines and Best Management Practices* when conceptualizing and implementing a design. The Designer is also expected to be familiar with and incorporate additional guidance from Metro's Urban Forestry Program Manager, regarding tree canopy maintenance and clearing on public lands.

2.2.2 Strategies

2.2.2.1 Plant Material

Plant material species selected for landscape design shall be native or non-invasive, naturally adapted species. Low maintenance species with limited pest and disease problems that do not require regular pruning are preferred.

2.2.2.2 Tree Protection

Existing vegetated site areas not being disturbed by proposed site improvements shall be protected from all site operations, including storage and access, using tree protection fencing measures as indicated in *Zoning Code Chapter 17.24 – Landscaping, Buffering and Tree Replacement*.

2.2.2.3 Landscape Buffers

The landscape buffer should exceed the *Zoning Code Chapter 17.24 – Landscaping, Buffering, and Tree Replacement* requirements by 10% on project sites where development for building type structures is adjacent to residential or mixed use land uses (per *Zoning Code Title 17 – Zoning*) or public use and view, e.g., parks or public right-of-way.

2.2.2.4 Water Quality Buffers

Water Quality Buffers as outlined in Metro's *Stormwater Management Manual, Volume 1*, Section 6.9, should be protected where possible. Disturbances to water quality buffers and a mitigation plan must be approved by the MWS Stormwater NPDES Department.

2.2.2.5 Tree Density Requirements

For all project sites, overall site landscape tree density requirements should exceed the Z*oning Code Chapter 17.24 – Landscaping, Buffering, and Tree Replacement* requirements by 10%. Tree density units may be used to fulfill the buffer requirements described above.

2.2.2.6 Reforestation

Where existing wooded areas greater than or equal to 5,000 square feet have been removed for required grading operations and are not replaced with structures or paved surfaces as a part of this improvement, an area on the site equivalent to the removed wooded area shall be reforested using reforestation measures described in Metro's *Stormwater Management Manual, Volume 5, Low Impact Development (LID Manual): GIP-10 Reforestation.* Where removed wooded areas are less than 5,000 square feet, the area may be planted with plant material equivalent to a Buffer B density per *Zoning Code Chapter 17.24 – Landscaping, Buffering and Tree Replacement*.

2.2.2.7 Landscape within Rights-of-Way and Easements

Where line repairs or replacements fall within public rights-of-way or designated utility easements and disturb existing vegetation and where planting can be provided without interference with operations and maintenance of the sewer, the following landscape shall be provided:

- Tree replacement should be provided at a rate of one 2-inch caliper tree for each 6-inch caliper or greater tree removed.
- Where no trees were removed within a public right-of-way in a residential or mixed-use neighborhood and where adequate planting area exists, trees shall be provided for the length of the improvements at an equivalent spacing of one 2-inch caliper shade tree per 50 linear feet.

Minimum adequate planting area constraints per tree are 100 square feet of surface area and three feet depth of root zone. Appropriate species in areas where overhead power lines exist are listed in the *Power Line Approved Trees* brochure at Nashville Electric Service's website, www.nespower.com.

2.3. Stormwater Design

2.3.1 Intent

The Designer is encouraged to find solutions that integrate Metro's landscape and stormwater requirements into project designs in order to reduce stormwater runoff and to allow for maximum capture and reuse, infiltration, and evapotranspiration of stormwater on site.

Examples and additional information of integrated stormwater and landscape requirements that may be appropriate for projects under the Program are provided in the *LID Manual*, which includes specifications and best management practices in addition to the items in this section. Although not listed here, additional items that may be considered include the use of infiltration trenches, green roofs, cisterns, etc.

Per the *LID Manual*, site development is expected to meet or exceed the requirement to manage the first inch of rainfall on a site through capture and reuse, infiltration and evapotranspiration.

2.3.2 Strategies

2.3.2.1 Bioretention

Bioretention areas should be used, where feasible, in areas downstream from proposed and existing surface areas to collect, filter, and infiltrate water from the project site's new construction and existing impervious surface developed areas. Recommended species are as included within the *LID Manual: GIP-01 Bioretention* and *GIP-02 Urban Bioretention* for trees, shrubs, grasses, and perennials.

2.3.2.2 Water Quality Swales and Grass Channels

Water quality swales and grass channels may be used to direct and hold stormwater when other measures are not appropriate.

2.3.2.3 Permeable Pavements

Permeable pavements for pedestrian pavement areas and for vehicular pavement areas not receiving heavy-duty traffic with turning movement should be considered. Where impervious areas do exist, the Designer shall, when practical, break up the flow directions from large surfaces and locate impervious areas so that they drain to stabilized vegetated areas or pervious pavements. Refer to *LID Manual: GIP-03*.

2.4 Urban Heat Island

2.4.1 Intent

Dark, non-reflective surfaces, such as asphaltic pavement and tar and gravel roofs, absorb heat from the sun and release it back into the environment. This in effect raises the local temperature and explains why cities are often warmer than rural or undeveloped areas. The increased temperatures may put more strain on building cooling systems as well as plant and animal life.

2.4.2 Strategies

2.4.2.1 Minimize Hardscapes

Minimize the use of pavement, hardscape, and rooftop surfaces.

2.4.2.2 Light, reflective pavement and roofs

If pavement and roof materials are necessary, select materials with a solar reflectance index (SRI) of 29 or higher. A light-colored material will have a higher SRI, meaning it reflects more of the sun's heat rather than absorbing it. Lighter materials tend to darken over time, and may require occasional cleaning to maintain high reflectance.

