



The City of Norman, OK

Engineering Design Criteria Update

Diagnostic Report

*Engineering Division
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Norman, OK 73069*

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Table of Contents

Acknowledgments	2
Introduction	3
Norman 2025 Land Use and Transportation Plan	4
Land Use	4
Transportation	4
<i>Moving Forward: Comprehensive Transportation Plan (2014)</i>	4
Stakeholder Input	5
Resulting Directive	5
Part 1 Diagnostic Report	6
General Comments	6
Engineering Design Criteria	7
Section 1000 General	7
Section 2000 Water Mains	13
Section 3000 Sanitary Sewer	16
Section 4000 Streets	18
Section 5000 Stormwater	26
Section 5012 Erosion and Sedimentation Control	30
Section 6000 Stormwater Pollution	31
Section 6000/7000 Stormwater Quality Design	33
Standards and Specifications	35
Section 1000 General Information	35
Section 1100 General Conditions	36
Section 2100 Site Development and Earth Work	36
Section 2200 Miscellaneous Construction	36
Section 2300 Streets and Drainage	37
Section 2400 Water Lines	38
Section 2500 Sanitary Sewers	41
Section 2600 Sanitary Sewer Lift Stations	42
Construction Drawings	43
Zoning Ordinance	44
Article I. Building Setback Lines	44
Article XI. Specific District Regulations	44
Article XII. Additional District Provisions	45
Center City Form-Based Code (CCFBC)	47
Part 3. The Regulating Plan	47
Part 5. Urban Space Standards	47
Part 6. Parking and Loading Standards	48
Part 9. Site Development	50
Subdivision Regulations	51
Article I. General Provisions	51
Article II. General Procedure; Administration	51
Article III. Plat Preparation and Approval Procedure	52
Article IV. Design	52
Article V. Improvements	53
Tree Protection Ordinance	54
Section 10-001. General Provisions	54
Part 2 - Benchmarking Study	56

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Introduction

The City of Norman has initiated an effort to update the technical standards that guide the design, construction, and maintenance of the City's infrastructure. Several documents collectively establish minimum standards and identify uniform criteria that apply to both publicly- and privately-funded infrastructure projects. These projects, when completed and accepted, become the responsibility of the City for operations and maintenance. This suite of technical and policy documents includes the Engineering Design Criteria (EDC), Standards and Specifications, Construction Drawings, Zoning Ordinance, Subdivision Regulations, Tree Protection Ordinance, and the Center City Form-Based Code.

The following broad concepts informed the drafting of this report:

- Consistent guidance for design, review, construction, and maintenance practices – Consistency and predictability improve efficiency, resulting in better outcomes and a better experience for all parties involved in the development process.
- Integrate stormwater management best practices – The City wants to develop opportunities for the use of Green Stormwater Infrastructure (GSI) within everyday design development, which would include design criteria to support infrastructure projects that address the requirements of the City's MS4 permit.
- Reflect current practices and materials – Technology and materials have evolved and now offer improved processes, programs, and products that are often recommended and utilized. The City would like to reflect current practices in this update.
- Address standards for infill development – Current design criteria and specifications were developed to implement regulations that focused on greenfield development. There is a need to include criteria that address redevelopment and infill sites that are constrained physically and often environmentally. Design criteria should support the City's goals related to urban development and preservation of historic buildings.
- Identify conflicting guidance – The updated EDC should resolve conflicts between governing ordinances and policies and the current design criteria. Recommendations for ordinance amendments are provided within this report, where appropriate.
- Modernize documents to support online access and easy navigability – Maintaining information online is common practice. The City wants to provide a digital platform that is comprehensive, easy to navigate, and accessible.

The City's comprehensive plan informs policies, programs, and regulations. It shapes the public and private development projects that form the built environment and express the community's unique character. Tools such as the EDC are essential for setting and maintaining high standards for all development within the public realm. The following section provides an overview of *Norman 2025*.

Norman 2025 Land Use and Transportation Plan

The City of Norman's comprehensive plan, *Norman 2025 Land Use and Transportation Plan*, was adopted in 2004 to provide a vision for the future and guide growth and development. Analysis conducted to support the plan revealed that there were just over 60,000 acres of vacant land in the City, and only 49,000 acres were unencumbered by development constraints. Even more limited was the amount of vacant land suitable for development at urban densities, consisting of approximately 8,000 acres.

Land Use

"Infrastructure is recognized as being an effective tool to manage the location of growth." Goals for future land use provide the policy framework for future development. A series of related policies support each goal. Goals include:

1. Managed Growth
2. Infrastructure-Supported Growth
3. Housing and Neighborhoods
4. Economic Stability and Enhancement
5. Rural Character and Development
6. Greenbelt Development
7. Core Area Stability and Enhancement

Accomplishing these goals requires a diverse set of tools. The City's Engineering Design Criteria must be flexible enough to address development in various contexts, supporting development patterns that range from rural to very urban.

Transportation

The Transportation Plan element of *Norman 2025* was replaced by the City's Comprehensive Transportation Plan (CTP) that was adopted in 2014.

Moving Forward: Comprehensive Transportation Plan (2014)

This updated transportation plan is based on guiding principles, goals, and objectives established through community engagement addressing a desire for safe, convenient, and widely available well-connected transportation modes for all people. The plan includes the report and three extensive appendices that provide supporting documentation for the public engagement program, transportation conditions and trends, and travel demand modeling. It identifies future transportation needs, goals, and policies, establishes typical street sections, and outlines capital improvement investments necessary to implement the plan. It also supports the day to day decisions affecting transportation in the City.

Stakeholder Input

As an initial step in preparing this diagnostic report, during the spring and summer of 2020, the project team interviewed City staff and local developers to receive their thoughts and ideas on the most pressing issues in the current documents and how to resolve those issues. This step included conversations with local development professionals and City staff responsible for managing the development process, conducting plan reviews, and ensuring proper installation and maintenance of public infrastructure.

Resulting Directive

This report defines problems and issues arising from the City's current documents and was informed by interviews with staff and stakeholders and the Consultant's independent review. The purpose of the diagnostic report is to guide the actual update of these technical reference tools, which will occur in the second phase of the project.

Once there is agreement on identified issues and recommended resolutions, a community benchmarking report will be developed to show how best practices are used successfully in other communities.

Following a review of this Diagnostic Report, the City Council should provide input on the recommendations contained herein. If the City Council agrees with the recommendations presented in this report, Phase II of the work effort will commence, which will include drafting of the updated EDC, Standards and Specifications, and Construction Drawings.

If the City Council has concerns about any of the issues or recommendations cited herein, these issues should be discussed, and additional direction should be given as to how City leaders would prefer to proceed.

Once the City reaches consensus on the issues within this Diagnostic Report, this document will be used as the basis for the City's directives as the new documents are written.

Part 1 Diagnostic Report

This Diagnostic Report is divided into the following sections to provide a recommended solution or approach for addressing each issue within the City's technical and policy documents pertaining to development.

- Engineering Design Criteria
- Standards and Specifications
- Construction Drawings
- Zoning Ordinance
- Center City Form-Based Code (CCFBC)
- Subdivision Regulations
- Tree Protection Ordinance

General Comments

1. Improve Overall User-Friendliness of the Document Format

- **Issue**
Internal and external stakeholders recognize that the EDC and companion technical documents need a full update. They should be available online in an easy to use format. It is challenging for out of town design professionals to navigate and find the information they need without checking with staff for guidance.
- **Resolution**
Thoroughly review and update the EDC, Standards and Specifications, and Construction Drawings. Include hyperlinks, illustrations, flowcharts, and checklists where appropriate.

2. Reflect Current Construction Practices and Materials

- **Issue**
Improved materials and practices have evolved; however, they are not reflected in the City's design criteria.
- **Resolution**
Update design criteria to include current practices and preferred/approved materials.

3. Address Inconsistencies

- **Issue**
Generally, there are inconsistencies between standards and regulations.
- **Resolution**
Identify inconsistencies and provide recommendations for resolving them. This may include ordinance amendments, additional design criteria, incentive program opportunities, or clarified processes.

4. Comprehensive Fee Schedule

- **Issue**
Fees are currently located throughout various ordinances and manuals. Changes can make forms and applications inaccurate. A single fee schedule for all development-related fees would be more user-friendly and easier to administer.
- **Resolution**
A comprehensive fee schedule of all development fees should be created for anything within the EDC. Consider including the designation of division or department responsible for each review/fee.

Engineering Design Criteria

Section 1000 General

5. 1001 Standards and Specifications / Nomenclature

- **Issue**
Section 1001: Standards and Specifications – The current development of the new Engineering Design Criteria will date this section, and the nomenclature and procedures will be outdated.
- **Resolution**
Update section to include the appropriate procedures and nomenclature.

6. 1001.7 Special Street Review

- **Issue**
The development of special streets should be minimized, and streets should be designed to proposed standards.
- **Resolution**
Each street section will have to be individually designed and reviewed. The review process needs to ensure complete application of materials are provided and allow a full review during the standard review period for a project. Consider how non-standard street sections, incorporating Green Stormwater Infrastructure (GSI), can be accepted without added review.

7. 1002.6 Drafting / Sheet Requirements

- **Issue**
1002.6: "The scale shall not be less than 1:500 (1" = 50') horizontal and 1:50 (1" = 5') vertical on plan and profile sheets. Minimum scale shall be 1:1000 (1" = 100') on plan sheets. Larger scales may be required where conditions warrant" This section references metric criteria, which is no longer used.
- **Resolution**
Sheet requirements should be revised to allow for project-specific flexibility as required by design or as specified in later sections of this criteria. Metric references should be removed.

8. 1002.16 Required Submittal Materials

- **Issue**
Drafting standards refer to the submittal of mylars (transparent reducible medium) and floppy disks, which are no longer representative of best practices and the need to maintain digital records.
- **Resolution**
Revise to require digital construction plans. Electronic files may be sent directly to the City or provided on preferred digital media. Recommend electronic submittal system for all plan submittals and review.

9. 1002.16 As-Built Drawings / Format

- **Issue**
1002.16: "Upon completion of construction, the Consulting Engineer will furnish the City Engineer's office "as-built drawings" incorporating those changes made during the construction process. This submittal shall include a set of mylar reproducible and CAD drawings as per section 1002.19 on 3 ½ "floppy disk or Compact Disk (CD) which are compatible with the City's computer system. The "as-built drawings" are to be certified and sealed by a Professional Engineer or Registered Professional Land Surveyor. The "as-built drawings" shall include the following:" The digital references, as discussed in the previous sections, should be updated to match the cities current needs and requirements for digital media.
- **Resolution**
It is recommended to update the digital deliverables within this section.

10. 1002.16 B Original Design Plans

- **Issue**
Section 1002.16.B.: “As-Built Original Design Plans” is a vague description limiting the overall liability of the contractor.
- **Resolution**
Develop an updated section for completing as-built plans and discuss the term “Original.”

11. 1002.17 Control Points

- **Issue**
Section 1002.17: “All development must be tied to two City of Norman control points. The control point locations shall be supplied by the City of Norman.” The section should also contain requirements for documenting and finding the data for control point locations.
- **Resolution**
Update the section to provide data or contact information for survey data and requirements for control points.

12. 1002.19 Computer-Aided Design Plans

- **Issue**
Section 1002.19.A.6.: “Shall include a legend indicating the specific layers or named layers of existing conditions, improvements, utilities, parcels, etc. in overall plan sheet file as per section 1002.3.” The section is vague regarding the city requirements for electronic submittals. The statement should include what layers, line types, and colors are provided within the digital drawings.
- **Resolution**
Update to include specific (GIS) layers for better integration and tracking of GSI features. GIS layers should be clearly defined (the GIS team needs to inform this) to ensure as-builts reflect complete and correct data on layers that are consistent across all projects.

13. 1002.19 CAD Plan Requirements

- **Issue**
Section 1002.19: Computer-Aided-Design (CAD) Plans section stated the requirements for as-built plans submitted to the City, and the nomenclature for this section is outdated.
- **Resolution**
Update Section name to reflect design criteria for all design and not just as-builts. Integrate critical data for insertion within city documents and GIS.

Include the version of each program the City requires and include smart line data and corridors for future modeling.

14. 1003 Benchmark Requirements

- **Issue**
Section 1003: Benchmark requirements for each project should tie to the City and state grid and include benchmarks from other projects, and this section should be updated to include new survey data requirements.
- **Resolution**
Update survey requirements regarding benchmarks per block or mile per project site per side of the road. Locations shall include and reference the Oklahoma Department of Transportation (ODOT) Specifications and include Licensed Land surveyor on-site with notes.

15. 1003.6 Level Notes

- **Issue**
Section 1003.6: “Level notes shall be provided to the City Engineer's office for all permanent and temporary benchmarks. All benchmark level notes shall be of closed-loop survey.”

- **Resolution**
Update the section should incorporate specifics for using GPS and the requirements for processing the deliverables.

16. 1004.1 Site Grading Plan / Present Site Conditions

- **Issue**
Section 1004.1.A: "Site Topography requirements...(2' maximum interval)" is typically not adequate for design, and in some instances, 0.5' intervals may be necessary.
- **Resolution**
Review parameters for increasing the maximum interval to 1' for grading.

17. 1004.2.B Site Grading Plan / Proposed Site Conditions - Topography

- **Issue**
Section 1004.2.B.: Proposed topography at a maximum of two (2') foot contour intervals is typically not accurate enough for design.
- **Resolution**
Update contour intervals to increase intervals to 1'.

18. 1004.2.C Site Grading Plan / Proposed Site Conditions – Improvements List

- **Issue**
Section 1004.2.C.: Proposed improvements list items to be surveyed, which limits what may be within the property. The limits should be placed beyond the property line to account for additional stormwater flow and utilities just outside the property boundaries.
- **Resolution**
Update to all proposed improvements to the site so as not to limit the data received.

19. 1004.2.C.3. Site Grading Plan / Curb Elevation

- **Issue**
Section 1004.2.C.3.: Top of curb elevation at each 100-foot station limits the data required for the review of the plans and the construction of the project.
- **Resolution**
Update to include radius points, point of inflection, and additional data required for review of the site.

20. 1004.2.C.4. Retaining Walls

- **Issue**
Section 1004.2.C.4: Retaining walls that are 3 feet high or higher requires engineering drawings, but the section does not cover Americans with Disabilities Act (ADA) requirements around walls.
- **Resolution**
Add a section to include ADA ramp elevations and access requirements. Curb ramps, railings, and handrails all need to be included in the retaining wall section of the EDC.

21. 1004.2.F. Drainage Areas

- **Issue**
Section 1004.2.F.: All drainage areas shall be clearly marked on the drainage area plan sheet, showing the acreage, runoff, and off-site pickup points.
- **Resolution**
Update language to include all off-site drainage.

