



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

APRIL 2016

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Table of Contents

Submittal Timelines	Inside Front Cover
Checklists for Reviews	Section 1
Introduction.....	1
Conceptual Approval	2
Preliminary Approval.....	3
Final Site Plan	4
Subdivision Development.....	7
Commercial Development	Section 2
Site Plan	1
Storm Water	1
Storm Water Pollution Prevention Plan	2
Sewer.....	2
Water.....	3
Street	4
General.....	4
Street Improvements	Section 3
Street Widths.....	1
Maximum Block Length Between Intersections.....	1
Dead End/Not-a-Through-Street Definition	2
Second Access Requirements	2
Street Curve Designs.....	2
Street Slopes.....	3
Street Pavement Thickness	4
Sidewalk/Curb and Gutter/Waterways/Driveways	5
Cul-de-sac/Turn-around Requirements.....	6
Temporary Turn-around.....	6
Right-of-Way Slope Requirements	7
Street Construction Sequencing	7

Culinary Water	Section 4
Water System Size Determination	1
Water Line Placement	2
Fire Hydrant Requirements	2
Isolation Valve Placement	3
Water Service Connections	3
Pipeline Materials, Construction and Testing	5
Special Requirements	7
Sanitary Sewer	Section 5
Sanitary Sewer Size and Slope Design	1
Sanitary Sewer Line Placement	2
Manhole Size and Placement Determination	2
Sewer Service Lateral Size and Placement	3
Pipeline Materials, Construction and Testing	4
Storm Drain and SWPPP	Section 6
Storm Drain Size determination	1
Surface Drainage Control	3
Storm Drain Line Placement	3
Inlet/Cleanout Box Placement	4
Pipeline Materials, Construction and Testing	4
Storm Detention Basins	5
Storm Water Pollution Prevention Requirements	7
Land Drain	Section 7
Land Drain Size Determination	1
Land Drain Line Operation	1
Land Drain Line Placement	1
Manhole Size and Placement Determination	1
Land Drain Service Lateral Size and Placement	2
Pipeline Materials, Construction and Testing	3
Geotechnical Information and Irrigation Systems.....	Section 8
Minimum Information Required for a Geotechnical Report.....	1
Subgrade Soil Classification	2
Armor Coating or Facing of Soil Slopes.....	2

Use of Filter Fabric for Street Construction.....	3
Flowable Fill	3
Trenchless Technology	3
Grading Permit Requirements.....	4
Irrigation System Improvements.....	5
Dedication Plat, Warranty and Utility System Acceptance	Section 9
Dedication Plat Considerations	1
Lot Line Adjustment	4
Warranty	5
Utility System Acceptance.....	6
Street Lighting.....	Section 10
Street Light Locations	1
Traffic Impact Study	Section 11
TIS Evaluation	1
Analysis Approach and Methods	1
Study and Report Format	4
Standard Plans for Public Facilities Construction.....	See Standard Drawings
Street Improvements	ST-ST-01 through ST-ST-25
Culinary Water Systems.....	ST-WL-01 through ST-WL-20
Sanitary Sewer Systems	ST-SS-01 through ST-SS-06
Storm Drain.....	ST-SD-01 through ST-SD-24
Street Lighting	ST-LT-01 through ST-LT-10



DEVELOPMENT GUIDELINES
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CHECKLISTS FOR REVIEWS

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INTRODUCTION

This document has been prepared and compiled by the Engineering Staff of the Public Works Department. This document is to assist developers in understanding the current procedures for the Engineering Department review and approval process of developments within the City.

The review process for a site plan submitted will require one approval.

The subdivision review process will require either two or three approvals. These include CONCEPTUAL approval, PRELIMINARY approval, and FINAL approval.

The review process for all development in areas designated as “sensitive lands,” in the zoning ordinance and all Planned Residential Unit Developments (PRUDs) will require all three approvals listed above.

In addition to the required reviews and approvals, a specific development request may also include Annexation and/or rezone.

This document includes a CHECKLIST to guide the developer through the review and approval process and the DESIGN STANDARDS required for each phase of the submittal process.

The items contained in the document have been prepared as a supplement to the adopted subdivision ordinances and standards, and are provided as an aid to the Developer. Through the use of this document, the Developer will be able to more closely comply with adopted standards.

This document does not, nor is it intended to, fully represent the current adopted subdivision ordinance, construction standards, master plans, or other City requirements. The Developer shall be responsible to comply with all aspects of the adopted ordinances of the City.

Conceptual Approval Checklist

(Required for development in sensitive lands and for all PRUD'S)

- One (1) set submitted for the Engineering Department.
- Site plan has legal description for the boundary.
- Site plan shows the lot configuration.
- Area of each lot is indicated.
- Contour lines (proposed and existing) are shown, with contour intervals clearly identified.
- Lot slope and buildable area shown.
- Street configurations with centerline slopes shown.
- Typical street cross-section is shown.
- Locations of all cuts/fills in excess of 6 feet are shown.
- Locations of existing utilities are shown.
- Proposed storm drainage system shown.
- Proposed culinary water system shown.
- Proposed secondary water system shown (if available).
- Proposed sanitary sewer system shown.
- Proposed land drain system shown.
- Boundary and elevation of the FEMA flood 100-year plain area, if applicable.
- Submittal of a geotechnical report if within sensitive lands.

Preliminary Approval Checklist

- One (1) set submitted for the Engineering Department.
- Preliminary dedication plat with legal description, lot configuration, and area of each lot is indicated.
- Contour lines (existing and proposed) are shown.
- Slope of each lot and buildable area shown.
- Street configurations with slopes shown.
- Street cross-section is shown with sidewalk, park strip and curb & gutter.
- The placement of intersections does not exceed the maximum block length allowed for the zone; are at right angles; are aligned with adjacent intersections as allowed by the City standards.
- The length of cul-de-sacs does not exceed 500 feet.
- Radius of all horizontal curves shall be identified.
- Locations of all cuts/fills in excess of 3 feet shown.
- Locations of existing utilities (water, sewer, storm drain, irrigation, streets, etc) are shown.
- Locations of existing overhead utilities are shown.
- Proposed method to control storm drainage is shown, including storm drain master plans with calculations for the pipe system and detention (if required).
- Location(s) of existing easements are shown.
- Proposed location(s) for the sanitary sewer, land drain, storm drain (including inlets), water (including valves and hydrants), irrigation, street lighting, and other public utilities shown.
- Boundaries and elevation of the 100-year flood plain as defined by FEMA map, including map and panel number.
- Written approval from adjacent property owner(s) agreeing to grant an easement for utility line extension, if the line extension crosses private property. (Subject to City approval.)
- Written approval from the State Engineer for any stream alteration.
- Written approval from Davis County Flood Control if discharging into a creek or stream.
- Written approval for offsite easements.
- Written approval from irrigation users for any change to an existing system.
- Submittal of the geotechnical report.
- A preliminary property title report is submitted.
- Submittal of a Traffic Study, if required.

