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Limitations:

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Table of Contents

List of Abbreviations	iii
Section 1: Introduction and Background	1
Section 2: Salem’s LID/GI Strategy	1
2.1 Definitions	1
2.2 Design Standards LID/GI Strategy	2
Section 3: Summary	5
References	6

List of Tables

Table 1 Summary of the Existing LID/GI Strategy	3
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List of Abbreviations

City	City of Salem
DEQ	Oregon Department of Environmental Quality
GI	Green Infrastructure
GSI	Green Stormwater Infrastructure
LID	Low Impact Development
MEF	Maximum Extent Feasible
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NSRR	Numeric Stormwater Retention Requirement
Permit	NPDES MS4 Phase I General Permit
SF	square feet
SFR	Single-Family Residential
SRC	Salem Revised Code
SWMP	Stormwater Management Plan Program Document



Section 1: Introduction and Background

Schedule A.3.e.ii of the City of Salem’s (City’s) 2021 Phase I National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Permit (Permit) requires the City to “review and update or develop and begin implementation of a strategy to require to the maximum extent feasible, the use of Low Impact Development (LID) and Green Infrastructure (GI) design, planning and engineering strategies intended to minimize effective impervious area or surfaces, and reduce the volume of stormwater discharge and the discharge of pollutants in stormwater runoff from development and redevelopment projects” by November 1, 2023. The Permit requires the City to document an LID/GI Strategy in the subsequent annual report (due November 1, 2023) and incorporate or reference the strategy in the Stormwater Management Program Document (SWMP) after completion and Department of Environmental Quality (DEQ) approval of the strategy.

The City of Salem’s (City’s) Administrative Rules-Design Standards (*dated January 2014, referred to as Design Standards hereafter*) and the Salem Revised Code (SRC) were adopted by City Council in November 2013¹ following a significant public outreach process and public hearing. The SRC gives the City the legal authority to require the Design Standards for development projects.

The City’s LID/GI strategy is implemented in accordance with their Design Standards, and consistent with the current NPDES MS4 Permit language (Schedule A.3.e.ii) as referenced above. The Design Standards require the use of Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible (MEF) for new and redevelopment activities that meet defined project thresholds. Although LID is not currently defined in the Design Standards or SRC, site planning is required to minimize impervious surfaces and reduce stormwater runoff volumes, consistent with the requirements for an LID/GI Strategy. Based on the City’s definition of GSI, infiltration-based facilities are prioritized and used where feasible and emphasized particularly on Single Family Residential (SFR) projects.

The purpose of this document is to summarize and document the City’s current LID/GI Strategy to meet the 2021 Permit requirements. The Strategy includes a review of the LID/GI requirements in the City’s Design Standards.

This Strategy is organized as follows:

- **Section 2** provides the City’s existing LID/GI Strategy in the Design Standards, including a brief history of the City’s Design Standards as they relate to LID/GI.
- **Section 3** provides a summary of next steps.

Section 2: Salem’s LID/GI Strategy

The purpose of this section is to summarize how the City’s current Design Standards incorporate GSI facilities and LID approaches to development projects. The City’s Design Standards prioritize LID through site planning techniques and GSI for stormwater management.

2.1 Definitions

Below is a summary of GI, GSI, LID and MEF definitions from both the Design Standards and the 2021 NPDES MS4 Permit to help inform the understanding of the City’s LID/GI Strategy:

¹ Documents dated January 2014. An additional update to the SRC, Chapter 71 was made in 2020 to clarify flow control requirements.

- **2021 NPDES MS4 Permit definition for Green Infrastructure (GI):** *a specific type of stormwater control using vegetation, soils, and natural processes to manage stormwater. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems designed to mimic nature by reducing and/or storing stormwater through infiltration, evaporation, and transpiration. At the site level, such measures may include the use of plant or soil systems, permeable pavement or other pervious surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspire stormwater and reduce flows to sewer systems or to surface waters. At the scale of city, green infrastructure refers to the patchwork of natural areas that provides flood protection and natural processes that remove pollutants from stormwater.*
- **Design Standards definition for Green Stormwater Infrastructure (GSI):** *a stormwater facility that mimics natural surface hydrologic functions through infiltration or evapotranspiration, or that involves stormwater reuse.*

The City's current definition for GSI is consistent with the NPDES MS4 permit definition of GI in that both apply to facilities that retain and infiltrate stormwater runoff.