22. 1004.2.G. Contour Frequency

- **Issue**
Section 1004.2.G.: Indicate 2' contours on sanitary sewer plans to determine minimum cover requirements as required by the City Engineer. Depending on the location, 2-foot contours are not sufficient to review the proposed sanitary sewer plan.
- **Resolution**
Increase contour frequency to 1' or 0.5' depending on the grade of the area.

23. 1004.2.H. Joints Shall be Sealed

- **Issue**
Section 1004.2.H.: Include a note on plans that all sawed contraction joints (i.e., structures, flumes, etc.) shall be sealed.
- **Resolution**
Update to include the required statement "Sealed per Standard Specifications."

24. 1004.3. Deviations

- **Issue**
Section 1004.3: Deviations from the accepted "As-Built Site Grading Plan" must be reviewed and accepted by the City Engineer.
- **Resolution**
Update this section to reflect the City's internal process; "City Engineer or designee" is appropriate and should be used consistently.

25. 1004.4. Erosion Control

- **Issue**
Section 1004.4: A "Sediment and Erosion Control Plan" shall include plans for both pre-and post-construction. These plans shall be prepared and submitted in accordance with Section 5012 for review by the City Engineer.
- **Resolution**
Update to reference the Stormwater Program Manager or designee as the proper review authority. The section should also be updated to include pre-and post-erosion control features.

26. 1005.1. City Engineer Approval Required

- **Issue**
Section 1005.1: "Written permission shall be issued by the City Engineer ..." which is a common theme within the EDC, and each section should be reviewed for the proper authority, as appropriate throughout the EDC.
- **Resolution**
Update to reference the Stormwater Program Manager or designee as the proper review authority.

27. 1005.2. Permit Fees / Fee Schedule

- **Issue**
Section 1005.2: Permit fee is \$100 plus \$10.00 per acre..." which may be an outdated fee that does not include requirements for multi-year projects.
- **Resolution**
In most sections where permit fees are mentioned, it is recommended to create a schedule of fees for all of the items in one place. Fees should be reviewed and updated for appropriateness. Include an annual renewal fee.

28. 1006.1. Mailboxes

- **Issue**

Section 1006.1: Mailboxes shall ..."

"...City Engineer or City Traffic Engineer." Any deviations shall be approved by the Traffic Engineer or the City Engineer. The mailbox criteria within the right-of-way should be determined by the EDC and the roadside design guide with regard to the safety of roadway travelers.

- **Resolution**

Update to address all structures within the right-of-way. This will require coordination between divisions within the Public Works Department and outside agencies such as the US Postal Service.

29. 1006.2. Road Maintenance

- **Issue**

Section 1006.2: All owners of the property, having acquired a building permit for new construction on property abutting a rural street or road in those areas zoned A-1, A-2, and R-E, and which has been platted and subdivided in accordance with City of Norman Codes and Ordinances, shall maintain the rights-of-way of said streets and roads.

- **Resolution**

Update to include tree requirements and assign responsibility for maintenance.

30. 1008.1. Retaining Wall Height

- **Issue**

Section 1008.1: All retaining walls two (2) feet... are required to be designed by an engineer.

- **Resolution**

Simplify this process – currently, a two (2) foot wall height triggers an inspection but no engineered plans. A three (3) foot tall retaining wall requires a higher fee and engineered plans. Update to only one standard for requiring permit, fee, plans and inspections for three (3) foot or taller retaining walls.

31. 1008.2.A. Retaining Wall Review Fee

- **Issue**

Section 1008.2.A.: Retaining walls from 2 feet in height to less than... requires a fee to be paid for the review.

- **Resolution**

Update the section to state that there are fees for review and inspection of retaining walls. Recommend creating a schedule of fees.

32. 1008.3.B. Retaining Wall Permit Fee / Fee Schedule

- **Issue**

Section 1008.3.B.: If the Builder/Contractor obtained a retaining wall permit, ..." which requires a fee should be stated within a schedule of fees. If the project length is greater than a year, additional fees should be applied

- **Resolution**

Update all fees to a schedule of fees.

33. 1009.1. Solid Waste Container / Enclosure

- **Issue**

Section 1009.1: The location of a solid waste container enclosure shall be determined ..." and reviewed by staff to create better flow from sites for refuse vehicles.

- **Resolution**
Update to "approved within site review but must meet requirements of 1009.2" Research to understand what other communities are doing - is there a requirement for drains before runoff enters the sanitary system? Drains are not desirable due to inflow and infiltration into the sanitary sewer. Some mechanism to keep rainwater out of the solid waste container is needed.

34. 1009.2. Solid Waste Container / Access

- **Issue**
Section 1009.2: Access to solid waste containers shall be made easy for sanitation vehicles. Backing into a street or parking way in order to egress the waste container is prohibited. Any backing requirement of greater than 50-feet shall be approved by the City Engineer.
- **Resolution**
Update shall include diagrams of typical trash enclosure locations to improve site access for sanitation vehicles and increased standard pavement requirements. Include pavement requirements that ensure adequate structure to support heavy vehicles.

35. 1010.1.A. Temporary Encroachment Permit

- **Issue**
Section 1010.1.A.: Temporary Encroachment Permits are required for the use of a public property. The permit should be reviewed by staff and legal counsel to determine the validity of the permit for the said permittees.
- **Resolution**
Add the location of the permit to include a link and add to permit fees to the proposed schedule of fees. It is also recommended that the permit be reviewed by legal staff to determine if franchise utilities fall within the permit requirements.

36. 1010.1.B. Temporary Encroachment Permit / Review Requirements

- **Issue**
Section 1010.1.B.: Requirements for Temporary Encroachment Permits
- **Resolution**
Update to current standards to meet insurance requirements to be reviewed by City Attorney – Remove City Engineer and change to Engineering.

37. 1010.B.4.a. Temporary Encroachment Permit / Sidewalk Encroachment Permit Fee

- **Issue**
Section 1010.B.4.a.: Sidewalks. The fee per day ..." for closure of the sidewalk seems to require calculations, which result in a small fee.
- **Resolution**
Develop a table and include it within the proposed Schedule of fees for ease of use. Update to add changes to the sidewalk to include ADA access requirements.

38. 1010.B.5. Temporary Encroachment Permit / Inspection of Encroachments

- **Issue**
Section 1010.B.5.: Inspections – An inspection must be obtained after all barricades, fences, railings and other forms of pedestrian and vehicular protection are in place. A final inspection must be obtained after all such items are removed.
- **Resolution**
Update paragraph to include a general contact number for inspections.

39. 1011.1.A. Permanent Encroachments / Private Improvements

- **Issue**
Section 1011.1.A.: Private improvements may not be constructed over an existing utility easement without written City approval for the proposed encroachment. All costs of applying, obtaining, and filing a consent to encroach should be borne by the requesting entity.
- **Resolution**
Update to list the approval agency and determine the approximate number of days for the approval and include the amount, which is currently \$400.

40. 1012.A. Permanent Encroachments / Hand Rails

- **Issue**
Section 1012.A.: A handrail or fence shall be required adjacent to a vertical drop (i.e., retaining wall, headwall, etc.) of 30" or more. See standard drawing SD-07 for handrail specifications and be ADA compliant.
- **Resolution**
Update – new detail for the handrail that removes the detail from the stormwater section and adds the detail within the streets section. This section needs to distinguish clearly between railings and handrails.

Section 2000 Water Mains

41. 2001.1. ODEQ Reference

- **Issue**
Section 2001.1: Oklahoma Department of Environmental Quality (ODEQ) Regulations are regularly updated, and the section does not include a date for the regulations.
- **Resolution**
Recommend the reference is updated to state "most current edition."

42. 2001.3. Maintenance Bond

- **Issue:**
Section 2001.3: Maintenance bond for privately financed projects is only 6-months, which is not long enough, in most cases, to determine if issues will arise with the settling of the pavement and landscaping.
- **Resolution**
Recommend reviewing maintenance bond lengths and increasing to one year to cover project maintenance issues. Review other jurisdictions to ensure regional consistency.

43. 2002.1. Stipulates ODEQ Compliance

- **Issue:**
Section 2002.1: Stipulations on ODEQ requirements must be met. The requirements of sewer and water main separations are set per ODEQ. These standards can be exceeded, and the current criteria match ODEQ.
- **Resolution**
Recommend requiring that all designs meet ODEQ requirements unless the City wishes to be more stringent.

44. 2002.1. Easement Requirements

- **Issue:**
Section 2002.1: Easement requirements are not specified for water or sewer lines with this section.

- **Resolution**
Update sections to state minimum easement sizes that correspond with planning documentation. Easement sizes should be tied to the depth of bury and/or size of the pipe.

45. 2002.4. Depth of Cover

- **Issue**
Section 2002.4 - Current permissible depth of cover over water mains limits the depth to 8 feet, and in some cases, water mains may be required to be designed at a depth greater than that.
- **Resolution**
Develop a specification to allow the depth of water mains greater than 8', with approval.

46. 2002.6. Types of Valves

- **Issue:**
Section 2002.6: Types of valves and criteria within this section is vague and does not correspond with the standard specifications.
- **Resolution**
Update valve section to include guidance for valve locations, the layout of valves, and automatic flushing devices on dead-end lines.

47. 2002.7. Dead End Line Length

- **Issue**
Section 2002.7: Dead-end line main lengths are longer than typically allowed by fire protection.
- **Resolution**
Update section to decrease dead-end line lengths and require loop line requirements in areas where main line lengths are greater than standard.

48. 2002.8. Fire Hydrants

- **Issue:**
Section 2002.8: Technical requirements for fire hydrants are not consistent across all guidance documents.
- **Resolution**
Update sections to include guidance for preferred fire hydrant locations consistent with fire department approvals.
 - a. Review fire hydrant spacing with the Fire Marshall. Consider matching the ODEQ standard of 300' for commercial and 500' for residential areas to reduce requirements for development.
 - b. Update fire hydrants bury depth as it is not consistent with spec. 2402.4.D.

49. 2002.8.D. Hydrant Spacing Criteria

- **Issue**
Section 2002.8.D: Hydrant spacing criteria is not consistent with the latest edition of the International Fire Code Appendix C.
- **Resolution**
Update hydrant spacing criteria (2002.8D) to be more consistent with or defer to the latest edition of the International Fire Code Appendix C.

50. 2002.8.G. Bury Depth of Fire Hydrant

- **Issue**
Section 2002.8.G: The required bury depth of hydrants is not consistent with Spec 2402.4 D.

- **Resolution**
Update depth of bury for fire hydrants and other appurtenances.

51. 2002.12. Preferred Water Main Pipe

- **Issue:**
Section 2002.12: Preferred Water Main Pipe is out of date, and the pressure class needs to be updated.
- **Resolution**
 - a. Update AWWA pipe material references (i.e., AWWA C905 is now AWWA C900)
 - b. Update minimum working pressure class of 150 psi to a minimum of 235 psi or as desired (i.e., minimum DR rating for PVC; if DR-18, then PC = 235 psi)

52. 2002.12. Reference to AWWA C905

- **Issue**
The reference to AWWA C905 in Section 2002.12 needs to be updated.
- **Resolution**
Remove all references to AWWA C905. This standard is obsolete.

53. 2002.12.D. Nominal Diameter for Pipe

- **Issue**
2002.12.D. -18" is not an acceptable nominal diameter pipe for water lines. Although this size has been used in the past.
- **Resolution**
Update acceptable nominal diameters for pipe, including pipe material

54. Additional Water Items not covered that should be added to the EDC

- a. Is Section 2003 (Rural Service Area) still relevant/necessary?
- b. Connection requirements and backflow for fire suppression systems should be added along with the Fire Department Connection (FDC) location. The EDC should include the required distance to fire hydrants and how to calculate the hose lay distance if it is different than the building code.
- c. Development of connection and backflow requirements for irrigation systems.
- d. Criteria set forth to require water main extensions along all public or private street frontage to the furthest property line to allow for future extension unless approved by Utilities.
- e. Develop requirements to loop water lines.
- f. Reduction in the amount of public fire lines serving a specific property without any fee for service availability.
- g. Distance where a connection is required to the water system and no connections to the well field lines.
- h. No size on size taps.
- i. City only required to provide a minimum pressure of 25 psi. Anything else is on the property owner/developer.
- j. Chlorinated water can't be discharged to the storm sewer.

Section 3000 Sanitary Sewer

55. 3001.1. ODEQ Regulations Reference

- **Issue**
Section 3001.1: ODEQ Regulations are regularly updated, and the current criteria can become out of date with changes to the ODEQ Regulations.
- **Resolution**
Recommend including reference to "most current edition."

56. 3001.3. Maintenance Bond / Privately Financed Projects

- **Issue:**
Section 3001.3: Maintenance bond for privately financed projects is only 6-months.
- **Resolution**
Recommend reviewing maintenance bond lengths and increasing to one year to cover project maintenance issues and for consistency. Also, consider that public and private maintenance bonds should be the same.

57. 3002.1. ODEQ Requirements

- **Issue:**
Section 3002.1: Stipulations on ODEQ requirements for the separation of water and sewer as covered within the water sections should be consistent throughout the document.
- **Resolution**
Recommend requiring that all designs meet ODEQ requirements except where the City requirements are more stringent.

58. 3002.3. Gravity Sewer Pipe Requirements

- **Issue:**
Section 3002.3: Gravity Sewer pipe requirements should be modified to include depths greater than 10'.
- **Resolution**
Update criteria to require SDR-26 PVC pipe as a minimum standard where a pipe is deeper than 10'-12.'

59. 3002.4. Dead End Sewer Manholes

- **Issue:**
Section 3002.4: Dead-end Sewer manholes are not used within this section and the use of lampholes can be used.
- **Resolution**
Remove the use of lampholes and require a manhole termination.

60. 3002.5. Minimum Pipe Grades

- **Issue:**
Section 3002.5: Minimum Pipe Grades may be out of date and should be referenced to ODEQ requirements for flow and slope.
- **Resolution**
Update section and verify minimum slopes are still acceptable to City and that the section meets or exceeds ODEQ requirements.

61. 3002.7. Concrete Encasement Requirements

- **Issue:**
Section 3002.7: Concrete Encasement Requirements can be expanded to include depths greater than sixteen (16) feet.
- **Resolution**
Recommend requiring SDR-26 PVC and a concrete cradle for depths over sixteen (16) feet.

62. 3002.9. Easement Requirements

- **Issue:**
Section 3002.9: Easement Requirements are not stated for depths greater than sixteen (16) feet.
- **Resolution**
Update the easement width in the table to match Section 3002.2.