Final Site Plan – Checklist

DEDICATION PLAT

- Paper copy of the final dedication plat shall be submitted for the Engineering Department.
- An electronic copy of the dedication plat in AutoCAD format shall be submitted, in order to expedite the review process.
- The boundary narrative matches the drafted description.
- The boundary matches the adjacent properties or parcels.
- The boundary is referenced from a found Davis County section corner, and uses Davis County bearings and coordinates. The basis of bearing is established using 2 found Davis County section corners.
- The boundary closes within approved limits.
- The dedication plat format conforms to Davis County Recorder standards.
- The street centerline information is complete (bearings, & distance, delta, tangent, radius, chord bearing and distance).
- The individual lots close with centerline and boundary information.
- The area of each lot is shown.
- Lot numbers are shown and conform to Phase numbering.
- The centerline monuments are shown at all intersections.
- ALL existing easements are clearly shown and identified.
- All new public utility easements (front lot, rear lot and side lot) are shown.
- North arrow and drawing scale is shown.
- The property title report is submitted with the dedication plat.

FINAL DRAWINGS

- Five sets of construction drawings submitted for the Engineering Department.
- All off-site easements, on Layton City forms, have been signed and submitted with the drawings.
- The final drawing is consistent with the approved Preliminary Site Plan.
- The cost estimate is included for the project.
- A Professional Engineer shall sign and stamp final drawings.

CULINARY WATER

- The culinary water system is of the size and type approved by the City on the preliminary drawings.
- The culinary water system has fire hydrants placed as approved on the preliminary drawings and at all dead end points.
- The culinary water system has isolation valves installed at intersections, cul-de-sacs and other locations required by the City Engineer.
- The culinary water system is installed at the appropriate location in the street, typically 4 feet north and east of centerline.
- The culinary water system is C900 DR14 for pipe sizes 3”-10” and class 51 ductile iron pipe for pipe 12” and larger.
- A note is provided indicating water service line and meter sizes.
- A note is provided indicating thrust blocking on all fittings.
- Dedication of water shares.
- A note indicating the lot numbers required to have a Fire Suppression System, with size and type.

SANITARY SEWER

- The sanitary sewer lines are shown on both the plan and profile drawings.
- The plan and profile drawing has a benchmark referenced to a physical feature AND to a found Davis County section corner.
- The sanitary sewer system is of the size and type approved by the City on the preliminary drawings, and/or as required by the City Engineer.
- The sanitary sewer system has manholes placed as approved on the preliminary drawings, at all dead end points, and as required by the City Engineer.
- The sanitary sewer system is installed at the appropriate location in the street, typically 9 feet south and west of centerline.
- The sanitary sewer system will indicate a separate lateral from the main line to 10 feet inside the property line for each building lot.

STORM DRAIN SYSTEM

- The storm drain system is of the size and type approved by the City on the preliminary drawings, or as required by the City Engineer.
- The storm drain system has clean out boxes and inlet boxes placed as approved on the preliminary drawings, at all dead end points and as required by the City Engineer.
- The storm drain lines are shown on both a plan and profile drawings.
- The plan and profile drawing has a benchmark referenced to a physical feature AND to a found Davis County section corner.
- The storm drain lines have the minimum cover as required in the specifications and the proper offset from the curb line.
- The type of box is shown for locations deeper than typical 36" to flow-line.
- The storm drain system is typically installed on the south and west sides of the streets, at the lip of curb.
- The storm drain system cannot act as a land drain system.
- Double inlet boxes are placed at all invert and isolated low street areas.
- A note shall be added indicating all inlet grates shall be bicycle safe type covers.
- Submittal of a copy of the Davis County Flood Control permit if required.

LAND DRAIN SYSTEM

- The land drain system lines are shown on both a plan and profile drawings.
- The plan and profile drawing has a benchmark referenced to a physical feature AND to a found Davis County section corner.
- The land drain line system is of the size and type approved by the City on the preliminary drawings, and/or as required by the City Engineer.
- The land drain line system has manholes placed as approved on the preliminary drawings, at all dead end points, and as required by the City Engineer.
- The land drain line system is installed at the appropriate location in the street, typically 10 feet north and east of centerline.
- The land drain line system will indicate a separate lateral from the main line to 10 feet inside the property line for each building lot.

STREET DESIGN

- The street widths conform to the cross-section widths approved in the preliminary drawings and/or as required by the City Engineer.
- The street cross-section shows the placement of sidewalk, park strip and curb & gutter as approved on the preliminary drawings or as required by the City Engineer.
- The pavement structure is a minimum 3" asphalt and 8" gravel road base or as required by the geotechnical report or City Engineer.
- The drawings of the curb & gutter show both the plan and profile design.
- The plan and profile drawing has a benchmark referenced to a physical feature AND to a found Davis County section corner.
- The centerline street design reflects the correct "K" value for vertical, or as required by the City Engineer.
- The centerline street design has the proper horizontal curve design.
- The placement of intersections conforms to the City standards.
- The top of curb (TBC) elevations are clearly shown on the plan drawing.
- The type of slope reinforcement (retaining wall, armor wall, extended slopes) shall be shown for all cut/fill areas exceeding 24 inches.
- The length of cul-de-sacs conforms to City Standards.
- The street slope does not exceed 8% or as approved by the City Engineer and the City Fire Chief.
- Lighting in the public right of way is shown on the plan view drawings.

STORM WATER POLLUTION PREVENTION PLAN REQUIREMENTS

- Submit a Storm Water Pollution Prevention Plan and State of Utah Water Quality Permit.

GEOTECHNICAL INFORMATION

- The requirements listed in the geotechnical report have been included in the construction drawings.

IRRIGATION SYSTEMS

- The irrigation users have submitted a written statement approving the system modification. This includes pressure systems and open-ditch flood irrigation systems.
- The flood irrigation system is located with all control structures in either the park strip area or behind the sidewalk.
- The pressure irrigation system is installed at an appropriate location in the street, typically at the lip of curb or in the 7.5 ft. parkstrip.
- The flood irrigation systems pipe through a development is located within a private irrigation easement.
- A copy of the receipt for payment for secondary water service from Davis Weber Canal Company or Kays Creek Irrigation Company must be submitted.

TELEPHONE & POWER

- The existing overhead utilities along the frontage are indicated to be buried along the frontage of the subdivision.

SUBDIVISION DEVELOPMENT CHECKLIST
PUBLIC WORKS DEPARTMENT

The following is a brief outline of the submittal requirements that a developer should consider when submitting for ANNEXATION, REZONE, CONCEPTUAL APPROVAL, PRELIMINARY PLAN APPROVAL, and FINAL PLAN APPROVAL. This outline also lists the items that the Public Works Department will provide at each approval level.