- **2021 MS4 Permit definition for Low Impact Development (LID):** *Low Impact Development (LID) means a stormwater management approach that seeks to mitigate the impacts of increased runoff and stormwater pollution using a set of planning, design and construction approaches and stormwater management practices that promote the use of natural systems, green infrastructure, and other techniques for infiltration, filtration, evapotranspiration, and reuse of rainwater, and can occur at a wide range of landscape scales (e.g., regional, community and site). Low impact development is a comprehensive land planning and engineering design approach to stormwater management with a goal of mimicking the pre-development hydrologic regime of urban and developing watersheds.*

The City does not explicitly define LID in the Design Standards, but does include various site assessment and site planning principals to be addressed with applicable new and redevelopment activities.

- **Design Standards definition of Maximum Extent Feasible (MEF):** *the extent to which a requirement or Standard must be complied with as constrained by the physical limitations of the site, practical considerations of engineering design, and reasonable considerations of financial costs and environmental impacts.*

The City's definition of GSI (infiltration facility) and requirement to use GSI to the MEF indicates infiltration (or retention) is prioritized as required in the Permit. Use of GSI facilities is based on site infiltration rates, and sizing for GSI assumes that, at a minimum, the water quality storm is captured. However, the Design Standards do not currently define a storm event with which GSI needs to be sized for.

The City's application and definition of GSI and alignment to the Numeric Stormwater Retention Requirement (NSRR) design storm will be clarified in the Design Standards as part of the City's 2024 Design Standards update.

2.2 Design Standards LID/GI Strategy

This section summarizes the LID/GI Strategy as laid out in the City's existing Design Standards.²

² Design Standards Div 400, Section 4.2(a) Project Type Thresholds and Discharge Requirements, Design Standards Div 400, Section 4.2(b) Green Stormwater Infrastructure to the Maximum Extent Feasible (GSI/MEF), Design Standards Div 400, Appendix 4E – Implementing Green Stormwater Infrastructure to the Maximum Extent Feasible.

Table 1. Summary of the Existing LID/GI Strategy

Design Standards Section Reference	Design Standards Content/Short Description
Section 4.1: Introduction	
Section 4.1(a) Objectives	<p>Three of the City’s nine documented Design Standards objectives relate to LID/GI and include the following:</p> <ol style="list-style-type: none"> 1. Reduce surface runoff volumes by prioritizing stormwater interception, evapotranspiration, and infiltration. 2. Substantially maintain the runoff characteristics of the original undeveloped drainage basin. 3. Achieve stormwater pollutant efficiency removal goals through the application of GSI to the MEF.
Section 4.1(c)(3) and (5): How to Use These Standards, Green Stormwater Infrastructure	<p>This section states that it is critical to perform a site assessment to determine soil types, infiltration rates, topography, existing trees and vegetation, etc. and that infiltration rates are required to determine types and sizes of facilities required. Conducting a site assessment reflects site planning activities (i.e., LID). This section also states that GSI is required to be used to the MEF and site design, including determination of necessary horizontal and vertical elevation design data will be necessary to determine if the MEF requirement has been met.</p>
Section 4.2: General Design Requirements	
Section 4.2(a)(1): Project Type Thresholds and Discharge Requirements, Single Family Residential	<p>All SFR projects where the total impervious surface is between 1,300 and 10,000 SF shall be designed and constructed with GSI to the MEF except where flow control facilities and treatment facilities have already been constructed to serve the lot or parcel.</p>
Section 4.2(a)(3): Project Type Thresholds and Discharge Requirements, Large Projects	<p>Large projects (current thresholds > 10,000 SF) are required to provide both flow control and treatment facilities using GSI to the MEF and conforming to these Design Standards.</p>
Section 4.2 (b): Green Stormwater Infrastructure to the Maximum Extent Feasible (GSI/MEF)	<p>GSI and MEF definitions are included in this section (see Section 2.1 above). For large projects, both treatment and flow control facilities must meet the standards for GSI to the MEF. Although site constraints, limitations in engineering design, and financial costs should rarely restrict the use of GSI completely, the City recognizes that some projects will be unable to exclusively provide GSI. <i>Appendix 4E of the Standards establishes the criteria for meeting GSI to the MEF requirement.</i></p>
Section 4.2(c): Site Assessment	<p>The following, applicable site assessment elements are required to be identified early in the design process to provide for the more efficient sizing of stormwater treatment and flow control facilities, assist in providing GSI to the MEF, and meet regulatory requirements:</p> <ul style="list-style-type: none"> • Site topography, boundaries, and existing improvements. • Existing soil types and infiltration capacity. • Geologic hazards such as landslides. • On-site contamination and hazardous materials. • Ground water elevations. • Existing trees and native vegetation. • Existing and proposed impervious areas. • Floodplains and floodways. • Sensitive natural areas (waterways, streams, wetlands, wildlife habitat, etc.).