63. 3003. Manhole Requirements

- **Issue:**
Section 3003: Recommended Manhole requirements can be updated to resolve design and maintenance issues.
- **Resolution**
 - a. Update specifications to include requirements for corrosion protection on concrete manholes and develop requirements for epoxy coating of specific manholes (i.e. drop manholes or manholes receiving force main flow); or an alternative to epoxy coating (i.e. Xypex Admix C-500).
 - b. Update current manhole spacing to meet or exceed ODEQ regulations.
 - c. Update standard details to remove service lines from direct connections to manholes unless required for commercial or industrial connections; retain the option of direct connection at a manhole.
 - d. Update minimum slopes to match standard detail SS-15.

64. General – Lift Stations

- **Issue:**
EDC does not contain guidance or standards for lift stations, force mains, and air release valves.
- **Resolution**
 - a. Update design criteria to include lift stations to match standard details and develop criteria for implementation of a lift station. The location of a lift station must be vetted by city staff with data provided by the developer/engineer.
 - b. If a lift station is installed, then the elimination of one or more lift stations upstream should be reviewed and eliminated.
 - c. Update design criteria to include standards for force mains and air release valves

65. Additional Sanitary Sewer Items not covered

- a. The use of 6-inch lines should be removed in their entirety. The standards should be revised to state that the City maintains the sewer main to the property line.
- b. EDC needs to clearly state that sewer mains must be in the front yards unless approved by Utilities.
- c. EDC needs to require sewer mains to be extended to the further upstream property line(s) to facilitate proper development.
- d. Update requirements for creek crossings. Ductile iron pipe should be removed from the design criteria.

- e. Minimum offset of sewer lines from creek banks.
- f. Restoration requirements for creek banks shall be updated to include stormwater's preference.
- g. Need to eliminate the possibility for anyone to install a lagoon within the City limits.

Section 4000 Streets

66. 4000 General Comments / Nomenclature

- **Issue**
The nomenclature of sections is not clear and concise, matching other design criteria, and the layout of the section is confusing for most designers.
- **Resolution**
Rename sections and reorganize for clarity.

67. 4000 General Comments / GSI

- **Issue**
The definition of streets does not mention GSI components and the general locations in which GSI components are necessary and allowed.
- **Resolution**
Consider adding GSI to the definition and add a link to GSI Sections.

68. 4004 Right-of-Way Width

- **Issue**
Requirements of right-of-way widths, curb and gutter, storm sewers, and/or shoulder widths could restrict the usage of GSI.
- **Resolution**
Provide for simultaneous review of non-standard street sections, incorporating GSI; integrate into the current review process. Ensure all necessary materials for review are submitted with initial application/plans. Consider the Complete Streets Manual and reference GSI within total R/W width.

69. 4001.3. Traffic Control Plans

- **Issue**
Section 4001.3(4): Traffic Control Plan requirements are vague, and a section should be added to determine the requirements of traffic control plans.
- **Resolution**
Define traffic control beyond barricades to be approved by the Transportation Engineer or designee to meet or exceed MUTCD requirements.

70. 4002.8. Storm Sewer Main Location

- **Issue**
Section 4002.8: Storm sewer mains are not permitted under street pavement without City Engineer approval. This section does not allow for crossing mains and limits the use of the current right-of-way beyond the back of curb. The current corridors for utilities, trees, pedestrians, and GSI create a bottleneck.
- **Resolution**
Define the variability in placement as corridors become denser. Allow for variations through concept planning within the corridor.

71. 4003 Street Functional Classifications

- **Issue**
Section 4003 does not match other City documentation.

- **Resolution**
Update the street classifications within this section to match the Comprehensive Transportation Plan, Form-Based Code, and Zoning documents.

72. 4004.2. Street Designs

- **Issue**
Section 4004.2: States that the City Engineer's office shall furnish all secondary and primary arterial street designs.
- **Resolution**
Define the Engineer's office (City Engineer or designee) role to provide designs and approve plans for thoroughfares within private Developments.

73. 4004.6. Minimum Design Grade / ADA

- **Issue**
Section 4004.6: The minimum design grade for streets do not consider ADA crossing or access
- **Resolution**
Update section to include ADA compliance relative to pedestrian crossings of streets.

74. 4004.8. Vertical Sag Curve Requirements

- **Issue**
Section 4004.8: States that vertical sag curve requirements for the algebraic difference are outside the industry standard of 1%.
- **Resolution**
Decrease the algebraic grade difference to 1% to meet industry standards.

75. 4004.9. Design Speeds

- **Issue**
Section 4004.9: Design speeds have been set for all streets unless modified by the City Traffic Engineer.
- **Resolution**
Modify sections to account for any changes that have been made through speed studies.

76. 4004.10. Horizontal Curves

- **Issue**
Section 4004.10: Horizontal curve Criteria are stated within two different sections.
- **Resolution**
Section 4004.10 can be deleted and included within Section 4004.7.

77. 4004.11. Minimum Radii

- **Issue**
Section 4004.11: Minimum Radii requirements are confusing and hard to follow.
- **Resolution**
Reformat this section into a table format to clarify the objective of the section.

78. 4004.13. Cross Slope Definition

- **Issue**
Section 4004.13: Cross slope definition is vague and allows for a 2% or 3% cross slope.
- **Resolution**
Refine section to better define cross slope design criteria for each street section. Include this definition in table format for each street section.

79. 4005.1.B. Four-Leg Intersections

- **Issue**
Section 4005.1.B: Inhibiting the use of four-leg intersections within the development.
- **Resolution**
Revise this section to include appropriate design alternatives to four-leg intersections.

80. 4005.1.C. Grades at Collector/Arterial Intersections

- **Issue**
Section 4005.1.C: Grades at collector/arterial intersections and 15 m (50') back of radius point shall not exceed 3%.
- **Resolution**
Update the Section to clarify the reasoning of maximum slopes within this area. This will allow for design alternatives for drainage and better access.

81. 4005.2. Sight Distance Triangle

- **Issue**
Section 4005.2: Sight Distance Triangle criteria need to be updated to include specifics for removal of obstacles and criteria for obstacles.
- **Resolution**
Revise section to remove all sight obstacles within the sight triangle. Review current sight distance factors and formalize criteria for each type of intersection and speed criteria. Slope distances for approaches will need to be added along with street type.

82. 4005.3.A. Right of Way

- **Issue**
Section 4005.3.A: Right-of-Way criteria within this section should be modified to match all city criteria.
- **Resolution**
Update Section to include the Comprehensive Transportation Plan

83. 4006. Traffic Impact of Developments

- **Issue**
Section 4006: The section is out of date regarding the criteria used. The development of impact studies should be stated with criteria formalizing the process for traffic studies.
- **Resolution**
Revise the section to formalize the process of traffic studies as discussed with staff.

84. 4007.1. Street Section Layouts

- **Issue**
Section 4007.1: Typical section sheet layouts are not defined and should match other criteria within city documents.
- **Resolution**
Specify typical section formats for street type. Provide/update detail sheets for all street classifications to include CTP and CCFBC standards.

85. 4007.4. Soil Testing Requirements

- **Issue**
Section 4007.4: Soil Testing Requirements should be tied to geotechnical pavement design criteria.

- **Resolution**
Remove Section 4007.4 revise to match requirements set forth within the geotechnical section. Density testing is required r/w to r/w and within easements (all public infrastructure). Address failing driveways over sewer lines and recommend implementing density testing on private lots.

86. 4007.5. Pavement Thickness

- **Issue**
Section 4007.5: Pavement thickness shall be designed according to Section 4015; however, industrial and commercial pavement sections shall have a minimum thickness of 200 mm (8") asphaltic concrete or (7") Portland cement concrete. Residential pavement sections shall have a minimum thickness of (6") asphaltic concrete or (6") Portland cement concrete.
- **Resolution**
Remove section and place pavement thickness data within the geotechnical section.

87. 4007.8. Pavement Joint Standards

- **Issue**
Section 4007.8: Pavement Joint Standards refer to ODOT Standards.
- **Resolution**
Recommend developing standards based on ACI Standards instead of ODOT. ODOT Pavement Joint standards were never intended for use on City Streets. If ODOT Standards are to be referenced, reference the Standards to be used and on what type of streets.

88. 4007.11. Asphaltic Concrete Specifications

- **Issue**
Section 4007.11: Asphaltic Concrete Specifications need to specify for each type of street.
- **Resolution**
Update Section 4007.11 to reference the geotechnical section of the specifications and use Section 4007.11 to delineate pavement recommendations for each street type.

89. 4007.12. Concrete Uses

- **Issue**
Section 4007.12: Concrete Uses are not specified for each street section.
- **Resolution**
Revise Concrete use table to match current ODOT criteria and City needs. Evaluate additional uses and thicknesses.

90. 4008. Cross Sections

- **Issue**
Section 4008: Cross Sections design and drafting details are vague and should be updated.
- **Resolution**
Update Cross Section Criteria to state the required scale for drawing cross sections.

91. 4009. Structures and Specific Details

- **Issue**
Section 4009: Structures and Specific Details section is vague and needs to include a better definition of special structure.
- **Resolution**
 - a. Update the section to define special structures or list all structures shall be detailed.
 - b. Update structures to use HS-20 loadings. Although using the H-20 loading has been typical with faster, heavier vehicles, it is recommended to use HS-20 loadings.

92. 4010. Sidewalks

- **Issue**
Section 4010: SIDEWALK section does not provide information on requirements to meet the current ADA requirements.
- **Resolution**
Recommend mentioning ADA standards compliance as the first bullet. Incorporate PROWAG (Public Right-of-Way Accessibility Guidelines) as best practices (by reference as opposed to adopting PROWAG); current practice is to adhere to PROWAG in the field. All sidewalk standards need to be updated/improved.

93. 4010.3. Cement Requirements

- **Issue**
Section 4010.3: Current cement requirements state to use ODOT Class A, 6 sack, 3000 psi, water/cement ratio of 0.48, 1" to 3" slump.
- **Resolution**
Review the current specification and revise as necessary. It has been mentioned to review permeable sidewalks for areas with permeable soils.

94. 4010.4. Portland Cement Concrete Sidewalks

- **Issue**
Section 4010.4: The finished thickness of Portland cement concrete sidewalks shall not be less than 100 mm (4"), and the width shall be not less than 1.2 m (4'). Sidewalks across driveways shall be 150 mm (6") thick.
- **Resolution**
Refine specifics to include a statement that 4' sidewalks should have a 5'x5' widening every 250' to meet ADA requirements

95. 4010.6. Sidewalk Location

- **Issue**
Section 4010.6: Sidewalk location is required to be 3' from the outside curb line.
- **Resolution**
Revise for clarity and best practices. Ensure that location matches planning documentation. Sidewalks also need to be meet future street sections, GSI criteria, and tree requirements.

96. 4010.8. Sidewalk Width and Cross-Slope

- **Issue**
Section 4010.8: To accommodate wheelchair passing space, sidewalks less than 5' wide shall have at least 5' by 5' passing spaces located at intervals not to exceed 200'. Driveways may be utilized as appropriate, provided that the cross-slope of the driveway on each side of the sidewalk does not exceed 2%.
- **Resolution**
Reorganize section to match 4010.4. Consider requiring 5' of width across the driveway with a 2% slope max.

97. 4010.11. Sidewalks / Drainage Flumes

- **Issue**
Section 4010.11: Where sidewalks intersect drainage flumes, the sidewalks shall span the flume if the flume is the principal drainage between the lots, and the sidewalks may slope into the flume if the flume is constructed to act as an overflow.

- **Resolution**
Update section to clarify if a sidewalk bridge is needed or if the sidewalk can flood. Create detail for sidewalk bridge; 4" curb on each side outside of the 4' width. The current detail is not adequate

98. 4010.12. Detectable Warnings

- **Issue**
Section 4010.12: Detectable warnings requirements are out of date or do not meet current standards.
- **Resolution**
This should be revised to meet current status in industry standards or specify products to keep accessible ramps consistent.

99. 4010.13. Sidewalks / Horizontal Alignment

- **Issue**
Section 4010.13: Changes in horizontal alignment of a sidewalk (See Standard Drawing No. 14b) is vague and should be updated to add clarification of the City requirements.
- **Resolution**
Add clarification. Update section to clarify alignment requirements and update detail. Label Drawing No. as ST 14b.

100. 4011.1.F. Intersection of Public Roads and Driveway

- **Issue**
Section 4011.1.F.: Intersection of Public Roads and Driveway criteria is vague without details or references.
- **Resolution**
When referring to a letter, it is necessary to reference the figure where the letter dimension can be found. Update the section to identify the referenced detail or add the detail to the specifications for clarity of travelway "C".

101. 4011.1.H. Approach Types

- **Issue**
Section 4011.1.H.: Approach types section is confusing and lacks a definition of type of use.
- **Resolution**
Update the section to combine with section 4011.3 to describe each approach type use.

102. 4011.1.I. Concrete Driveway Approaches

- **Issue**
Section 4011.1.I.: All concrete driveway approaches shall use 24.1 MPa (3000 psi) concrete and be a minimum of 6" thick. All commercial driveways shall be concrete and may be thicker than 6" if required by the City Engineer.
- **Resolution**
Update section to add language-based on-site generated traffic and vehicle classification.

103. 4011.1.J. Expansion Joint at Right-of-Way Line

- **Issue**
Section 4011.1.J: The expansion joint at the right-of-way line may be redwood or cedar if asphaltic expansion joint material is used at the building (garage if the building is a residential home).
- **Resolution**
Update section to match current industry standards or developed detail.

104. 4011.1.M. Historic District Driveways

- **Issue**
Section 4011.1.M: In the Historic District, the minimum driveway width shall be 8 feet and the maximum 10 feet. Also, two strips of concrete, 18" wide, shall be allowed.
- **Resolution**
Review section to match current zoning documentation and Center City Code if applicable.

105. 4011.2. Approach Grades

- **Issue**
Section 4011.2: Approach grades are above normal limits set by ODOT and other Cities.
- **Resolution**
Revise section to clarify suggested grades and identify potential issues with ingress/egress based on grade change max.

106. 4011.3.B. Type II Driveway Approaches

- **Issue**
Section 4011.3.B: Type II Driveway Approaches (streets located in areas other than agricultural or residential estates) seems redundant.
- **Resolution**
Remove and combine with the previous section to avoid confusion. Reconfigure the whole driveway section to improve usability.

107. 4012.1. Control Sign Plans

- **Issue**
Section 4012.1: Street and traffic control sign plans shall be prepared by the City Traffic Engineer.

Section 4012.2: The developer shall be responsible for street name and other traffic control signage in all subdivisions, both public and private. For public subdivisions, the City will furnish and install these signs for the developer based on the City's current price schedule. For private subdivisions, the developer may, at his option, pay the City for the installation of the signs or hire a private contractor to do the work. Either way, the signs shall meet the requirements outlined in the Manual on Uniform Traffic Control Devices, the latest edition.