I. ANNEXATION

- A. The developer will provide a location map and plat of the proposed annexation.
 - 1. The map will show the location of the parcel to be annexed, and will include the legal description of the parcel to be annexed.
 - a. The legal description for the annexation will match the adjacent annexation parcels as recorded at the Davis County Recorder's Office or on file with the City recorder. A conceptual plan of the proposed development may be required.
- B. The Public Works Department will provide a report concerning the actual annexation. The report will define the availability of water, sewer, storm drainage and street configuration for the proposed annexation area. This information will be of a general nature, and is not intended to be inclusive of all requirements for the proposed annexation area. The report will include development requirements that will be imposed as a condition of annexation.

II. REZONE

- A. The Developer will provide the site plan location map. The map will show the location of the parcel for rezone and will include the legal description for the rezone.
- B. The Public Works Department will provide a one or two sentence statement concerning the actual rezone. The Public Works department will provide a statement which defines the availability of water, sewer, storm drainage and the street configuration for the proposed rezone area. This information will be of a general nature, and is not intended to be inclusive of all requirements for the proposed rezone area.

III. CONCEPTUAL SUBDIVISION APPROVAL

- A. Conceptual approval is required for all developments in the designated "sensitive lands" area and all Planned Residential Unit Developments (PRUD's). The configuration of the lots and streets is considered.
- B. The developer will submit:
 - 1. Lot configuration
 - a. Conceptual site plan with boundary and legal description.
 - (1) The site plan shall include adjacent parcels.
 - (2) The site plan shall be scaled no smaller than 1"=60'.
 - b. Area of each lot
 - c. Contour lines, existing and proposed, with actual elevations referenced to Davis County information.
 - (1) 2-foot intervals are preferred while 5 foot or 10-foot intervals will be accepted. Additional contour information may be required.

- d. Slope and size of buildable area of all lots exceeding 25%. (Minimum building area is 30% with 5000 sq. ft., 50-foot minimum one side dimension).
- e. The site plan will show the location of any retaining structures that exceed a height of 10 feet that maybe/will be required to be constructed prior to the construction of any home.
- 2. Street configuration
 - a. Indications of street slopes over 8%
 - b. Proposed street cross section
 - c. Locations of cuts/fills exceeding 6 feet.
- 3. Location of existing and proposed improvements
 - a. Location of water, sewer, storm drainage, streets, and natural drainage path.
 - b. Locations of existing easement, i.e. Weber Basin Water, petroleum gas lines, irrigation lines, power lines, phone lines, private access easements.
- C. The Public Works Department will provide the following information:
 - 1. A written memorandum addressing the acceptability of the street configuration, the street cross-section, the slope of the lots. The Planning Department will address the lot size and their configuration.
 - 2. The memorandum will provide information concerning waterline size, possible off-site utility system improvements, sanitary sewer size and details, storm drain configuration, land drainage requirements, slope protection requirements (including easements and re-vegetation), and possibly other items specific to the development.

IV. PRELIMINARY SUBDIVISION APPROVAL

- A. The purpose of the Preliminary Subdivision Plan is to show the feasibility of the proposed development and the conformance to the adopted standards. The Staff, Planning Commission, and City Council may make alterations to the Preliminary Site Plan as necessary to make the development conform to the standards and expectations of the City. The preliminary approval will give the developer the direction needed to complete the final compilation of the construction drawings. The preliminary approval shall terminate one year after the City Council has given approval.
- B. The developer will submit the soils study for the development area with the preliminary plan. The soils study will contain the minimum information required, as shown in the geotechnical section of this booklet, and the drawings will reflect the recommendations of the soils report.
- C. The developer will submit the preliminary plan containing the following information:
 - 1. Lot configuration
 - a. Preliminary dedication plat with boundary legal description.
 - (1) The plan shall include adjacent parcels.
 - b. Area of each lot
 - c. Contour lines, existing and proposed, with actual elevations referenced to Davis County information.
 - (1) 2-foot intervals are preferred while 5 foot or 10-foot intervals will

- be accepted. Additional contour information may be required.
- d. Slope and size of buildable area of all lots. (Minimum building area is 30% or less with 5000 sq. ft., 50-foot minimum one side dimension).
2. Street configuration
 - a. Indications of all street slopes
 - b. Radius of all horizontal curves shall be identified.
 - c. Proposed street cross section conforming to City Street Standards.
 - d. The preliminary site plan shall include cross-section drawings at locations where the slopes will have cuts or fills exceeding 5 feet on either side of the street. The cross-section drawings shall be spaced no greater than 50 feet.
 3. Location of existing improvements
 - a. Location of water, sewer, storm drainage, streets, irrigation (open ditch or pressure lines) and natural drainage paths and/or creeks and streams.
 - b. Locations of existing easement, i.e. Weber Basin Water, petroleum gas lines, irrigation lines, power lines, phone lines, private access easements.
 - (1) All easements shall be shown on the preliminary dedication plat.
 - c. Location of all cuts/fills exceeding 3 feet at the right-of-way line.
 4. Proposed configuration of public utilities, i.e., Sanitary sewer, culinary water, storm drainage, land drainage, street lighting, pressure irrigation, telephone, natural gas, electrical power, cable T.V.
 - a. The sizes of the system(s) shall be shown but the City has the right to require size changes prior to final submittal.
 5. Boundaries of areas subject to flooding or listed on the FEMA flood plain maps and drawings. FEMA 100 year flood plain map and panel number must be noted on plans.
 - a. Areas subject to flooding may include low areas created by street construction.
 6. Written approval from affected entities.
 - a. Stream alteration - State Engineer
 - b. Irrigation system relocation - Irrigation users and company.
 - c. Acknowledgment to grant easements on adjacent private property from the property owner(s).
 - d. A copy of the Davis County Flood Control permit approving the layout of storm drain system and discharge into the creek.
 - e. All developments located in a FEMA flood zone will be responsible for approval from FEMA.
 7. Submittal of a preliminary title report and complete geotechnical report.
- D. The Public Works Department will provide the following information:
1. A written memorandum addressing the acceptability of the street configuration, the street cross-section, the slope of the lots. The Planning Department will address the lot size and their configuration.
 2. The memorandum will provide information concerning waterline size, possible off-site utility system improvements, sanitary sewer size and details, storm drain configuration, land drainage requirements, lighting requirements, slope protection requirements (including easements and re-vegetation), and possibly other items

specific to the development.