2.5 Exterior Site Lighting

The Designer shall provide placement locations and fixture styles for all building and site lighting to minimize light trespass beyond the site boundary. Fixture types should be International Dark Sky Association (IDSA) approved based on the fixture category.

Section 3

Water Efficiency

3.1 Intent

Site uses which do not require the use of potable water, such as irrigation, toilet flushing, or water for washing or flushing pavement, should use passive irrigation or non-potable water supply whenever possible. Where a potable water supply is necessary, efficient use of water resources should be critical element in design. This elimination of potable water and/or efficient design of potable sources results in long-term, life-cycle cost savings.

3.2 Strategies

3.2.1 Passive Irrigation

Landscape areas on project sites which are lawn, meadow, reforestation, or a part of a bioretention or low impact design system should use passive irrigation whenever possible. Passive irrigation incorporates the diversion of stormwater from impervious surfaces, such as roofs or pavements to pervious surfaces, including landscape areas, in order to reduce the need for a subsurface irrigation system. This promotes deep root systems for plant material and reduces operating cost due to the reduction or elimination of the use of potable water or piped water from a cistern or tank. Wherever possible, downspouts should be used to allow roof surface areas to be directed to stabilized vegetated areas via passive irrigation. Refer to *LID Manual: GIP-07*. When working within the combined sewer system, directly connected downspouts should be disconnected, where possible. In the sanitary sewer system, consistent with Metro codes, downspouts should not be connected to the sewer system.

3.2.2 Irrigation

Where passive irrigation cannot be used to meet the requirements of plant material, an automatic irrigation system should be used to insure the survivability of new plant material. Basic irrigation may be provided with a site hydrant/hose system(s). Automatic systems required by development areas shall use a high efficiency automatically controlled irrigation system achieving a 30% minimum reduction in water use. The preferred distribution for irrigation systems, if provided, is high efficiency spray heads or drip irrigation system. The Designer should account for the elimination of automatic irrigation after successful establishment of plant material except in the case of drought.

3.2.3 Water Harvesting

Water harvesting may be used when the collected roof or surface area and the proportionate irrigated area or reuse needs are compatible for providing 80% of the watering needs based on the detailed best management practice and sizing information provided in the *LID Manual: GIP-11*.

Section 4

Energy and Atmosphere

4.1 Intent

The Designer shall provide for efficient design of all proposed energy systems in order to reduce reliance on fossil fuels and to reduce the long-term operating and maintenance cost for the facility. The use of reliable, clean, renewable resources can further reduce our dependence on fossil fuels for electricity. The consequences of our continued dependence on fossil fuels for electricity include global warming, acid rain, smog, increased incidence of respiratory disease, and natural resource damage. Renewable energy alternatives should be evaluated on a case-by-case basis and shall include potential community impacts and visual and natural resources as a part of the evaluative process.

4.2 Strategies

4.2.1 Geothermal Systems

Where site areas and economics allow, the Designer shall review opportunities for direct-use geothermal energy to heat and cool space within buildings or to provide for heat pumps. Geothermal systems typically require a higher capital investment with smaller annual operating costs but can help address required load sharing and redundancy for HVAC systems in electrical rooms.

Geothermal well boring and distribution line locations should be evaluated based on site area, boring requirements, and site disturbance. Well holes should not be located within primary vehicular access routes.

Resource assessment prior to installation should include local experience, information on adjacent or proximate wells, and local geology. An exploration well should be drilled in construction and tested to meet the manufacturer's recommendations and be incorporated as a production well if all tests are positive.

All materials and installations shall meet all local building codes and the standards specified by American Society of Testing and Materials and the American Society of Heating, Refrigerating, and Air Conditioning Engineers in the United States.

4.2.2 Energy Generation Systems

Where site areas are oriented to take advantage of solar or prevailing winds, the Designer shall review opportunities for use of solar panels or small wind turbines as small-scale renewable energy alternatives for facility components. Location of such systems shall be oriented so as not to detract from neighboring site vistas.

Section 5

Materials and Resources

5.1 Intent

The Designer shall endeavor to use materials that meet the intent of *LEED for New Construction*, latest version, in order to reduce the consumption of natural resources and to reduce waste in the production chain and on-site.

5.2 Strategies

5.2.1 Construction Waste Management

The Designer shall evaluate and determine the applicability of construction waste management for each building facility site in order to maximize the diversion of demolition and construction waste from landfill disposal. Where appropriate, a construction waste management plan shall be developed and included in the technical specifications and should have a goal of 50% diversion of salvage and recycling by weight of construction and demolition waste.

Construction waste management may include the salvaging, recycling, or disposing of non-hazardous demolition and construction waste either on-site or diversion to reuse facilities, i.e. crushing of existing site concrete pavements for reuse as on-site aggregate fill.

5.2.2 Recycled Content

Facilities and building projects should include a total of 20% recycled content based on LEED New Construction & Major Renovation credit MR Credit 3.2.

5.2.3 Regional Materials

Facilities and building projects should include a total of 10% regional materials based on LEED New Construction & Major Renovation credit MR Credit 3.2.

Section 6

Indoor Environmental Quality

6.1 Intent

Where the site design incorporates an occupied building, the Designer shall endeavor to meet the intent of LEED for New Construction, latest version, in order to promote the comfort of building occupants and reduce the negative impact to building occupants through harmful materials.