Payment for public subdivision signs shall be made to the City before the final plat is filed. In the case of a private subdivision, either payment to the City or installation of the signs by a private contractor will be required prior to the filing of the final plat.
- **Resolution**
Revise Section 4012.1 and 4012.2 to clarify the roles of the City and the Developer. Signs are made in-house; layouts are approved by the Traffic Division; developer pays City.

108. 4013. Striping

- **Issue**
Section 4013: Striping section is out of date for concrete pavement and current industry standards.
- **Resolution**
Revise section to include markings on concrete and asphaltic pavement.

109. 4015. Paving Design

- **Issue**
Section 4015 contains outdated content and needs general revisions.
- **Resolution**
 - a. Recommend renaming section to "Pavement Thickness Design" to differentiate this section from geometric design.

- b. Recommend adding: "All pavement designs shall be supported by a geotechnical study that is signed and sealed by an engineer licensed in the State of Oklahoma."
- c. Develop criteria to determine the scope of the study for each type of project to include boring location, number, and depth. This can be completed by adding a new section to define geotechnical aspects.
- d. Update nomenclature to match Section 4003 and adding Norman naming conventions in parenthesis
- e. Update ADT levels to include ADT's between 700-2000.
- f. Add requirements for truck movements within residential areas.
- g. Design periods can be adjusted to add a 30-year life span, which is typical for concrete. Increasing the design life allows for comparing bids between asphalt and concrete.
- h. Consider increasing the Reliability Factor for residential streets.
- i. Change Section "E" to include the geotechnical study beyond just testing and revise the coefficient of drainage with a maximum value of 1.00.
- j. Revise "Geotechnical Data" to "Geotechnical Parameters"
- k. Revise statement that the M_R testing is expensive however, adequate CBR testing and a true "k" determination are also costly. Suggest rewording the section to state that the MR test is not discouraged.
- l. Reword the section to place the responsibility of the design on the Geotechnical Engineer.
- m. Within Table 4015.2, add a caveat that, in the absence of actual test data, that the most conservative side of the range shall be used. The intent is to motivate the designer to complete testing for the project.
- n. Per Inch of Depth can vary widely depending on soil type; consider giving the Geotechnical Engineer the flexibility to adjust based on actual data.

110. 4016. Lighting

- **Issue**
Section 4016 should be revised to include lighting requirements for each type of facility or road section.
- **Resolution**
Clarify that these requirements are for each project and not just for developers. Full cut-off lights are currently required.

111. 4016.3. Location and Design

- **Issue**
Section 4016.3: The location and design of streetlights should be modified to include street design and the requirements of the lights.
- **Resolution**
Include verbiage on whether photometric calculations are required

112. 4017.A. Cut Back Parking / Curbs and GSI

- **Issue**
Section 4017.A: Cut back parking areas shall be paved in accordance with the applicable adopted City paving standard. A curb shall be constructed to prevent parked vehicles from encroaching into unpaved areas or sidewalks.

- **Resolution**
Revise to include roadways that are not curbed or areas that include GSI. Consider areas that vehicle overhang will affect pedestrian or vehicle access.

113. 4018.A. Access Management / Arterials

- **Issue**
Section 4018.A: Access guidelines for Arterials stating, "Direct access to arterial roadways must be avoided when possible" is vague. Revise to be more specific and reference the City's Access Management Protocol.
- **Resolution**
Revise section to detail and/or reference the City's Access Management protocol.

114. 4018.C. Sight Distances

- **Issue**
Section 4018.C: Adequate sight distances are open to interpretation and should be defined within the sight distance requirements
- **Resolution**
Define what adequate means. Develop criteria for sight distances and place within a table.

115. 4018.G. Traffic Controls

- **Issue**
Section 4018.G: Chart does not seem to consider future conditions or future changes in traffic control.
- **Resolution**
This should be revisited. If an intersection is stop-control now, it doesn't mean it will be that way forever, and if a drive is there, it is hard to have it moved later. Revise section to have one requirement to allow for future traffic control.

Section 5000 Stormwater

116. 5001.3. Reference to GSI

- **Issue**
Section 5001.3 does not include mention of GSI as a responsibility of all owners of the subject property.
- **Resolution**
Add a subsection with mention of GSI if this is to be the owners' responsibility to maintain or add GSI to the list in subsection G.1.

117. 5001.4. Primary and Secondary Drainage Channels

- **Issue**
Section 5001.4 - Primary and secondary drainage channels are not defined/distinguished.
- **Resolution**
Clarify the difference between primary and secondary channels or use the term "drainage channels" for all.

118. 5002.2. Regulatory Flood / Definition

- **Issue**
Section 5002.2 - Regulatory Flood is not defined
- **Resolution**
Clarify if the use of Regulatory Flood refers to the Federal Emergency Management Agency (FEMA) or City Regulatory floodplain representing fully urbanized conditions.

119. 5002.2. Floodplain Variances

- **Issue**
5002.2 - Floodplain Variances must be accepted by the Floodplain Permit Committee.
- **Resolution**
Consider removing and rewording to "All proposed design within a Floodplain must be reviewed and accepted by the Floodplain Permit Committee."

120. 5003.3. GSI Utilization for Drainage System

- **Issue**
Section 5003.3 does not explicitly state any GSI as being included as part of the drainage system.
- **Resolution**
Include GSI as an appurtenance.

121. 5003.4. Full Urbanization

- **Issue**
5003.4 - Full urbanization is not clearly defined.
- **Resolution**
Establish the scope of full urbanization in Section 5003.4. This should state clearly if full urbanization refers to upstream drainage areas that are off-site or if it only applies to the subject property.

122. 5003.5. Blocked Bypass Design

- **Issue**
The 50% blocked bypass design can create confusion. This statement may create time-consuming analysis and review.
- **Resolution**
5003.5 - Consider rewording to clarify the requirements of the 50% blocked bypass design for different situations.

123. 5003.5.B. Sump Collection System

- **Issue**
5003.5.B – Sump collection system blockage.
- **Resolution**
Update section and remove "in the event of complete blockage of the sump" stating that an overflow routing plan is required and shall be approved for all sump collection systems.

124. 5003.6. Overland Flow / Lots

- **Issue**
5003.6 – The number of lots used is an inconsistent value.
- **Resolution**
Revise 5003.3 to create a maximum area that can drain between two structures or to another lot. Instances with off-site drainage may account for a larger portion than three lots.

125. 5004.1. Total Rainfall Depths Table

- **Issue**
Table 5004.1 – Current table is out of date and does not match NOAA Atlas 14 Data.
- **Resolution**
Update tables and language to reference National Oceanic Atmospheric Administration (NOAA) Atlas 14 data.

126. 5005.2. Rational Method / Small Basins

- **Issue**
5005.2 – Use of the Rational method for small basins but does not take into account saturated soil conditions for each rainfall event.
- **Resolution**
Update Section 5005.2 to include the Modified Rational Method. Specify the appropriate applications for using each approved method. Modified Rational Method should only be used to size inlets and closed storm sewer systems. It can also be used to size culverts but not when floodplain storage needs to be accommodated.

127. 5005.1 Runoff Calculation Methods Table

- **Issue**
Table 5005.1 should be updated to reflect the current best engineering practices.
- **Resolution**
Revise tables and language to remove the Rational Method. The Modified Rational Method should not be used for Volume Calculations. Update current language requiring the subdivision of the SCS Method Drainage Basins to a maximum of 40 acres to maintain homogeneity.

128. 5005.2.B.3. and 5005.2.B.4. Maximum Overland Flow Length

- **Issue**
Sections 5005.2.B.3 and 5005.2.B.4 - Maximum overland flow length are longer than normal.
- **Resolution**
Reduce overland flow length to a maximum of 300 feet.

129. 5005.2.B.3. ODOT Drainage Manual Reference

- **Issue**
Section 5005.2.B.3. refers to an outdated ODOT manual.
- **Resolution**
Update the reference to Section 7.6.4 in ODOT's Roadway Drainage Manual and utilize the Modified Rational Method with the use of the Wright-McLaughlin Modifiers.

130. 5005.3. ODOT Drainage Manual Reference

- **Issue**
Table 5005.3 does not match the current ODOT Drainage Manual.
- **Resolution**
Update Table 5005.3 to reflect values stated in the 2014 ODOT Drainage Manual.

131. 5005.2. Unit Duration Times

- **Issue**
Section 5005.2 allows unit duration times of up to 15 minutes. Durations longer than 1-minute in an urbanized area (such as Norman) will likely lead to missing the peak flow rates on the hydrographs.
- **Resolution**
Update Section 5005.2.B.3. requiring 1-minute multiples for the calculation of the maximum unit duration.

132. 5005.2.C. HEC-1 Program Reference

- **Issue**
5005.2.C - The US Army Corps of Engineers computer program (HEC-1) has been updated to HEC-HMS.

- **Resolution**
Update reference in Section 5005.2.C. to reflect the use HEC-HMS for calculating the SCS Unit Hydrograph.

133. 5007.1.A.3. ODOT Reference (SSCD)

- **Issue**
5007.1.A.3 – The SSCD-1-15 ODOT reference is out of date.
- **Resolution**
Revise Section 5007.1.A.3. to reflect ODOT Standard SSCD-4.

134. 5008.2.D. Storm Sewer Alignment and GSI

- **Issue**
Section 5008.2.D strict requirements on storm sewer alignment could restrict innovation and use of GSI.
- **Resolution**
Consider how non-standard street sections, incorporating GSI, can be accepted without additional review.

135. 5008.2.G. Runoff Collection in Storm Sewer

- **Issue**
Section 5008.2.G uses of the word "must" to first collect runoff in a storm sewer restricts usage of GSI to capture the first flush.
- **Resolution**
Include GSI as the City's preferred approach for collecting the runoff before discharging from a parking lot.

136. 5011.1.B. Natural Channel Improvements / Floodplain Storage

- **Issue**
Improvements to any natural channel should maintain floodplain storage.
- **Resolution**
Modify the last sentence of Section 5011.1.B to state in any condition that the current level of floodplain storage must be maintained.

137. 5011.2.H.3. Backwater Analysis / Platting Process

- **Issue**
Additional guidance is needed with regard to backwater analysis to be provided during the platting process.
- **Resolution**
Add the following statement:
"5011.2.H.3. No detention volumes will be allowed that are below the 100-year floodplain or calculated tailwater elevations."

138. 5011.2.J. Detention Storage / Future Development

- **Issue**
Detention storage to accommodate future development must be located on-site or downstream of said development to mitigate the impact on downstream properties. Banking additional storage upstream of a planned development does not provide necessary mitigation.
- **Resolution**
Remove Section 5011.2.J.

Section 5012 Erosion and Sedimentation Control

139. 5012.2.A Regulations

- **Issue**

Section 5012.2.A includes requirements for Earth Change Permits. The Earth Change Permit needs to reflect the requirements of ODEQ's OKR10 or more stringent guidelines. Due to recommendations within the Lake Thunderbird TMDL Compliance Plan, all land disturbance activities should be monitored or permitted.

- **Resolution**

The Earth Change Permit should be modified to meet the OKR10 requirements and updated to include criteria for developing smaller sites. Sites that do not fall under the requirements of the OKR10 should also be permitted and follow the TMDL Plan. Permits for smaller sites should not require a signed and sealed document by a Professional Engineer.

A process for reviewing and approving Earth Change permits should include the development of appropriate forms. The forms should include requirements that meet all OKR10 termination procedures in addition to a final inspection checklist.

Due to some projects' length, developing and implementing an annual permit renewal process with a renewal fee is recommended. The annual renewal process will allow the City to recoup the costs associated with processing the permits.

140. 5012.3 Exemptions

- **Issue**

Section 5012.3: Current exemptions are vague and include bona fide agricultural and farming operations. Exemption criteria may cause long-lasting ramifications.

- **Resolution**

With the influx of urban farming, chemicals, and point source pollution, exemptions should be reviewed and expanded.

141. 5012.6-.8 Temporary Best Management Practices

- **Issue**

Section 5012.6.8: The current Temporary Best Management Practices are out of date, including the use of the straw bale dike.

- **Resolution**

Update the Temporary Best Management Practices and move this erosion control section into the EDC under Section 6000. The new Section 6000 will allow a seamless transition to the development and inclusion of GSI design criteria that comply with state and federal regulations.

142. 5012.9 Compliance

- **Issue**

Section 5012.9: The compliance inspections are out of date and do not meet the requirements of OKR10.

- **Resolution**

Update the compliance section to meet all state and federal regulations for inspections. The fines should be updated to allow the City to recoup any fees associated with the time required for processing. Re-inspection fees should also be added to the fee schedule.

Section 6000 Stormwater Pollution

143. 6000 Stormwater Pollution

- **Issue**
Section 6000: The label of this section leads the reader to think erosion and sedimentation control is stormwater-related only.
- **Resolution**
Consider renaming this section to MS4 Pollution Prevention.

144. 6000 Stormwater Pollution

- **Issue**
Section 6000: Per the OKR04 Part IV.B. Established Total Maximum Daily Load (TMDL) Allocations must be addressed. The ordinance must require the reduction or control of pollutants of concern (POC), enforcement procedures for noncompliance, and develop additional ordinances, as necessary. The findings in the TMDL report and criteria to address TMDL findings are not addressed in this section.
- **Resolution**
Consider adding a subsection to this section to identify and add restrictions for discharges into Thunderbird watershed. Provide cross-reference to WQPZ Ordinance.

145. 6000 Stormwater Pollution

- **Issue**
Section 6000: Per the OKR04 Part V.C.2 MCM 2: Industrial Stormwater Runoff Control must be addressed. The ordinance must require industrial facilities to implement BMPs that will minimize exposure, provide good housekeeping, preventative maintenance, spill prevention and response, and erosion and sediment controls, as well as sanctions to ensure compliance.
- **Resolution**
 - a. Consider adding a subsection in 6003 to identify and add restrictions to industrial stormwater runoff control.
 - b. In this subsection, specifically, reference the OKR05 for Stormwater Discharge from Industrial Activities general permit and adopt its regulations, as well as subsequent revisions, and make its requirements enforceable.
 - c. Additionally, the ordinance must include potential water quality impact guidelines for site plan reviews.
 - d. An industrial stormwater inspection and enforcement program, including permitting, documentation, and inspection/enforcement processes that meet the requirements of the State's Multisector General Permit, OKR05.

146. 6002 Definitions

- **Issue**
Section 6002: Director is used in later sections, but it is not defined in the definitions.
- **Resolution**
Add Director to the definitions.

147. 6003.1 Allowable Discharges

- **Issue**
Section 6003.1: Some allowable discharges and descriptors in the OKR04 are not included in this section.