V. FINAL SUBDIVISION APPROVAL

- A. The purpose of the Final Subdivision Plan is to show the final construction details of the project; provide the final dedication plat information; provide the necessary access easements. The development configuration conforms to the approved preliminary plan but may be a portion or phase of the overall preliminary plan. The Staff, Planning Commission, and City Council will grant final approval. The final approval shall be submitted within one year of the Preliminary approval.
- B. The Developer will submit Six (6) sets of drawings containing the following information:
 - 1. Dedication Plat - Refer to the Dedication Plat section.
 - a. Electronic file of Dedication Plat in an AutoCAD format.
 - b. Final title report.
 - 2. Construction Drawings
 - a. Culinary Water design - Refer to the culinary water section.
 - b. Sanitary sewer design - Refer to the sanitary sewer section.
 - c. Storm drainage collection system - Refer to the storm drainage improvement section.
 - d. Land drainage design - Refer to the land drainage section.
 - e. Street design showing TBC elevations at all PC, PT points (both horizontal and vertical) and at points not to exceed 100 feet, rates of grade, "K" values on all vertical curves. (Refer to the Streets section).
 - f. Storm Water Pollution Prevention Plan shall be included with all final plan submittals.
 - 3. All easements for the off-site improvements crossing private property in those locations approved by the City Engineer.
 - 4. Cost estimate for the entire project.
 - 5. Other information required for preliminary approval.
- C. The Public Works Department will provide a memorandum stating that the drawings are acceptable OR a memorandum stating the corrections required on the drawings.



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COMMERCIAL DEVELOPMENT

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COMMERCIAL SITE DEVELOPMENT CHECKLIST

Site Plan-

1. Location(s) of existing and proposed easements shall be shown.
2. The north arrow and proper drawing scale shall be shown.
3. The site plan will need to show site configuration including buildings, parking, sidewalk, curb and gutter, landscaping, fencing, and all nearby existing driveways especially those across the street from the development.
4. The site plan shall include design TBC elevations and TOA elevations, other spot elevations, grade breaks and ridges.
5. The locations of existing utilities including culinary water, sanitary sewer, storm drain, irrigation, land drain, streets, etc. shall be shown on the site plan. If the developer is to connect to existing laterals or meters, they shall verify the condition meets current Layton City Standards.
6. The proposed location(s) for the sewer, storm drain (including inlets), water (including valves and hydrants), land drain, irrigation, lighting for public right of way and other public utilities shall be shown on the site plan.
7. Identify boundaries of the 100-year flood plain area as defined by FEMA map, if applicable.
8. Written approval for utility easements, stream alterations, irrigation alterations, and/or street access alterations shall be submitted prior to scheduling a pre-construction meeting.

Storm Water –

1. A grading and drainage plan must be submitted with the calculations for the proposed storm drain pipe system and 100 year storm water detention basin. The grading and drainage plan must include pipe material, sizes, lengths, slopes, flow elevations, rim elevations and contours to verify proper runoff.
2. Storm drainage calculations for pipes shall clearly identify the “C” value, rainfall intensity, inlet sub-basin area, total flow and required flow for each pipe section. Pond calculations must show the “C” value, rainfall intensity, acreage, allowable discharge, orifice size and required 100 year storage. (See Layton City Development Guidelines and Design Standards for Storm Drain Systems for design values.)
3. Storm drainage detention basins shall be sized for the 100-year return storm. Underground detention will only be allowed in high density urban areas and must be approved by the City Engineer. Volume in a pipe system will not be considered as storage. The dimensions, volume, and high water elevation of detention areas shall be clearly indicated on the plan. Typically, the maximum depth of water for the detention ponds is 3.0 feet. Depths greater than three (3) feet require approval by the City Engineer. The bottom slope shall be designed to prevent permanent stagnation of water. A bypass pipe for low flows may be required as part of the detention basin. In addition, 12 inches of freeboard above the high water mark is required for the detention pond. The side slopes of the detention pond shall be 3:1 (H:V) or flatter (walls not allowed in ponds). The detention basin shall include a separate inlet and outlet pipe with a control structure located in the pond berm. A detail of the control structure shall be shown on the plans and must include an orifice and overflow wall in the structure. (See Layton City ST-SD-16 for standard inlet/outlet structure drawing).

4. Detention ponds will be surveyed by the City, prior to being landscaped, to verify required capacity is available.
5. Storm drain pipes shall connect to and discharge into an approved storm drain system that is owned or maintained by Layton City, or a natural channel maintained by Davis County Flood Control, with approval, specified by county ordinance. Use of irrigation ditches, pipes, or other private drain systems for discharge of storm water from the development is not allowed.
6. Storm drain pipe within Layton City right-of-way shall conform to city standards.
7. Twenty-five percent (25%) of a required parking stall can be used for detention. All hard surfaces, not required for parking, can be used for detention.

Storm Water Pollution Prevention Plan-

1. The developer shall submit a Storm Water Pollution Prevention Plan with all site plans which implements the 'Best Management Practices' adopted by the Layton City Storm Water Management Plan.
2. For sites greater than 1 acre, the developer is required to obtain a UPDES Construction Storm Water Permit from the State and submit a copy to Layton City before scheduling a pre-construction meeting.

Sewer –

1. The proposed location(s) for the sanitary sewer shall be shown and the site plan shall specify the size, slope, and material of the sewer lateral.
2. Sewer lateral(s) shall have a minimum slope of 2% for 4-inch laterals, and 1% for 6-inch laterals. This shall be specified on the site plan.
3. Clean-outs along the sewer lateral shall be spaced at a minimum of 90 feet.
4. All commercial connections shall have individual connections based on unit ownership.
 - A. If one building site has one or more buildings and has one owner or one group of owners, (such as a partnership or a condominium venture) but is divided into two or more units, only one connection per building will be allowed. An example may be a strip center, which is built on one lot but contains several stores. Only one service per building is provided.
 - B. If several buildings are built on separate lots as part of an over-all development scheme, one connection per unit will be required. An example is a business park similar to the Traveler's Inn location.
5. Commercial connections will be required to submit calculations showing the anticipated peak flow demand OR the number of fixture units for the sanitary system. The International Plumbing Code will dictate the size of the line depending on the submitted information.
6. The sewer connection shall be made directly to the city sewer main for 4-inch laterals. For laterals 6-inches or larger, the connection shall be made into a manhole. The flow line of the new sewer service shall match the flow line of the manhole bottom. The sewer is not allowed to drop from a higher elevation inside the manhole. For connections into existing manholes, the manhole shall be cored and a trough created in the bottom.
7. Sewer improvements within Layton City right-of-way shall conform to City standards. If the development is to connect to a North Davis Sewer District main, the site plan shall indicate this and the developer will be required to submit to Layton City a letter from the sewer district approving the connection or alterations.

8. There must be a minimum of 1 ½ feet vertical clearance between water and sewer mains. Sewer mains must cross under water mains.
9. A minimum 10-foot horizontal separation is required between sewer and water mains.