Table 1. Summary of the Existing LID/GI Strategy

Design Standards Section Reference	Design Standards Content/Short Description
Section 4.2(d): Preserve Existing Trees and Vegetation	Existing trees and native vegetation must be preserved as specified in Salem’s code. Plans must identify all trees and native vegetation that are being retained. Protecting existing trees/planting new trees on the site can reduce the amount of treatment that is needed.
Section 4.2(e): Ground Disturbing Activities	Site design and construction should minimize ground disturbing activities and retain the undisturbed state of the duff layer, topsoil, and native vegetation where feasible. Impervious development areas should be minimized, preserving natural features (i.e., LID).
Section 4.2(f): Other Design Considerations	<p>The following design considerations are applicable to site planning activities (i.e., <i>LID</i>):</p> <ul style="list-style-type: none"> • Incorporate the stormwater facilities into the site’s landscaping features to minimize the impact on the available green space. • Utilize construction techniques and landscape designs that minimize soil compaction/preserve soil permeability. • Use permeable pavement in parking lots and on private property where practicable, to minimize surface runoff and reduce the amount of impervious area.
Section 4.2(g): Impervious Area Reduction Technique	The following measures can be applied to reduce the amount of impervious area requiring stormwater management: tree preservation, planting new trees, pervious pavement, green roofs, rainwater harvesting, amending soils. All these measures are either site planning techniques or facilities and considered LID and/or GSI.
Section 4.2(l): Infiltration Testing	Infiltration testing is required to determine the location, size and capacity of a stormwater treatment facility.
Section 4.2(n): Design Sizing Methodology	This section includes design sizing methodologies. A simplified sizing form is provided which provides incentives for reducing impervious surfaces.
Section 4.3: Combined Stormwater Flow Control and Treatment Facilities	<p>This section specifies the requirements for designing combined stormwater flow control and treatment facilities. Combined stormwater flow control and treatment facilities are encouraged (Design Standards Section 4.1(c)(6) and include planters/rain gardens/swales, flow dispersion, pervious pavement, green roofs, and constructed wetland treatment systems. All of these are GSI facilities.</p> <p>If the infiltration rate is 0.5 inch/hour or greater, the GSI must be designed without an underdrain. If the measured infiltration rate is less than 0.5 inches/hour; if the facility size is greater than 10% of the total impervious area it serves; or if the rock storage areas used in the sizing calculation has reached the maximum depth of 48 inches, the GSI must be designed as a partial infiltration facility with a perforated underdrain pipe.</p> <p>Filtration facilities are required when a list of limiting site conditions are encountered regardless of infiltration rate (e.g., slope stability concerns, high groundwater table, contaminated soils, setbacks).</p>
Section 4.4: Stormwater Treatment Facilities	This section summarizes design requirements for facilities designed for Stormwater Treatment only. This section references GSI facilities, as well as manufactured treatment facilities, but stipulates that GSI facilities can be designed for the stormwater generated by the water quality design storm, clarifying that GSI sizing should meet water quality requirements even if flow control requirements cannot be fully met.
Section 4.6: Retention Systems (GSI) (Private Only)	Underground retention and infiltration systems, such as soakage trenches, manufactured chambers, and drywells can be used to collect and recharge stormwater runoff into the ground. These systems may be approved for either partial or full retention of stormwater onsite, thereby defined as a GSI facility.
Appendix 4E: Implementing GSI to the MEF	This appendix establishes criteria for determining whether an applicant for a development project is meeting the requirements to implement GSI to the MEF.



Section 3: Summary

As the Design Standards currently read, they are meeting the 2021 Permit requirements in Schedule A.3.e.ii which states that by November 1, 2023, the City must “*begin implementation of a strategy to require to the maximum extent feasible, the use of LID and GI design, planning, and engineering strategies intended to minimize effective impervious area or surfaces, and reduce the volume of stormwater discharge and the discharge of pollutants in stormwater runoff from development and redevelopment projects*”.

Additional Design Standards and SRC updates will be completed by November 1, 2024. The Design Standards updates are anticipated to include more explicit language related to infiltration rates (measured vs. design) and technical exemption criteria to qualify the use and sizing of GSI.

The Design Standards updates will also clarify an NSRR design storm and require the use of GSI facilities to manage the NSRR, if use of GSI is feasible. Adjustment of the impervious area threshold for large projects will be documented to align with the NPDES MS4 Permit requirements. Additional updates may include refined site planning guidelines and a definition of LID as well as priorities around GSI facility selection (e.g., manufactured facilities should be chosen only when GSI is infeasible).

These updates will collectively support and build upon the City’s LID/GI Strategy.



References

NPDES MS4 Phase I City of Salem Permit, Oregon Department of Environmental Quality, 2011.

NPDES MS4 Phase I City of Salem Permit, Oregon Department of Environmental Quality, 2021.

Salem Revised Code (2020).

Administrative Rules - Design Standards (January 2014).