- **Resolution**
 - a. Consider revising this subsection title to “Authorized Non-Stormwater Discharges.”
 - b. Consider explicitly listing the authorized non-stormwater discharges as identified in the OKR04 II.B Types of Authorized Discharges and OKR10 Part 1.2 Authorized Discharges.
 - c. Consider clearly identifying the activities and state the conditions that authorized non-stormwater discharges need to have for a discharge to be permitted.

148. 6003.2 Prohibited Discharges

- **Issue**

Section 6003.2 is missing some prohibited discharges included in OKR04 and OKR10.
- **Resolution**
 - a. Consider revising this subsection title to “Unauthorized Discharges.”
 - b. Consider explicitly identifying each type of unauthorized discharge in OKR04 and OKR10. Reference each applicable general permit for clarity.
 - c. Consider including a catch-all line to include any discharge that is not considered an insignificant source of pollutant to small MS4 considering proximity to sensitive water bodies.
 - d. Consider including stormwater discharges currently covered under another permit are unauthorized.
 - e. Consider including discharges exceeding water quality standards.
 - f. Consider including discharges that are not consistent with any future TMDL.
 - g. Consider including an item to address endangered species sections from OKR10 and OKR4
 - h. Consider explicitly addressing illicit discharges, illicit connections, and illegal dumping per OKR04.
 - i. Consider making the distinction that all ordinance requirements apply to both municipal and private operations.

149. 6003.4 Construction Activities

- **Issue**

This section does not specifically reference OKR04 or OKR10 requirements.
- **Resolution**

Consider specifically referencing the OKR04 and OKR10 general permits and adopt their regulations, as well as subsequent revisions, under this section.

 - a. Consider potential water quality impact guidelines for site plan reviews.
 - b. Consider updating the Earth Change Permit to specifically require City approval of the Stormwater Pollution Prevention Plan (SWP3) during the construction review process in accordance with OKR10 and OKR04. Ensure appropriate control measures are being used at the site for specific TMDLs or site conditions.
 - c. Consider including language that delays authorization to the construction site operator if provisions are not met during the SWP3 review.
 - d. Consider defining when an SWP3 is required in accordance with OKR10 or City preferences, if stricter than a 1-acre threshold.

150. 6003.5 NPDES Permitted Activities & 6003.6 Records

- **Issue**
Sections 6003.5 and 6003.6 do not provide the appropriate provisions to collect the information deemed necessary to assess compliance with OKR04, OKR05, and OKR10.
- **Resolution**
Consider providing legal authority to the City to allow for the receipt and collection of the pertinent facility or property documentation and information to assess applicable compliance.

151. 6003.7 Best Management Practices (BMP)

- **Issue**
Section 6003.7 is not tied to temporary erosion control measures section.
- **Resolution**
Add a reference to the following chapter (or move to this location) to include design requirements for temporary BMPs. This is also an opportunity to mention SWPPP requirements.

152. 6003.8 Spill Reporting

- **Issue**
This section does not reference federal or state spill reporting requirements.
- **Resolution**
Consider including the applicable Oklahoma Department of Environmental Quality (DEQ) and Environmental Protection Agency (EPA) Spill Reporting requirements.

Section 6000/7000 Stormwater Quality Design

153. Stormwater Quality Controls

- **Issue**
Stormwater quality controls and Green Stormwater Infrastructure (GSI) design criteria should be integrated into the EDC to ensure all design options are easily referenced and located by staff and designers.
- **Resolution**
Consider adding a new subsection to 6000 or a section 7000 for stormwater quality controls. This section would have design criteria for regional/centralized controls and GSI/de-centralized controls. It is recommended that GSI design criteria be housed in the design manual to allow for accountability and standard design criteria, even though the water quality controls are voluntary.

In conjunction with this additional section, some other updates should be considered:

- a. Develop additional enforcement procedures for stormwater quality requirements, such as the authority to administer, review, and inspect cases that do not meet city standards.
- b. Develop a City Ordinance referencing the City's MS4 permit, TMDL, and EDC requirements.
- c. Revise other City documents based on the diagnostic report to allow and promote the installation of GSI components.
- d. Develop GSI recommendations that provide incentives for use in residential, commercial, and industrial developments.
- e. Develop an education program outlining city requirements along with the responsibilities of residents and property owners about the use of GSI. The program will educate the public about what GSI is and how it is designed, installed, and maintained, and the benefits of GSI.

- f. Develop parking and landscape requirements that promote GSI and water conservation and/or reuse. Examples include the review of parking requirements and irrigation of parking lot islands with potable water.
- g. Address the following requirements for Post-Construction Management for New Development and Redevelopment in a City Ordinance:
 - Specifically, reference the OKR04 in this section for clarity.
 - Require BMPs or Low Impact Development (preferred) to be installed to address post-construction runoff.
 - Clearly identify threshold criteria for sites required to implement post-construction controls.
 - Ensure adequate long-term operation and maintenance (O&M) of BMPs with responsibilities clearly defined. Make O&M agreement transferable during the sale and/or record the O&M agreement with the deed of record for the subject property.
 - Identify sensitive waterways and TMDLs and provide standards that developers must follow.
 - Require a pre-construction review of the final design of post-construction controls.
 - Develop penalty provisions for non-compliance and enforcement of requirements and allow for report collection, inspection, corrective action, etc.

Standards and Specifications

Section 1000 General Information

154. Section 1004 – Materials not Listed in These Specifications

- **Issue**
Section 1004: When materials not listed are approved to be used, there is not a straightforward process for developing the specifications and including the new materials in the list of approved materials for future projects.
- **Resolution**
Draft specifications required for approval and provide a process for including the materials for use in projects without additional review and approval by the City Engineer. State that the approval is not guaranteed.

155. Section 1006 Testing Requirements - Testing

- **Issue**
The current specifications do not address testing for various components of landscape and GSI installations.
- **Resolution**
Expand this section to include testing requirements and procedures for landscape soils, plant evaluations; and other sustainability products, underdrain systems, and backfill and irrigation systems.

156. Section 1006.4. Testing Requirements - Matching

- **Issue**
1006.4: The testing requirements for sewer force mains appear to be the minimum required.
- **Resolution**
1006.4: Update required testing requirements for sewer force mains to match water line testing requirements.

157. Section 1006. TV Inspections

- **Issue**
There are no requirements for pre-construction or post-construction TV inspections of gravity sewers or storm sewers.
- **Resolution**
Add requirements for pre-construction or post-construction TV inspections of gravity sewers and storm sewers.

158. Section 1009. Definitions

- **Issue**
The definitions section needs to be current and reflect any changes that introduce new/different terms to the Specifications.
- **Resolution**
Update terms to include specialty features added, design approaches (Complete Street, CSD, Transportation Enhancements, GSI, etc.), and Landscape Architect, among other new terms.

159. Other Potential Items

- **Issue**
Decorative landscape materials and finishes should be considered to provide direction for designers.

- **Resolution**
MSE Wall Finishes, Masonry Wall Veneers, Ornamental Metal Fencing, Ornamental Metal Sign Hardware, Ornamental Light Standards, Architectural Light Standards, Site Furnishings (Benches, Trash, Shade Structures, Information Kiosks, Bike Racks), Specialty Signage (Pin-Mount), Bus/Transit Shelters, Protective Bollards.

Section 1100 General Conditions

General Conditions will be reviewed with staff and the City Attorney to define changes.

Section 2100 Site Development and Earth Work

160. Section 2102. Earthwork

- **Issue**
Section 2102: Some common terms and practices are not currently addressed in the Earthwork section.
- **Resolution**
Add definitions and specifications for biofiltration soils and backfill, topsoil, compost, and planting soils (multiple types), possibly other durable mulch types. Add means for excavation around existing trees, excavation and replacement of unsuitable materials in Section 2101.5 Under grading, urban landscape backfill with sub-surface soil support geo-systems, address essential soil density relief for compaction of landscape soils.

161. Section 2104. Sodding and Seeding

- **Issue**
This section should establish an edge of sod for stabilization, it does not include some common turf types, and it lacks guidance related to integral elements of sodding and seeding.
- **Resolution**
Require min. 15" sod strip around all perimeter edges, add provisions enabling additional common turf types (Bermuda hybrids, Zoysia grass, Buffalo grass, St. Augustine) and temporary seeding varieties (such as Tall Fescue, Kentucky Bluegrass or Annual Ryegrass). Add provisions for incidental elements integral to Sodding and Seeding (Mulch Emulsion, Tackifier, and Soil Microbial Inoculant).

Section 2200 Miscellaneous Construction

162. Section 2200. Miscellaneous Construction

- **Issue**
This section should be updated to address commonly used materials and techniques for concrete surfaces.
- **Resolution**
 - a. Section 2201.3.H. Finish of Concrete Surfaces - Add provisions for light, medium, and heavy blast finishes. Include requirements for integral colored concrete.
 - b. Section 2201.3.K&L. Forms & Removal of Forms - Include provisions for textured formliners.

163. Section 2202. Bore and Conduit / General Updates

- **Issue**
Section 2202: Updates and clarifications are required for this section to address the steel casing and design requirements of borings.

- **Resolution**
 - a. Update steel casing requirements with the most up to date standards.
 - b. Add clarification around the design requirements for steel casing.
 - c. Update casing coating to allow epoxy.
 - d. Update to require pressure grouting of annular space.
 - e. Update clearance requirements to reference ODOT and RR specific requirements.
 - f. Update to include the use of pilot-guided bores, mainly for gravity applications where maintaining grade is important.

164. Section 2202.2 Bore and Conduit / Permits

- **Issue**
Section 2202.2: Permits are managed by the City of Norman.
- **Resolution**
Revise the section to have the design engineer obtain all permits. This is a right of way permit (not a specific bore and conduit permit); included in a fee upfront with a larger project; outside permits must be obtained independently.

165. Section 2205. Pavement Removal and Replacement

- **Issue**
Section 2205: PAVEMENT REMOVAL AND REPLACEMENT Specifications should match the Engineering Design Criteria (EDC).
- **Resolution**
Update this section to match the EDC.

166. Section 2205. Pavement Removal and Replacement / General

- **Issue**
Common materials for hardscape features are not addressed.
- **Resolution**
Add provisions to include permeable paving, integrally colored imprinted concrete, concrete pavers, clay pavers, and in-pavement warning lights. It may be appropriate to include aspects of these elements in other sections of this document.

167. Section 2205. Pavement Removal and Replacement / Underdrains

- **Issue**
This section does not include provisions for landscape underdrains/French drains.
- **Resolution**
Include provisions for Landscape underdrains/French drains, including backfill aggregate and filter fabric.

Section 2300 Streets and Drainage

168. Section 2300. Streets and Drainage

- **Issue**
Common landscape materials should be added to this section.
- **Resolution**
Include provisions for gravel landscape mulch(es), weed barrier, and/or filter fabric.

169. Section 2304. Special City Requirements

- **Issue**
Section 2304 needs to be reviewed to ensure references to ODOT are current.
- **Resolution**
References to ODOT and other sections should be checked to ensure current. ODOT is revising its specs right now, and numbering could change.

170. Section 2304.7. Sidewalks / ADA Requirements

- **Issue**
Section 2304.7 does not mention ADA requirements.
- **Resolution**
Revise to reference ADA compliance requirements.

171. Section 2304.7. Sidewalks / Colored Concrete and Pavers

- **Issue**
Colored concrete and various paver applications are often used in hardscape designs and should be addressed in the Specifications.
- **Resolution**
Add provisions for integrally colored imprinted concrete, unit pavers, and brick pavers - reference Public Right-of-Way Accessibility Guidelines (PROWAG) as best practice.

172. Section 2304.10 Asphalt Pavement / Minimum Requirements

- **Issue**
Section 2304.10: Asphalt paving criteria need to be updated to match the EDC and developed for City Streets.
- **Resolution**
Update section to match the EDC and set minimum requirements for asphalt paving. Review the need and desire to allow pervious asphalt.

173. Section 2304.10. Asphalt Pavement / Stamped Synthetic Asphalt Pavement

- **Issue**
The section does not provide for stamped synthetic asphalt pavement.
- **Resolution**
Include provisions for Stamped Synthetic Asphalt Pavement.

Section 2400 Water Lines

174. Section 2400. Water Lines / General

- **Issue**
General clerical errors.
- **Resolution**
Make clerical edits provided by city staff.

175. Section 2400. Water Lines / Ductile Iron

- **Issue**
The City desires to eliminate the use of ductile iron pipe.
- **Resolution**
Ductile iron can be restricted to only be used in specific scenarios (i.e., where petroleum contaminated soils are encountered), with added protection to protect from corrosive soils, with the use of a zinc coating plus the use of V-BIO polyethylene encasement.

176. Section 2400 Water Lines / Update Cross References

- **Issue**

Section 2400 needs general updates and clarifications.

- **Resolution**

- Update tracer wire requirements and add tracer wire integrity testing for mains and service lines.
- Tracer wire connectors need to be silicon filled.
- Update water line service requirements per City provided specification. Update requirements to match the service connection sheet provided by the City.
- The valve opening direction says to match existing valves. Change reference to “counterclockwise” to match other sections within the specification.
- Update fire hydrant bury depth.
- There are no requirements listed regarding which city roads require steel casing/trenchless construction. Add the appropriate specification.
- Update the requirements to provide minimal steel sizing of casing in relation to pipe size and restraint type.
- Update the requirements to provide minimum depths of the casing to be installed under city roads.
- Develop a specification for casing plugs.
- Update the design requirements to provide thrust restraint design parameters.
- Move reference to sewer backfilling out of the water line specification and into the sewer specification.
- Re-evaluate the test pressure requirements and consider making it 1.5 times the working pressure.
- The pressure test duration should match AWWA recommendations.
- Provide fire line requirement standards to meet the 25 psi is the minimum allowed by ODEQ or develop a City standard.
- Consider updating the measurement and payment section to better align with the latest updates.
- Remove all metric dimensions from the specs.
- All references to AWWA C905 should be removed since this standard is now obsolete. All other technical references in this specifications document should be reviewed to ensure there are no other outdated references.
- The lists of approved manufacturers for valves, pumps, hydrants, etc., should be reviewed and updated based on the City’s recent experience.
- Remove the Engineer’s “Corrosive Soil Map” and assume all soils are corrosive.
- Consider reviewing all specifications documents from recent water/sewer projects for special provisions that could be included in these specifications. For example, for the Robinson Street Water Line project that is currently near completion, a special provision was added about filling in abandoned water lines with a concrete plug. This could be added to Section-2400 of the City’s standard specifications. Also, for this same project, there was a special provision concerning stainless tapping sleeves. Section 2402.1-A-7 of the specs could be edited to include the special provision from the Robinson Street Water Line specifications.