Water –

1. The proposed location(s) for the culinary water (including isolation valves and fire hydrants) shall be shown on the site plan. The site plan shall indicate pipe sizes and material. Pipe material for a 2-inch water service and less shall be type K copper tubing or HDPE CTS-OD SDR-9 poly tubing from the water main to the water meter. Pipe material for water services between 3 inches and 12 inches shall be C-900 DR14 PVC pipe. All water lines larger than 12 inches in diameter shall be class 51 ductile iron pipe.
2. Meters shall not be installed within asphalt areas. Commercial meters 1.5” and larger shall be installed behind the sidewalk, meters smaller than 1.5” shall be located in the park strip.
3. Multi-family units and private residential subdivisions will require a master meter. Meters 3 inches and larger will require a backflow assembly in a separate manhole/vault after the master meter vault. Adequate access and 12 inches of clearance on all sides of an APWWA approved backflow assembly is required. The backflow assembly and vault will be privately owned and maintained. The level of protection of the backflow assembly is determined by the type of development being proposed.
4. Fire lines with hydrants connected on the line into a commercial development shall connect to the water main in the street, and shall be a minimum of 8 inches in the public right of way. No other service connections can be made to this line, unless it is a looped line. (See 9.C below). A gate valve shall be installed at the connection in the street.
5. Bends are not allowed on the connection of a public fire hydrant to the city water main.
6. Fire sprinkler lines shall be separate lines from the service lines, and shall connect to the main in the street. A gate valve shall be installed at the connection in the street. The line shall be a minimum of 6 inches within the city’s right-of-way. Behind the right-of-way, the sprinkler line size will be according to the fire protection engineer’s calculations. If another connection is made to the fire sprinkler line (i.e. fire hydrants), the line will need to be a minimum of 8 inches.
7. A minimum fire flow of 3,000 gpm is required for commercial development. The fire flow requirement may be reduced to 1,500 gpm if approved by the City Fire Marshall. The fire flow may be increased as determined by the City Fire Marshall.
8. A list of all water fixtures and quantities that are to be installed as part of the development shall be submitted. Water fixture unit counts shall be submitted to verify that water meters and laterals are appropriately sized to handle demands. Commercial connections shall be sized according to the peak domestic fixture count and outdoor use as determined by the City Engineer.
9. All commercial connections shall have individual connections based on unit ownership.
 - A. If one building site has one or more buildings and has one owner or one group of owners, (such as a partnership or a condominium venture) but is divided into two or more units, only one connection per building will be allowed. An example may be a strip center, which is built on one lot but contains several stores. Only one service per building is provided.

- B. If several buildings are built on separate lots as part of an over-all development scheme, one connection per unit will be required.
- C. A water service line may be connected to a fire hydrant line system where a loop system exists, or is proposed, through a large commercial development, and the following items are considered:
 - (1) The fire hydrant system is isolated from the culinary system with isolation valves. The fire line shall be able to be removed from service without affecting the culinary system, and the culinary line shall be able to be removed from service without affecting the fire line system. The City is responsible for the meters and meter boxes. All water lines, from the valves at the connection to the city mains, are privately owned and maintained.
 - (2) An isolation valve will be required on the City main between the fire hydrant loop system. This will apply when the loop connection is made to the same culinary waterline.
 - (3) Master meters are installed at each connection to a Layton City main.
 - (4) The fire hydrant line size shall be increased to accommodate the increased demands.
 - (5) The minimum combined system line size shall be 8 inches.
 - (6) The dedication plat and CCR's for the development shall specify waterline responsibility and ownership.
 - (7) Lateral connections to a single hydrant line stub are not allowed.
- 10. Water exactions – Layton City passed an ordinance on November 4, 2004 requiring all development to provide irrigation water shares to Layton City. This is required for all development. The water exaction requirement is based on the required water meter size for the development. The water shares shall be dedicated to the city before scheduling a pre-construction meeting.
- 11. If a fire flow meter is installed, the water exactions requirement will be based on the meter size required for a supply line only.
- 12. An 11" x 17" utility plan and a "water/sewer crossing table" must be submitted for approval by the State Division of Drinking Water.

Street –

- 1. Drive approaches shall be 20 feet from the nearest property line, 80 feet from intersections, and 200 feet from existing or future signalized intersections.
- 2. The site plan shall show the proposed street improvements such as sidewalk, park strip, curb and gutter, driveways and lighting in the public right of way.
- 3. Sidewalk through a drive section shall be 6 inches thick in commercial areas.
- 4. Disabled ramps with ADA paver sections (truncated domes, red brick in color), shall be constructed at each street corner, and other locations as determined by the city engineer.
- 5. Waterways shall be used only at locations not served by a storm drain system.
- 6. Plans will need to show adjacent drive approaches.

General –

- 1. Once a development has received final approval, six full sets of plans must be submitted prior to scheduling a pre-construction meeting. All sheets shall be stamped and signed by a professional engineer.

2. Other residential requirements may be applied to the commercial site plan checklist.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

STREET IMPROVEMENTS

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

STREET IMPROVEMENTS
(Refer to Title 18, chapter 18.24 entitled "STREETS" of the Layton Municipal Code.)

I. Street widths

LAYTON CITY STANDARD STREET SECTIONS						
STREET TYPE (ALL MEASUREMENTS IN FEET)	ROW WIDTH	ASPHALT WIDTH	PARK STRIP WIDTH	SIDE WALK WIDTH	TBC TO TBC	COMMENTS
ARTERIAL	100	76	4.5	5	81	
MINOR ARTERIAL	84	60	4.5	5	65	
COLLECTOR	66	42	4.5	5	47	
MINOR COLLECTOR	60	36	4.5	5	41	
RESIDENTIAL COLLECTOR	62	32	7.5	5	37	TYPICAL THROUGH STREET FOR RESIDENTIAL DEVELOPMENT
RESIDENTIAL	58	28	7.5	5	33	TYPICAL INTERIOR STREET WITHIN A SUBDIVISION
MINOR	50	28	4.5	5	33	CUL-DE-SACS; LOOP STREETS SERVING 10 LOTS OR LESS; SENSITIVE LANDS
HILLSIDE RESIDENTIAL	39	28		6	33	HILLSIDE DEVELOPMENT AREAS ONLY - AS APPROVED BY CITY ENGINEER
PRIVATE STREET	*	28			33	*RIGHT OF WAY TO BE APPROVED BY CITY ENGINEER
SPLIT ROADWAY	2 @ 23' EA	2 @ 18' EA			2 @ 23' EA	HILLSIDE DEVELOPMENT AREAS ONLY - AS APPROVED BY CITY ENGINEER

- A. The asphalt on all public streets, except frontage roads, shall be bordered on both sides by two and one-half foot wide, 6-inch high back curb and gutter.
- B. For private street requirement – see Municipal Code 18.50.