- u. The Standards and Specifications and the EDC should be reviewed for redundancy. Instead of repeating the same information or providing contradictory information, the specs and the EDC could reference each other or, in some cases, just reference ODEQ requirements. An example of this is the horizontal and vertical separation between water lines and sanitary sewers. This is addressed in EDC 2001.1, 2002.2, and 3002.1 as well as Standard Specifications 2404.1 and 2501.6. Each of these sections could defer to ODEQ requirements like EDC 2001.1. The other option is to spell everything out like Standard Specifications 2404.1, with each of the other sections referencing Spec 2404.1.

177. Section 2402.1.A.6. Nuts and Bolts

- **Issue**
Section 2402.1.A.6.: Nuts and bolts are not required to be standard stainless steel.
- **Resolution**
Update the section requiring all nuts and bolts to be stainless steel regardless of the corrosive soil map, and all nuts shall be Teflon coated.

178. Section 2402.1.B. Pipe and Fittings

- **Issue**
Section 2402.1.B.1.a., 2402.1.B.1.c., 2402.1.B.1.d.: "...C905..." is obsolete. C905 is no longer used and therefore this section is obsolete.
- **Resolution**
Remove the section.

179. Section 2402.2.A. Gate Valves

- **Issue**
Section 2402.2.A.: Valve opening direction is vague and should be revised.
- **Resolution**
Require the valve direction to be counterclockwise to match the "Valve Operation" section of the spec on the next page.

180. Section 2402.2.B.1. Butterfly Valves / Manufacturers

- **Issue**
Section 2402.2.B.1.: The list of manufacturers are out of date and should be updated to match the Public Works Department Requirements.
- **Resolution**
Provide a detailed list of allowable valves, pipe, hydrants; provide updated materials lists.

181. Section 2402.2.B.2. Butterfly Valves / Opening Direction

- **Issue**
Section 2402.2.B.2.: As stated above, nuts and bolts are not required to be stainless steel. The valve opening direction shall be consistent with the operation of existing valves
- **Resolution**
Revise to state that all nuts and bolts shall be stainless steel. Require the valve direction to be counterclockwise.

182. Section 2402.2D. Gate Valve Manufacturer List

- **Issue**
Section 2402.2.D.: The list of manufacturers is out of date and should be updated to match Public Works requirements.
- **Resolution**
Provide a detailed list of allowable valves, pipes, hydrants; provide updated materials lists.

183. Section 2402.4.D. Bury Depth of Hydrant Barrel

- **Issue**
Section 2402.4.D.: The bury depth does not match other sections of the specifications
- **Resolution**
Update this section to match EDC Section 2002.8 G

184. Section 2403.1.K.1. Trench Depth / Backfill Cover

- **Issue**
Section 2403.1.K.1.: The proposed depth of cover is a minimum of 30," which is shallow.
- **Resolution**
Consider increasing the minimum cover to 48".

185. Additional Water Items

- a. No 2-inch water mains.
- b. Eliminate pressure class. Rather, state what is working, what is surge, and for PVC, specify the required DR.
- c. Holiday testing for fittings. Is it required upon request?
- d. Should a pressure reducing valve specification be developed?
- e. Develop a better installation for stem extension.
- f. Specification for hydrant tamper-proof cover.
- g. Tracer wire – eliminated weather head above ground. Clarify that tracer wire is required for service lines as well.
- h. No above water crossings.
- i. Update the blowoff sizes to accommodate full-pipe flushes.
- j. A hydrostatic test needs to be done with taps installed.

Section 2500 Sanitary Sewers

186. Section 2500 Sanitary Sewers / Update Cross References

- **Issue**
Section 2500 needs general updates and clarifications.
- **Resolution**
 - a. 2501.4 – Submittals should always be required before the fabrication of materials.
 - b. 2501.5.A. - Statement allows too much room for a variance to be requested if the minimum slope is not met. Consider eliminating that option.
 - c. 2501.5.B. - There are no minimum requirements around what is required by the Engineer to feel comfortable that the sewer line is being installed to the line and grade on the plans.
 - d. 2501.6 – Update specification cross-references with the latest EDC updates.
 - e. 2502.1 – Remove references to metric units.
 - f. 2502.1.A.– Remove DIP requirements
 - g. 2502.1.B. – Update all ASTM references.
 - h. 2502.1.B. – Remove reference to ductile iron fittings in a gravity application.

- i. 2502.1.C. – No requirements for removing weld beads on the interior and/or exterior of the pipe.
- j. 2502.1.D – Add a section for the use of Fiberglass pipe at >36" diameter.
- k. 2502.2.A. – Increase minimum SDR rating from 35 to 26; possibly at depths greater than 10'.
- l. 2502.2.B. – Remove reference to ductile iron fittings in a gravity application; conflicts with 2502.3.
- m. 2502.4.A. – Update PVC PC requirements to match the latest AWWA C900 standards.
- n. 2502.4.A. – Add an option for HDPE force mains.
- o. 2502.4.B. – Add guidance on when a plug valve should be used versus a gate valve.
- p. 2502.4.B. – Update list of approved air valve manufacturers.
- q. 2502.4.D. – Add corrosion protection requirements to the structure.
- r. 2502.5 - Add corrosion protection requirements to certain specified manholes.
- s. 2502.7 – Update reference requirements within Section 2202 to match the latest EDC updates.

187. Section 2503 Site Preparation

- **Issue**
Guidance for protecting existing trees and various landscape components is not provided.
- **Resolution**
Include Existing Tree Protection measures and Landscaping specifications, including a range of Urban Landscape and Sustainable Landscape components and techniques. Tree Protection Ordinance refers to the area between the sidewalk and curb at this time; Tree Protection Ordinance is more recent and should be the standard.

Section 2600 Sanitary Sewer Lift Stations

188. Section 2600 Sanitary Sewer Lift Stations

- **Issue**
City preferences may have changed since the last update of this document.
- **Resolution**
Update to match latest city preferences.

Construction Drawings

Standard construction drawings are important for communicating technical requirements to designers, developers, and the public. Review of the standard drawings will continue throughout the development of the EDC; however, standard drawings are developed to reflect design guidance and technical requirements. Markups will be developed during the second phase to align with the updated EDC.

Zoning Ordinance

Article I. Building Setback Lines

189. Sections 22-101 to 22-103

- **Issue**
New street classifications introduced in the CCFBC are not included in the definitions or setback restrictions outlined in Sections 22-101 and 22-103.
- **Resolution**
Add the necessary definition and setback requirements. These narrower, more urban street sections may also need to be addressed in Sec. 22-104. Consider expanding the authority of the City Engineer or designee to grant administrative variances (with appropriate parameters) without Board of Adjustment hearings like the provision for setback adjustments in Sec. 429.5.5.c that applies to property within the Northern Community Separator Overlay District.

Article XI. Specific District Regulations

190. Article XI. Specific District Regulations / All Residential Districts

- **Issue**
Density limitations within residential districts limit incremental infill and attainable housing in appropriate locations through the addition of accessory dwelling units (ADUs).
- **Resolution**
Consider including a provision to allow ADUs when development addresses increased coverage on a site by installing Green Stormwater Infrastructure (GSI) features. Further review of ADUs as a permitted use in most, if not all, residential districts may also be beneficial in order to support the development of appropriate, attainable housing throughout the City.

191. Sec. 420 Planned Unit Developments

- **Issue**
The PUD zoning tool is a great fit for low impact development and other GSI applications. Reductions in parking requirements or allowances for greater density (density bonuses) can be used to incentivize the use of these design techniques. While there is flexibility in the uses and layout of these developments, the code falls short of providing direction about using alternative designs to achieve stated purposes, including “More efficient and economic use of land resulting in smaller networks of utilities and streets thereby lowering costs.”
- **Resolution**
Include language supporting the use of approved GSI design solutions for PUD projects. Using alternative design solutions should be permitted by right without additional approvals or hearings but in compliance with the adopted EDC.

192. Sec. 429 MUD, Mixed-Use Development District

- **Issue**
The provision of shared parking (Table X) allows for adjusted parking requirements where complementary uses are located within a common development and can accommodate multiple uses. This provision is restricted to the MUD District.
- **Resolution**
Shared parking may be possible in other locations that include properties with multiple zoning designations and/or uses. This may be introduced as an incentive for using GSI design measures.

Article XII. Additional District Provisions

193. Sec. 431.1 Open Space

- **Issue**
Setbacks are established in 431.1.c. for streets with less than 50' of right-of-way. This needs to be consistent with all other references for building setbacks.
- **Resolution**
Determine which standard governs in the instance of a conflict and ensure it is clear in regulations (Zoning, CCFBC, Subdivision) and in the EDC.

194. Sec. 431.1.f. Open Space / Business and Industrial Districts

- **Issue**
No minimum lot sizes or open space areas are currently required for business or industrial districts.
- **Resolution**
Consider instituting a maximum coverage area for impervious surfaces on commercial and industrial properties. This may be useful for establishing incentives for the use of GSI projects to address stormwater conditions and requirements of a site.

195. Sec. 431.5.2. Off-Street Parking Requirements / Number of Off-Street Parking Spaces Required

- **Issue**
Decreasing minimum parking requirements can improve stormwater conditions by reducing impervious pavement.
- **Resolution**
Include parking reduction provisions in an incentive program; additional language and benchmarking to review regulations for comparable and regional communities may also be useful for updating minimum parking requirements.

196. Sec. 431.5.3.c. Off-Street Parking Requirements / Joint Use

- **Issue**
Joint Use provisions require that off-street parking areas are available that equal the total requirements for all uses.
- **Resolution**
A shared parking provision (such as the allowance for MUD projects) can be used as an incentive and paired with appropriate GSI best practices.

197. Sec. 431.5.3.d. Off-Street Parking Requirements / Landscaping of Existing Parking Lots

- **Issue**
Providing landscaping for existing parking lots that are not subject to current landscape requirements allows a 10% reduction in the required number of off-street parking spaces. This may support modest expansions of existing structures and uses.
- **Resolution**
It may be appropriate to enhance this parking reduction (to 25%) where GSI is installed within landscaped areas of a site.

198. Sec. 431.5.4. Off-Street Parking Requirements / Bicycle Parking Facilities

- **Issue**
Bicycle parking is required for all uses except single-family, two-family, and three-family units. Reducing vehicle parking requirements when additional bicycle parking facilities are provided may help support the revitalization and reuse of existing buildings.

- **Resolution**
Include a description and standards for long-term bicycle parking spaces and provide that every ten long-term bicycle spaces provided may be counted as one required vehicle parking space. Consider including a maximum reduction amount of 25% of total required spaces.

199. Sec. 431.7 Development and Maintenance of Off-Street Parking Facilities / Surface

- **Issue**
431.7.1. Location of Off-Street Parking Spaces refers to “an approved pavement surface.” This terminology may limit the utilization of GSI for certain parking locations.
- **Resolution**
Ensure consistency in terminology to provide opportunities, where appropriate, for the installation of parking on surfaces that are not traditional asphalt or concrete.

200. Sec. 431.7 Development and Maintenance of Off-Street Parking Facilities / Access

- **Issue**
431.7.2.c. Access provides for driveway ribbons, in place of fully paved driveways, only in the Historic District.
- **Resolution**
Consider allowing this type of driveway for other single-family residential applications.

201. Sec. 431.8 Landscaping Requirements for Off-Street Parking Facilities

- **Issue**
431.8.2 & 431.8.3. Need to increase landscape requirements generally.
- **Resolution**
Consider granting credit for increased landscaping in an incentive program; additional language and benchmarking to review regulations for comparable and regional communities may also be useful for updating minimum landscaping requirements.

202. Sec. 431.8 Landscaping Requirements for Off-Street Parking Facilities

- **Issue**
431.8.5. Alternative Landscaping Method introduces the option of a xeriscape design. There may be an appropriate application for GSI as another alternative.
- **Resolution**
Include language that allows GSI features to be used in an alternative landscape design for off-street parking facilities.

Center City Form-Based Code (CCFBC)

The CCFBC is customized to address conditions in the Center City area. Not all provisions will translate to other geographic areas of Norman. However, the EDC and companion technical manuals must contain guidance to support the implementation of projects under this code.

The CCFBC defines explicitly the activities and development that can and should occur within the complete street-space (the public domain between buildings; the travel lanes between the curbs and the sidewalks; public plazas as well as urban squares and civic greens.) Traditional zoning and subdivision regulations do not address the character of this space. Generally, it is seen only as a service area needed for utility and access easements and sidewalks when they are required. Standards should be included in the EDC and accompanying technical manuals to better define the street-space's use and function to include GSI measures and landscaping.

Part 3. The Regulating Plan

203. Sec. 301.D. Streets, Blocks and Alleys on the Regulating Plan

- **Issue**
This section emphasizes controlling traffic movements and protecting the pedestrian realm by restricting turning, parking, and access points as much as possible to alleys and existing curb cuts. Block lengths cannot exceed 300 feet. No new curb cuts are permitted; however, flexibility is provided for parking structures that have sufficient public parking spaces included. Alleys and common drives are encouraged and should be properly maintained for utilities and to access parking areas.
- **Resolution**
Update Subdivision Regulations (Sec. 19-404) to include block length provisions for property within the boundary of the CCFBC District.

204. Sec. 301.D.2.b. Curb Cuts

- **Issue**
Section 301.D.2.b states that no new curb cuts are permitted. However, there are many GSI scenarios where a curb cut is standard.
- **Resolution**
Include a clarification that allows curb cuts for usage in conjunction with GSI while still restricting new vehicular access points.

Part 5. Urban Space Standards

205. Sec. 503.Street Type Specifications

- **Issue**
New street classifications are introduced in the CCFBC (Alley, Main Street, Boyd Street, Neighborhood Street).
- **Resolution**
Include design guidance and standards for each of these new classifications in Section 4000, Streets of the EDC.

206. Sec. 503.B. Street Types

- **Issue**
Street sections leave no space for GSI
- **Resolution**
Consider how non-standard street sections, incorporating GSI, can be accepted without additional review.

207. Sec. 504.A.2. Streetscape Standards / General Provisions

- **Issue**
Turfgrass must be sod and not seeded. Grasses for a GSI might not meet these requirements.
- **Resolution**
If a GSI manual is developed or GSI sections are added to the EDC, include a planting section and reference it here.

208. Sec. 504.B. Streetscape Standards / Street Trees

- **Issue**
GSI such as planting box or tree box might not meet requirements put forth in street trees and may be less than 6 feet unless otherwise specified in this code
- **Resolution**
Add a section for street tree planting area requirements if a tree is part of a GSI, such as a planting box or tree box.

209. Sec. 504.B.2.c. Streetscape Standards / Street Trees

- **Issue**
Requirements that unpaved ground area shall be planted with groundcover could restrict the use of GSIs such as infiltration trenches.
- **Resolution**
Add a caveat that this requirement is only in place when the gravel is not acting as an infiltration surface.