II. Maximum block length between intersections

Zoning	Maximum block lengths between street R-O-W that are considered local streets
A	None
R-S	1,000 feet
R-1-10	800 feet
R-1-8	700 feet
R-1-6	600 feet

- A. Street intersections shall have a 90-degree approach angle.
 - 1. The interior approach angle may be reduced to no less than 80 degrees as approved by the City Engineer.
 - 2. The approach to an intersection shall have at least 100 feet of tangent (perpendicular) approach. This distance may increase with a change in speed or traffic volume.
 - 3. "T" intersections will be acceptable if the centerlines are offset by at least 260 feet for residential streets.
 - 4. On arterial and collector streets, drive entrances may be required to be aligned as determined by the City Engineer. The number and location of drive access points may also be limited.

III. Dead-end/Not-a-through-street definition

- A. A dead-end street is a street that does not have another intersection located along the travel path, i.e., a cul-de-sac. The length of the dead-end is as described in the cul-de-sac section.
- B. A “not-a-through-street” is a street access to a street network which contains other intersections and possibly dead-end streets.
 - 1. The City Engineer and the City Fire Marshall shall approve a ‘not-a-through-street’ network.
 - 2. A “not a through-street’ shall have the ability to provide for future street accesses which will provide at least a second access to the site.

IV. Second access requirements

- A. A second access to a site is required under the following conditions:
 - 1. A multi family development that has 100 or more residential units shall be equipped throughout with two separate and approved fire apparatus access roads.
 - 2. A development that extends more than 1800 feet from a connecting street will have a second access.
 - 3. A development of one or two family dwellings where the number of dwelling units exceeds 30, unless fire apparatus access roads will connect with future development as determined by the City Engineer and Fire code official.

V. Street curve designs

- A. Vertical curves shall meet the following AASHTO design standards
 - 1. Vertical crest curves, minimum design control
 - a. Subdivision (25 mph), K=12
 - b. Minor collectors (≤ 30 mph) K=19
 - c. Collectors (≤ 40 mph) K=44
 - d. Other streets - As directed by the Engineer
 - 2. Vertical sag curves, minimum design control
 - a. Subdivision (25 mph), K=26
 - b. Minor collectors (≤ 30 mph) K=37
 - c. Collectors (≤ 40 mph) K=64
 - d. Other streets - As directed by the Engineer
 - 3. Vertical curve calculation:

$$L=KA \quad E=AL/800 \quad Y=E*(D^2)/(T^2)$$

"K" is the allowable rate of vertical curvature.

"L" is the length of the vertical curve.

"A" is the algebraic difference of the approach and departure slopes.

"E" is the curve offset from the approach tangent line.

"Y" is the offset from the tangent line to the curve at any given point along the curve.

"D" is the distance from the beginning point of the curve to any point desired along the curve.

"T" is $\frac{1}{2}$ the length of the curve or $L/2$.

Example –

Assume that the approach grade to a crest curve is 2% and the departure grade is 8%.

$$L=KA \quad L=20*(8-(-2))=200 \text{ feet (minimum length)}$$

B. Horizontal curve design

1. The minimum centerline street radius, with a standard 2% crown, shall be:
 - a. Minor – Subdivision < 25 mph R=200'
 - b. Feeder - Subdivision - <30 mph R=333'
 - c. Collector - <35 mph R=510'
 - d. Collector - <40 mph R=762'
 - e. Arterial - <45 mph R=1,039'
2. The minimum centerline radius with a standard crown shall be 200 feet.
3. The minimum turning path for street intersections, parking/fire lanes must meet AASHTO “Minimum Turning Path for Intermediate Semitrailer (WB-50’) Design Vehicle” as shown below:

Type of vehicle	Min. Turning Radius (front outside tire)	Minimum radius (Inside rear tire)	Maximum turn radius (front fender)
WB-50'	45'	17'	45.7

VI. Street Slopes

- A. The minimum street slope allowed is 0.50 %. The minimum street slope through a cul-de-sac is 1%.
- B. The maximum street slope allowed without special approval is 8.0 %.
- C. The maximum street slope allowed with special approval from the City Fire Chief and the City Engineer is 12.0 %.
 1. The City Fire Chief and the City Engineer shall review and grant special approval for grades between 8.1% and 12.0 %.
 2. Grades of 10% that exceed 500 continuous feet are required to provide an approved automatic fire sprinkler system to all residential, commercial and industrial buildings.
 3. The location of connecting streets with slopes less than or equal to 8.0 % is reviewed.
 4. The locations of downhill exits are considered. A street that is proposed to terminate downhill will not be allowed to exceed 8.0% if no downhill exit is available.
 5. The maximum distance of a slope exceeding 8.0% shall not exceed 500 feet. This distance may only be adjusted by the City Fire Chief and the City Engineer. The slope that exceeds 8% should be preceded and followed by a slope less than 8% for at least twice the distance of the slope that exceeds 8%.
- D. Intersecting streets shall have an approach slope not exceeding 4.0%. The distance of this approach pad shall be no less than 100 feet or as approved by the City Engineer.
- E. Streets shall be designed to carry excess storm water, which may not be contained in the storm drainpipe system (beyond the 10-year design storm) out of the subdivision on street surfaces. Low points shall not be designed unless all other

alternatives are exhausted.

- F. Vertical curves at the approach and departure grade shall be designed to meet the minimum “K” values listed in Street Curve Designs section.

VII. Street pavement thickness

- A. The geotechnical report shall include a recommendation for asphalt, roadbase, and sub-grade structure depths.
- B. The minimum standard pavement structure shall be 3 inches of asphalt surface course and 8 inches of gravel roadbase.
- C. The following table indicates different street structures for differing California Bearing Ratio (CBR) values:

**Asphalt Concrete (HMA)
Pavement Structural Section**

Subgrade Class	Pavement Section	Traffic Classification			
		I Minor Street	II Feeder Street	III Collector Street	IV Minor Arterial
Very Poor CBR <3	Asphalt Concrete Surface	3"	3"	4"	6"
	Untreated aggregate base	10"	12"	8"	12"
	Aggregate sub-base	-	-	12"	16"
Poor CBR 3-8	Asphalt Concrete Surface	3"	3"	3.5"	6"
	Untreated aggregate base	8"	8"	8"	8"
	Aggregate sub-base	-	-	12"	12"
Medium CBR 9-17	Asphalt Concrete Surface	3"	3"	4"	6"
	Untreated Aggregate base	8"	8"	8"	8"
	Aggregate sub-base	-	-	6"	6"
Good Excellent CBR +17	Asphalt Concrete Surface	3"	3"	4"	6"
	Untreated Aggregate base	8"	8"	8"	8"
	Aggregate sub-base	-	-	6"	6"