210. Sec. 505. Plazas, Squares and Civic Greens

- **Issue**
This section specifically encourages the use of pervious paving materials that are approved by the Public Works Department.
- **Resolution**
The EDC should provide descriptions of appropriate materials and plants and clear instructions for the installation and maintenance of these treatments.

Part 6. Parking and Loading Standards

211. Sec. 601. Intent

- **Issue**
On-street parking is encouraged to be maximized, and pervious cover is encouraged for surface parking lots. Pervious surfaces should be encouraged for on-street parking as well, if possible.
- **Resolution**
Encourage parking in the place where pervious cover is utilized the most. If on-street parking is to be maximized, consider encouraging pervious cover for on-street parking as well.

212. Sec. 602. Other Applicable Regulations

- **Issue**
Pervious surfaces are encouraged for parking and loading areas when approved by the City Engineer.
- **Resolution**
Include guidance for the design, installation, and maintenance of pervious surfaces for application in CCFBC areas. This provision may also be transferable to other areas of the City.

213. Sec. 603. Minimum Parking Requirements

Parking requirements are waived for properties zoned C-3 within the bounds of the CCFBC district. And there is no minimum parking required for the reuse or renovation of existing structures when

no gross floor area is added. This provision allows existing building stock to be useful and to be reactivated with a change of use.

Compliance with minimum parking requirements is often difficult when a building transitions to a new use. When these standards cannot be met, buildings are demolished or remain vacant, which can lead to negative conditions such as blight, vandalism, and reduced tax revenues.

- **Issue**

Parking regulations housed in the CCFBC may be appropriate applications within other established zoning districts.

- **Resolution**

Consider allowing required off-street parking to be provided within a 1000-foot walking distance (603.F.2).

Payment in lieu of minimum parking requirements may also be a transferable requirement. This allowance may need to be capped at 10% of required spaces or have similar terms in order to be applied appropriately in areas outside of the CCFBC.

214. Sec. 604. Maximum Parking Standards

- **Issue**

The CCFBC introduces a cap on non-residential parking spaces that may be useful in other areas of the City as well. More parking may be supplied when certain conditions are met – payment of an annual fee, use of pervious materials, construction of structured underground parking.

- **Resolution**

Consider updating parking standards for all zoning districts/uses to match the provisions of the CCFBC more closely.

215. Sec. 605. Special Parking Standards

- **Issue**

Several options are offered in the CCFBC for accommodating required parking minimums that can be used throughout the City.

- **Resolution**

Consider including some or all of the following CCFBC provisions in the City's zoning code where they would apply to non-residential development.

- a. Joint parking for abutting lots with access between the sites is a common application that not only addresses parking needs but also improves general access, safety, and capacity of adjacent streets. The CCFBC exempts lot configurations that existed prior to adoption of the district.
- b. On-street parking adjacent to a lot can be treated as shared parking.
- c. Off-site parking can be used to meet minimum requirements when it complies with site design standards, is located within 1000 feet, and has an acceptable long-term lease agreement in place. *(Use of off-site spaces within 200' is permitted currently per 431.7.1.e. Relation to Premises.)*
- d. Tandem parking is permitted for certain residential projects.

Part 9. Site Development

216. Sec. 905. Impervious Coverage Incentive

- **Issue**

The impervious cover incentive section seems slightly out of place here.

- **Resolution**

This area is a good opportunity to reference the proposed GSI Manual (or EDC section) and tie-in all the applicable manuals

Subdivision Regulations

Article I. General Provisions

217. General

- **Issue**
General updates are needed to accommodate urban conditions and sustainable development techniques.
- **Resolution**
Incorporate updates and clarifications to include:
 - a. Update to enable and/or encourage sustainable development techniques.
 - b. Update to include urban landscape conditions encouraging compact and walkable development.
 - c. Driveway spacing (access management) should be incorporated to improve the capacity and safety of streets in the City.

Article II. General Procedure; Administration

218. Sec. 19-207 Utility line extension: Improvement responsibilities

- **Issue**
Specific line diameters for utilities may change over time, causing the need for an ordinance amendment.
- **Resolution**
Consider removing specific line diameters for water and sewer line extensions but keep the reference to applicable technical manuals (or specifically to the EDC). This would allow updates to the EDC without the need to update the Subdivision Regulations.

219. Sec. 19-210 Definitions / Impervious Cover Disconnection

- **Issue**
All GSI might not be included in the listed structural and non-structural controls.
- **Resolution**
Include “impervious cover disconnection,” and any other accepted GSI under the definition of non-structural BMP controls.

220. Sec. 19-210 Definitions / Impervious Cover List

- **Issue**
In some municipalities, compacted soils are considered impervious cover. Since this item is usually questioned, it may be beneficial to include this in the definition for impervious cover.
- **Resolution**
Include compacted soils in the impervious cover list if desired.

221. Sec. 19-210 Definitions / LID

- **Issue**
Definition for Low Impact Development seems pretty vague. It also appears as though the City wants to call water quality improvements “GSI.”
- **Resolution**
Remove and replace all LID mentions with GSI. This definition should mention that the main goal is to improve water quality.

Article III. Plat Preparation and Approval Procedure

222. Sec. 19-309 Final plat: Procedure for filing application for consideration of the City Council

- **Issue**
The current platting requirements do not include the establishment of a Property Owner's Association (POA) when needed to address maintenance of GSI systems.
- **Resolution**
E.1. of this section may need to be expanded to address the need for the mandatory POA to also be assigned responsibility for maintenance of designated structural controls that are installed as part of a green stormwater infrastructure system.

223. Sec. 19-320 Procedure for Amendment of Final Plats

- **Issue**
Section F states the importance of achieving optimum quality of development. GSI would be considered above the minimum standards.
- **Resolution**
Consider what incentives can be provided to encourage exceeding the minimum standards and including GSI in designs.

Article IV. Design

224. Sec. 19-401 Design principles

- **Issue**
Low Impact Development (or GSI) is not identified as a supported design alternative.
- **Resolution**
Add a statement in support of the use of LID (Green Infrastructure) alternatives.

225. Sec. 19-410 Subdivision design standards: Streets

- **Issue**
Street design standards are outdated and support inefficient development patterns.
- **Resolution**
Consider modifying D. to encourage minor streets to be developed on a grid network promoting connectivity and providing options for travelers using all modes of transportation throughout the community.

Consider removing "such as cul-de-sac and loop streets" (Section 19-410.N) as a reference to streets designed for local service only as these street designs are inefficient and should not be encouraged.

226. Sec. 19-411 Water Quality Protection Zone (WQPZ) design standards

- **Issue**
Improve the organization of this document and consistency with related technical manuals.
- **Resolution**
Consider including basic design standards here but moving variable criteria into a separate section of the EDC to support the use of low impact design alternatives that will need to be reviewed and determined to meet minimum standards.

Setbacks for land uses and/or activities designated as potential water pollution hazards are established in Section 19-411.G. Does this also apply to structures? Are these setbacks cross-referenced in the zoning code?

227. Sec. 19-411.A WQPZ Design Standards / Vegetation

- **Issue**
Section A states that in the WQPZ, it is preferable that the vegetation remains undisturbed and natural.
- **Resolution**
Require that vegetation must not be disturbed and remain a “no-mow zone” or “grow zone.”

228. Sec. 19-411.B WQPZ Design Standards / GSI Controls

- **Issue**
Section B is not clear whether the GSI controls need to be contained within the WQPZ or not.
- **Resolution**
Clarify Section B on where the GSI needs to be on-site in reference to the WQPZ.

229. Sec. 19-411.F WQPZ Design Standards / Application of GSI within WQPZ

- **Issue**
Section F leaves room for interpretation by the developer.
- **Resolution**
Consider requiring GSI in the areas that contain a portion of the WQPZ. The second sentence needs to be modified to fit how the City wants to move forward with a GSI manual.

Article V. Improvements

230. Sec. 19-503.C Improvements required

- **Issue**
References to the EDC, Standards and Specifications, and Construction Drawings.
- **Resolution**
This section may be revised as a reference to applicable technical manuals for simplicity and to support the addition of BMPs or other documents that may apply in the future.

231. Sec. 19-506 Maintenance and Supervision

- **Issue**
This section leads the reader to assume that the POA would maintain the GSI.
- **Resolution**
Determine which party is to maintain GSI and update this section accordingly.

232. Sec. 19-514 Water Quality Protection Zone Management and Maintenance

- **Issue**
Since GSI is mainly linked to WQPZ, section C reads as though the PWD will inspect/maintain the GSI.
- **Resolution**
Determine which party is to maintain and inspect GSI installations and update this section accordingly.

233. Sec. 19-504.E Vegetation within the WQPZ

- **Issue**
Section E states that grassy vegetation in the WQPZ shouldn't be mowed less than six (6) inches tall. However, it really shouldn't be mowed at all.
- **Resolution**
Require that vegetation must not be disturbed and remain a “no-mow zone” or “grow zone.”

Tree Protection Ordinance

Section 10-001. General Provisions

234. General Comments

- **Issue**
General updates will improve and strengthen this ordinance.
- **Resolution**
Update ordinance based on a review of several best in class examples from other communities that target Normans' design goals. Input from the Tree Board and other stakeholders will be important to this.

235. Sec. 10-001. General Provisions

- **Issue**
There is no mention of how trees can improve water quality in the built environment.
- **Resolution**
Add a purpose statement that notes that trees and landscaping can improve water quality.

236. Sec. 10-1008. Placing Stones, Concrete, or Other Substances Near a Tree Trunk

- **Issue**
Section 10-1008 definition could restrict the usage of planter box/tree box Green Stormwater Infrastructure (GSI) element.
- **Resolution**
Add a section for street tree planting area requirements if a tree is part of a GSI, such as a planting box or tree box.

237. Other comments

- **Issue**
General updates and clarifications can improve and strengthen this section.
- **Resolution**
Consider general updates and clarifications to include:
 - a. Define industry standard for tree measurement.
 - b. Include multi-trunk and ornamental tree definitions and measures.
 - c. Remove undeveloped properties from exemption – this is a loophole for future/pending development.
 - d. Increase potential fines commensurate with actual tree values; include a provision to enable annual updating of costs. An update to the Tree Protection Ordinance should include appropriate fees/fines.
 - e. Locate and protect/mitigate trees in ROW and within 10' of ROW, including within pavement footprint.
 - f. Increased open area requirement around trees, add additional protective requirements, and potential sustainable design treatment provisions.
 - g. Include tree protection provisions, including frequent water inundation/erosion.
 - h. Acknowledge trees within 10' of the ROW, potentially needing mitigation versus removal or replacement.
 - i. Increase tree clearance over sidewalks to 9'.

- j. Update the fine provisions to include varied conditions/fines; amount is too low as currently defined.
- k. Update Historic criteria to enable City designation based on size, possibly less than 36". A review of other communities would be useful in determining the correct size/threshold for Historic designation.

Part 2 - Benchmarking Study

A benchmarking study has been conducted to complement this report. The benchmarking table on the following pages includes an evaluation of development codes and design criteria for several communities. The table discerns the pros and cons for discussion with links for research and review purposes. Benchmarking allows us to understand what other municipalities are doing, how they have communicated their design requirements, and what systems they are using. This tool will support the selection and inclusion of best practices for the EDC update.