TRAFFIC CLASSIFICATIONS			
Traffic Class	Maximum EAL Equivalent Axle load	Type of Street	Total Heavy Trucks during design period (20 years)
I	5000	Light traffic cul-de-sac	7,000
II	10,000	Residential Streets	7000 – 15000
III	100,000	Collector Minor Collector	70K - 150K
IV	1,000,000	Minor Arterial or Arterial	700K - 1.5M

VIII. Sidewalk / curb & gutter / waterways/driveways

A. Curb & gutter shall be placed on each side of developed streets.

1. The standard curb & gutter is placed 12.5 feet from the property line on subdivision streets with 7.5 foot park strips, 9.5 feet from property lines with 4.5 foot park strips.
2. The top of the curb is placed level from one side of the street to a point perpendicular on the other side of the street.
3. If a "cross-slope" is proposed to match existing contours, the maximum top of curb differential shall be equal to the pavement width times 2.0%. The developer shall obtain special approval for a 'cross slope' street at the preliminary plan stage.
4. The maximum percent of slope allowed around a corner radius shall be 12%.
5. The back of curb radius for residential and minor collector streets shall be 25 feet.
6. The back of curb radius for collector streets shall be 35 feet.
7. The back of curb radius for minor arterial and arterial streets shall be 40 feet.
8. The curb & gutter shall be placed on a minimum of 6 inches of compacted roadbase material.

B. Sidewalk shall be placed on each side of developed streets.

1. All sidewalks will be placed on a minimum of 6 inches of compacted gravel roadbase material.
2. 5-foot wide sidewalks shall be installed in all areas of the city with park strips. Typically there shall be a 7.5-foot park or planter strip (or 4.5 foot park strip when required) placed between the back of curb and the sidewalk.
 - a. The street edge of the sidewalk shall be a minimum of 0.10 feet above the top back of curb.
 - b. The street edge of the sidewalk shall be a maximum of 0.25 feet above the top back of curb ONLY if the City Engineer has issued prior approval.
 - c. The sidewalk shall have 0.10 feet of slope from the property side to the street side of the sidewalk
3. 6-foot wide sidewalks shall be installed in sensitive lands residential areas

where no park strip is provided or as approved by the City Engineer. (The developer shall obtain special approval for abutting sidewalk at the preliminary plan stage, and shall demonstrate the impending need and that all other alternatives have been exhausted.)

- a. The sidewalk shall be placed abutting the back of the curb & gutter.
 - b. The street edge of the sidewalk shall be a flush with the top back of curb.
 - c. The sidewalk shall have 0.10 feet of slope from the property side to the street side of the sidewalk.
 - d. The placement of mailboxes will be allowed near the driveway, where the sidewalk will be placed at the back of the drive approach (typical 7.5' park strip location) to meet ADA standards.
 - e. In locations where the sidewalk abuts the curb & gutter, the public utility easement shall be increased from 7 feet to 10 feet.
4. The sidewalk in a cul-de-sac shall have the standard park strip for the street width (4.5') through the entire "bubble" portion of the cul-de-sac. Abutting sidewalk will not be allowed.
 5. The minimum thickness for sidewalk shall be 4 inches except through a drive section where it shall be 6 inch thick.
 6. "Disabled Ramps," with ADA paver sections (truncated domes), shall be constructed at each street corner, and other locations as determined by the City Engineer. The color of truncated domes shall be "brick red."
- C. Waterways in public streets are not allowed unless approved by the City Engineer and Fire Department.
- D. Driveways
1. Drive approaches shall be 50 feet from intersections on minor subdivision streets.
 2. Drive approaches shall be 80 feet from intersections on collectors or arterial streets.
 3. Drive approaches shall be 20 feet from property line on commercial sites.
 4. Drive approaches shall be at least 200 feet from intersection where traffic signals are present, or will be constructed in the future.

IX. Cul-de-sac / Turn-around requirements

- A. Streets terminating in cul-de-sacs shall be no longer than five hundred feet (500') to the end of the turn-around. Exceptions to the length of a cul-de-sac length may be granted in the Foothill Development area where it is determined that no other form of development is practical due to topography. See standard drawing ST-ST-15.
- B. Each cul-de-sac shall be terminated by a turn-around not less than one hundred feet in diameter, of which a minimum of eighty feet in diameter shall be surfaced.
- C. Adequate catch basins and drainage easements shall be installed and secured by the sub-divider/developer.
- D. Alternative cul-de-sac turnarounds allowable only in the sensitive lands area shall be specifically approved by the Fire Department.

X. Temporary turn-around

1. A temporary turn-around shall be required on any fire access road for future development that is more than 150 feet or two lot lengths (maximum of 200 feet) from an intersection. All distances in this section

- are measured from the face of the curb of the intersection.
2. An off-site temporary turn-around with a minimum 80 foot diameter drivable surface may be located on abutting property with proper easements (see ST-ST-14). An on-site temporary turn-around with a minimum 80 foot diameter drivable surface may be located within the development as part of a building lot or future phase with proper easements and noted on the subdivision plat (see ST-ST-14). Any lots encumbered by an on-site temporary turn around must be designated as “R” lots on the plat. These lots will not be issued building permits until the future street is stubbed through and the temporary turn around improvements have been replaced with permanent improvements to match the through street. All cost associated with the removal and replacement of these improvements will be the responsibility of the owner of the lot at the time the future street is extended.
 3. If a street extends more than 150 feet or two lot lengths (maximum of 200 feet) from an intersection and the Developer is not able to obtain an easement for a temporary turn-around from the adjacent property owner, the Developer will be required to install a fire suppression system meeting the requirements of the currently adopted NFPA 13(d) standard in all of the homes located greater than 150 feet or two lots from an intersection. All lots with fire suppression systems must be identified on the final site plan and plat.
 4. The City Engineer and Fire Chief may approve a permanent turn-around with a future street tie in as shown in standard drawing ST-ST-14, for a street that extends more than 450 feet from an intersection and is planned to be extended in the future.

XI. Right of way slope requirements

- A. The developer shall provide cross-section drawings of the right-of-way when the cut or fill exceeds 2 feet at the right-of-way line.
- B. The developer shall provide slope easements on the dedication plat when the cut or fill exceeds 3 feet, or as required by City Engineer.
- C. The developer shall provide engineering drawings (signed and stamped by a professional licensed engineer) for slope retain when the cut or fill requires retaining walls or structures, (typically over 4.0 feet).