Norman EDC Update
GSI Example Codes and Criteria

Entity	Development Code				Design Criteria				Type of GI Program			
	Link	Section	Pros	Cons	Link	Section	Pros	Cons	Required or Incentivized?	Type of Incentive	Description	Link
EPA									Incentivized		EPA provides recommendations on various incentives options for promoting GI	https://www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf
Atlanta, GA	Sustainable Development Design Standards	Ch. 75	- Outlines impacted city orgs		Georgia SW Management Manual	Volume 2	- provides design spreadsheet tool - BMP Screening Process - Easy to follow layout with summary table - Pictures - Outlines pollutant removal capabilities - Step by step design procedures - Outlines challenges and potential solutions	- pdf so difficult to edit and update - BMP required to achieve more than just 1 volume	Incentivized	Credits	If credited practice is incorporated, requirement for capture and treatment of water quality volume is reduced. Credits (better site design practices): natural area conservation, avoiding floodplains/steep slopes, disconnecting rooftops, keep stream buffers, encourage groundwater recharge (full list on pg 40/811 of vol 2)	https://www.atlantawatershed.org/greeninfrastructure/
	Post Development SW Mgmt	Ch. 74	- Thorough and extensive - Extensive exemptions considerations - Municode, so easy to navigate	- Seems to overlap with content of design criteria manual - Long					Required		Stormwater runoff volume generated by first one inch of rainfall shall be retained on site	
Austin, Texas	Land Development Code		- Short and concise - Municode, so easy to navigate	- Refs locations without ref. to maps	Environmental Criteria Manual		- Infiltration rate applicability table - Municode, so easy to edit and navigate - Greater attention to landscape element - Provides references to useful resources for more info	- not as many BMP options - text heavy	Required		Treat volume of first one-half inch of runoff plus an additional one-tenth inch for each ten percent increase of impervious cover over twenty percent	
		Article 6							Incentivized	Credits, development bonus	-Green infrastructure water quality credit can be applied as a reduction in water quality volume for structural control or reduction in fee-in-lieu cost -some GI measures can be approved for a development bonus	https://www.austintexas.gov/page/stormwater-management-discount https://www.watercache.com/main/wp-content/uploads/austin-rainwater-rebate-application.pdf
Charlotte, NC	Charlotte Code		- Municode, so easy to navigate - Total Phosphorus mitigation section	- Minimal content	BMP Design Standards Manual		- Outlines areas that have additional design criteria - Removal efficiencies of treatment train of BMPs - Table of Primary pollutant removal process per WQ practice - Equations for removal efficiency of treatment train - Easy to use summary fact sheet per WQ practice	- Each section of manual is separate pdf	Incentivized	Credits	Eligibility for credits based on measures that address the impacts of peak disahrge, total runoff volume, and annual pollutant loading from site.	https://charlottenc.gov/StormWater/Fees/Pages/FeeCredits.aspx
									Required		High density projects must treat runoff generated from the first inch of rainfall	https://charlottenc.gov/StormWater/SurfaceWaterQuality/Pages/GreenInfrastructure.aspx
Chattanooga, TN	https://library.municode.com/tn/chattanooga/codes/code_of_ordinances?nodeId=CH31SEMADR_ARTVIIIISTMA		-Municode		https://app.box.com/s/pdl1afehg00s1wwqa94d8qmizyptxw3i/file/25367692645				Required		Stay on Volume: First inch of rainfall, must be captured and managed onsite	
									Incentivized	Water Quality Fee Discount, Credit Coupons, Mitigation Fees, Offsite Mitigation	% reduction to annual water quality fee for approved controls and practices	https://chattanooga.gov/images/citymedia/publicworks/Credit_Incentive_Manual_2016-08-12.pdf
		Article 8							Incentivized	RainSmart, Green Grants	-green grant: provide partial funding for design and construction of GI -rain smart: reimburse for rain gardens and rain barrels	https://chattanooga.gov/public-works/water-quality-program/
Denver, CO	The Code		- Municode, so easy to navigate	-No references to WQ requirements	Urban Storm Drainage Criteria Manual (USDCM)		- Provides opportunity for regional treatment if not feasible at site - Provides BMP selection table by Development Type	- pdf so difficult to edit and update - Criteria spread out between various manuals (WQ Management Plan, District Manual, GSI manual) - Includes definitions section, which is typically found in Code	Required		pg 150 has WQ requirements	https://www.denvergov.org/content/dam/denvergov/Portals/711/documents/StormMasterPlan/StormDrainageDesignTechnicalCriteria.pdf
		Chapter 56			Ultra Urban Green Infrastructure Guide	2.2	- Table with approx. treatment volume per BMP - Useful figures to estimate BMP size - Useful design tables - Nice renderings per BMP outlining various components	- pdf so difficult to edit and update - text heavy	Incentivized	Grants & Credits	Credits can reduce the Annual Fee and/or System Development Fee (SDF) some properties pay based on amount of impervious cover. One of the features of the Credit Policy is to provide a mechanism by which an existing property owner or other responsible party can apply for technical assistance and grant funds for retrofits of existing stormwater management facilities.	https://www.semswa.org/grant-program.aspx
Kansas City, MO	Code of Ordinances		- Municode, so easy to navigate	- Directed at industrial uses only - No references to WQ design requirements	Green Stormwater Infrastructure Manual		- colorful - Summary of content - Provides useful table outlining BMP element requirements - Nice BMP pictures and graphics	- pdf so difficult to edit and update - Layout is busy and text heavy - Limited design criteria	Incentivized	credit	Kansas City Water Services offers credits for BMPs: ratio of stormwater fee credit for large pervious area OR detention credit for installation of stormwater detention structure	
Los Angeles, CA	Los Angeles County Code	Chapter 12.84	- Municode, so easy to navigate - Appropriate amount of content without including design criteria		BMP Design and Maintenance Manual		- Easy to follow numbered criteria	- scanned pdf so difficult to edit and update - Dated document	Required		100% of Stormwater Quality Design Volume (SWQDv)	https://dpw.lacounty.gov/lib/fp/Hydrology/Low%20Impact%20Development%20Standards%20Manual.pdf
Lower Colorado River Authority	https://www.lcra.org/download/high-land-lakes-watershed-ordinance/?wpdmcl=11765		- Appropriate amount of content without including design criteria	- pdf so difficult to edit and update - no hyperlinks	https://www.lcra.org/download/watershed_technicalmanual-pdf/?wpdmcl=19934		- Outlines available sw credits - High level BMP summary tables - Pollution removal efficiency table per BMP - Step by step procedure - Easy to follow criteria - Design process spreadsheet tool	- Information is presented out of order - Limited schematic drawings, no pictures	Required		Treat volume based on one-year storm runoff	
		Section 5							Incentivized	credit	Reducing IC: porous pavement, rainwater harvesting, soil amendment and conservation landscaping, disconnection of rooftop runoff, natural area preservation	

Norman EDC Update
GSI Example Codes and Criteria

Entity	Development Code				Design Criteria				Type of GI Program			
	Link	Section	Pros	Cons	Link	Section	Pros	Cons	Required or Incentivized?	Type of Incentive	Description	Link
Minneapolis, Minnesota	The Charter	Ch 54	- Municode, so easy to navigate - Outlines responsibilities during various phases of BMP development - Appropriate amount of content without including design criteria		The Blue Book		- Easy to follow	- Dated manual. Entities recommends referring to state manual. - pdf so difficult to edit and update - Text heavy	Incentivized	credit	Based on BMPs	http://www2.minneapolismn.gov/publicworks/stormwater/fee/stormwater_fee_stormwaterqualitycredits
New York, NY	Administrative Code		- American Legal so easy to navigate - Public education elements and public input - WQ Monitoring requirements	- Formatting poor making it hard to read.	On-site Design Manual		- Newer manual (May 2019) - Colorful, attractive, easy to read - Example pictures - Design Process flow chart with detailed description for each step in following sections - Use of sidebars to highlight important aspects - Setback requirements - Alternate elevation view layout examples - Preferential hierarchy in BMP selection	- pdf so difficult to edit and update - no hyperlinks - Definitions provided, which are usually found in Code	Required		Needs to capture the full WQV and is capable of 80% TSS removal and 40% TP removal.	https://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf
									Incentivized	grant	Mostly geared toward green roofs	https://www1.nyc.gov/site/dep/water/green-infrastructure-grant-program.page
Northeast Ohio Regional Sewer District	https://www.neorsd.org/business-home/code-of-regulations/	Title V		-PDF					Incentivized	Credits & community cost-share program	Residents can apply to receive a stormwater fee credit by using SCMs such as rain gardens and rain barrels.	Stormwater Fee Credit Policy Manual
Philadelphia, PA	https://www.phila.gov/water/wu/ratesregulationsresp/pages/regulations.aspx	Ch. 6	- Clearly outlines regulated activities and exemptions in text and table format - Fee in Lieu section - Easements section	- pdf so difficult to edit and update - contains design criteria	Stormwater Management Guidance Manual (The Manual, or SMGM)		- Online version and downloadable pdf - Provides general summary upfront of design process and hyperlinks to following sections - Outlines Non structural strategies - Overview of BMP Functions - Preferential hierarchy in BMP selection - Provides lots of planning detail -SW Trading	- Lots of long paragraphs of text only	Required		WQV: 1.5 inches X DCIA [directly connected impervious area]	
									Incentivized	Grants & Credits	-City will pay grants for retrofitting non-residential properties with stormwater management features -Credits on stormwater charge for implementing LID -fast track review with 95%+ IC disconnected	Grants, https://www.phila.gov/water/PDF/scaa_manual.pdf https://www.pwdplanreview.org/manual/chapter-6/6.3-stormwater-credits-program
Portland, OR	Code and Charter	Chapter 17		- Cannot easily flow from one section to another - Little to no regulations outlined	Stormwater Management Manual (SWMM)		- Outlines what other sections of criteria/regulations impacted by this section - Provides info on underground injection controls - Outlines outside regulations - Lists 303(d)-Listed parameters by Watershed - Design Flowchart and Stepped Process - Facility Setbacks - Various BMP sizing methods based on development type/size	- Cannot view manual online; have to download - Lots of long paragraphs of text only	Incentivized	Credit	-Clean River Rewards Stormwater Discount Program: private stormwater management facilities get discounts on stormwater fee -Ecoroof construction incentive of \$5/sq ft	
									Required		Infiltration of 10-year design storm	
Prince George's County, Maryland	Charter	Section 32	- Municode, so easy to navigate - Applicable components	- Thorough and complete information but too deep for Code	Stormwater Management Design Manual	5.2.2 & 9.6.2	-One manual for all stormwater criteria (quantity and quality) - Outlines approval authorities - Thorough pond section - Outlines what shall be provided in the plans	- pdf so difficult to edit and update - partial refs to Maryland Design Manual - Do not define variables in equations - All text, no pictures	Required		infiltrate 100% of annual groundwater recharge volume, reduce IC by 50%, treat 50% of existin IC	
									Incentivized	Rebate & Grant	-Rain Check Rebate to homeowners and businesses that install practices that improve runoff quality, reduce pollution, and improve local stream and river health -Stormwater Stewardship Grant Program: funds restoration activities	https://cbtrust.org/grants/prince-georges-stormwater-stewardship-2/ https://www.princegeorgescountymd.gov/310/Rain-Check-Program
Raleigh, NC	Unified Development Ordinance (UDO)		- grandfather clause - nitrogen reduction section - payment in lieu option - City rights section - Appropriate amount of content without including design criteria	- set up like a pdf storybook	Draft Stormwater Design Manual	Ch. 5	- Hyperlinks to referenced sections - Defines methods based on land use - Criteria for TN Reduction - Nice BMP layout sheets	- pdf so difficult to edit and update - text heavy - References NCDEQ manual for BMP design and additional requirements	Required		In Urban Watershed Protection Overlay District: first 1/2" of rainfall in access of 24% IC retained, detained, or captured in treatment device	
									Incentivized	Reimbursement & credit	-90% reimbursement for project that "capture and clean rainwater" (cistern, disconnecting downspout, green roof) -stormwater fee based on IC, credits if you detain more stormwater on property than required	
San Antonio River Authority	Unified Development Code (UDC)		- Applicable to Norman, since WQ not required, but incentivized - Outlines incentives - Appropriate amount of content without including design criteria		LID Technical Design Guidance Manual		- Outlines design process - Good mix of criteria, figures and example pictures - Table showing increased property value related to LID - Outlines references per chapter - Table showing pollutant removal efficiency per WQ practice - Table showing hydro and WQ unit processes per WQ practice - Advantages/limitations per WQ practice	- pdf so difficult to edit and update - Lots of long paragraphs of text only	Incentivized	Rebate	-Watershed Wise Rebate: provides funds for LID projects	https://www.sariverauthority.org/sites/default/files/2019-09/Watershed_Wise_Stormwater_Rebate_2019_20_Form_1.pdf

Norman EDC Update
GSI Example Codes and Criteria

Entity	Development Code				Design Criteria				Type of GI Program			
	Link	Section	Pros	Cons	Link	Section	Pros	Cons	Required or Incentivized?	Type of Incentive	Description	Link
San Diego, CA	Code of Ordinances		- Outlines various development scenarios - Includes Enforcement and violation sections	- No references to design criteria - formatting makes it difficult to follow	LID Handbook		- Examples of Integrated Management Practices - Table of WQ unit processes for pollutant removal - Table showing hydro and WQ unit processes per WQ practice - Table of site design characteristics per WQ practice - Operation and Maintenance Considerations per WQ practice - Design Templates per WQ practice - Good mix between text, figures, and pics in the design sections of each WQ practice - Easy to follow design process per WQ practice, including hyperlinks	- pdf so difficult to edit and update - Design guidance per practice included as appendix	Required		-listed BMPs that must be implemented at all development projects -additional requirements for priority development projects	https://www.watersmartsd.org/residential/incentives/#toggle-id-4
									Incentivized	Rebates	-rain barrel rebates	
San Francisco, CA	Administrative Code		- Nice formatting - easy to follow	- Does not address code requirements of WQ; just references SW Mgmt Requirements and Design Guidelines document.	Stormwater Management Requirements (SMR)	Ch. 4	- Educational components telling the why - Lots of example pictures - BMP sizing spreadsheets - Graphics used to outlined development scenarios - Promotes GI certification programs, like LEED and Envision	- pdf so difficult to edit and update - Formatted like a story book, instead of criteria manual - High level design criteria only in document; design criteria found in appendix that is not a part of document.	Required		Required per the Stormwater management ordinance. SMR applies to large projects with >= 5000 sq ft IC and small projects 2500-5000 sq ft.	https://sfwater.org/modules/showdocument.aspx?documentid=9077
									Incentives	Grant	Covers cost of design and construction of stormwater management feature	
Seattle, WA	Seattle Municipal Code		- Thorough information and applicable - Outlines regulations by development type	- No hyperlinks	Green Stormwater Infrastructure (GSI) Manual		- Detailed info about each design process step, including public engagement - Bioretention design criteria for various street typologies - H&H modeling for GSI info	- Separate manuals for various steps in design process - pdf so difficult to edit and update; no hyperlinks	Required		Green Factor Program: requires 30% green space on parcels. Based on stormwater volume where 91% of total runoff volume occurs. Basic treatment required for all projects	https://www.seattle.gov/Documents/Departments/SDCI/Codes/DR172017.pdf
									Incentivized	Rebate	Rainwise: offer rebates for rain gardens and cisterns	
Shoreline, WA									Incentivized	Rebate	-Soak it up: up to \$2,000 to install rain garden or native vegetation landscaping	
Texas Commission on Environmental Quality					Technical Guidance on BMPs		- Provides selection criteria, limitations, and cost considerations per WQ practice - Design tool spreadsheet for sizing BMPs - TSS Reduction by WQ practice - Provides pollutant removal efficiency per BMP in series - Thorough design criteria per WQ practice	- Present design criteria in two different places (general then detailed) - New WQ practices are published outside of manual through errata - Weak renderings	Required		Required in Edwards Aquifer Recharge and Contributing Zone Areas	
Tulsa, OK	The Code			- no GSI regulations	under development		- close proximity to Norman, so designers used to format - provides definitions and the "why" behind the criteria - provides various configurations for underdrains - provides examples in different soil conditions - provides design spreadsheet	- Manual under review - text heavy; reads like a textbook	Incentivized	credit	Stormwater Fee Discount for onsite detention and retention facilities (EPA mentions, but can't find anywhere on internet). Incentives forthcoming with release of LID Manual?	
Washington DC	Municipal Regulations		- Straight, to the point regs - Regs for shared BMPs - SW Credit, Fee in-lieu programs - Regs for technically infeasible WQ sites	- difficult to scroll between sections of code	LID Manual			- pdf so difficult to edit and update - lots of references to RiverSmart DVD - dated material - poor graphics - minimal design criteria	Incentivized	Several different types of "RiverSmart" programs, ranging from site evaluation and up-front funding to a rebate or discount.	DOEE's RiverSmart programs provide financial incentives to help District property owners install green infrastructure such as rain barrels, green roofs, rain gardens, permeable pavers, shade trees, and more.	https://doee.dc.gov/riversmart#:~:text=DOEE's%20RiverSmart%20programs%20help%20to,%2C%20shade%20trees%2C%20and%20more.
Wichita, KS	The Code of the City of Wichita, Kansas		- Municode, so easy to navigate - Applicable components		Stormwater Manual		- Table outlines which BMPs meet pollutant removal criteria - Section outlining requirements of special businesses, like gas stations	- pdf, so difficult to edit and update; no hyperlinks - each volume of manual is separate document - site difficult to navigate - Cannot find design criteria by WQ practice	Required	N/A	Water quality treatment and downstream channel protection shall be required of owners of new developments and redevelopments that cause a land disturbance greater than or equal to one acre, including projects that cause a land disturbance less than one acre that are part of a larger common plan of development or sale.	https://library.municode.com/ks/wichita/codes/code_of_ordinances?nodelid=TIT16SESEDIDR_CH16.32STPOPR_S16.32.091STWAQUMAST