XII. Street construction sequencing

- A. Residential streets which are paved with the asphalt surface course one season following the utility construction season, (to allow a wet cycle to help consolidate the trench areas) will be required to conform to the following tests:
 1. The soils report will identify the acceptability of the native material for consolidated backfill. The soils report will identify the appropriate method for backfilling, compaction, and consolidations.
 2. The street area will not have gravel roadbase material placed during the winter season. Placement of select borrow material is required for all trench backfill between November 1 and April 1. This requirement may be extended by the Public Works inspector, dependant on the condition and quality of the native soils.
 3. Prior to the placement of the gravel roadbase material the following tests results shall be provided.
 - a. More than 75% of the utility trenches shall be tested and will have

- a minimum average test result of 92% at each lift of soil placement, as determined by the soils report.
 - b. The street sub-grade shall be compacted to a minimum average of 95% compaction. The random sampling shall be one test per 100 square yards or 3 tests per 100 feet of street.
 - 4. Prior to the placement of the asphalt surface, and within five days of the asphalt placement, the gravel roadbase material shall be compacted with a minimum average of 95% maximum density, (no test below 92%). The random sampling shall be one test per 100 square yards or 3 tests per 100 feet of street.
 - 5. The minimum temperature for laying asphalt must be 50 degrees and rising. The asphalt surface shall be tested for compaction with the same density and frequency requirements as the gravel road base material.
- B. Residential streets which are paved or have gravel roadbase placed to the final grade during the same season as utility construction shall conform to the following tests:
 - 1. The soils report will identify the acceptability of the native material for compacted backfill. The soils report will identify the appropriate method for back filling and compaction, excluding consolidation.
 - 2. The street area will generally have selected borrow material placed as trench backfill prior to the placement of the gravel roadbase material if the existing material is determined to be unsuitable for backfill and compaction at the time of excavation, as determined by the soils report, and the Public Works inspector. Placement of select borrow material is required for all trench backfill between November 1 and April 1. This requirement may be extended by the Public Works inspector, dependant on the condition and quality of the native soils.
 - 3. Prior to the placement of the gravel roadbase material the following tests results shall be provided.
 - a. More than 75% of the utility trenches shall be tested and will have a minimum average test result of 95% at each lift of soil placement as determined by the soils report.
 - b. The street sub-grade shall be compacted to a minimum average of 95% compaction. The random sampling shall be one test per 100 square yards or 3 tests per 100 feet of street.
 - 4. Prior to the placement of the asphalt surface, and within five days of the asphalt placement, the gravel roadbase material shall be compacted with a minimum average of 95% maximum density, (no tests below 92%). The random sampling shall be one test per 100 square yards or 3 tests per 100 feet of street.
 - 5. The asphalt surface shall be tested for compaction with the same density and frequency requirements as the gravel roadbase material.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

CULINARY WATER SYSTEMS

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

CULINARY WATER SYSTEMS

- I. Water system size determination
 - A. The minimum water line size is 8 inch for distribution lines in a residential subdivision.
 1. Subdivisions that have a school or church will be required to install 10 inch, 12 inch, or larger line, looped systems.
 2. All subdivision water lines shall be subject to the City Engineer's size requirements. The lines may be increased in size to accommodate future development or to provide adequate fire flow protection. The size of the line is a function of the location of the system within the specific pressure zone and the approved master plan.
 - B. The minimum line size for dead-end systems (including cul-de-sacs over 500 feet in length) shall be 8 inch.
 - C. The water line sizes shall be determined by the City Engineer, after consultation with the Fire Marshall, using the following requirements:
 1. A minimum fire flow of 1,000 gpm for residential units, without brush or near standing trees.
 2. A minimum fire flow of 1,500 gpm for residential units with brush and/or standing trees nearby.
 - a. The City Fire Marshall will make the determination of brush requirements.
 3. A minimum fire flow of 2,200 gpm for a typical church building. Subdivision developments that may include a school or church will be required to provide the additional fire flow line size.
 4. A minimum of 3,000 gpm for commercial development.
 - a. The fire flow may be reduced to 1,500 gpm if approved by the City Fire Marshall.
 - b. The fire flow may be increased as determined by the City Fire Marshall.
 5. The culinary demand of .33 to 1.0 gpm per unit shall be added to the fire flow amount, allowing 8 fixture units to 27 fixture units.
 6. The outdoor demand of .66 to 2.0 gpm from the culinary system shall be added to the fire flow and indoor culinary use.
 - a. The outdoor demand will not be used in areas serviced by a secondary water system AND the secondary water system is installed at the site in question.
 7. A minimum of 50 psi is expected in all parts of the system.
 8. 100 psi is the anticipated maximum operating pressure. Pressures exceeding 100 psi must be approved by the City Engineer.
 9. The flow velocity through a pipe during a fire flow must not exceed 10 ft/sec. Flow velocity must be verified by the Layton City water model.
 10. The impact of the proposed system on the existing system will be reviewed by the City Engineer.
 - a. The developer may be required to add additional lines off site in order to provide adequate water supplies and pressures.

11. The areas that will be supplied through the proposed development will be considered and the method of service to those areas determined. An increased line size may be required for future development, as indicated by the master plan.
12. The system storage requirements will be considered for each development.

II. Waterline placement

- A. The waterline shall be placed 4.0 feet north and east of the street centerline.
- B. The waterline shall be placed along the curve of a street to conform to the 4-foot alignment. The use of bends may be required if the centerline radius is shorter than the allowed radius of the pipeline.
- C. The waterline shall be installed with a minimum of 48 inches and a maximum of 72 inches of cover over top of the pipe unless prior approval is obtained from the City Engineer.
- D. If the waterline needs to be "looped" to pass another line or structure, the minimum clearance between the two utilities shall be 12 inches except for sanitary sewer lines which require 18 inches minimum clearance.
- E. The waterlines will not be installed at side lot or rear lot property lines. All lines will be installed within street right-of-ways.
- F. Water lines shall be extended to the boundary of the development.
- G. The minimum centerline radius of the waterline shall be as follows:
 1. 6" through 12" - 205'
 2. 14" and 16" - 260'

III. Fire hydrant requirements

- A. Fire hydrants shall be installed at 500-foot intervals in residential areas.
- B. Fire hydrants in commercial and industrial areas shall be installed in accordance with table C105.1 in Appendix C of the International Fire Code. The City Engineer and City Fire Marshall will determine any variations to the required number and location of fire hydrants.
- C. Bends are not allowed on the water line connection of a public fire hydrant to the water main.
- D. Fire or flushing hydrants shall be installed at the end of all lines.
 1. Fire Hydrants placed at the end of cul-de-sacs or on dead end streets shall not be considered as a "fire protection" fire hydrant but simply as a hydrant for use by the water department to flush the system lines.
 2. 2" flushing hydrants may be placed at temporary dead end streets as approved by the City Engineer.
- E. Fire hydrants shall be placed in the planter / park strip area 12 to 18 inches behind the curb with the auxiliary valve located on the mainline tee in the street. The hydrant breakaway flange shall be flush with the sidewalk.
- F. Fire hydrants shall be placed 12"-18" behind the sidewalk in areas where no planter / park strip is provided. The auxiliary valve shall be located on the mainline tee in the street. The hydrant breakaway flange shall be flush with the sidewalk.
- G. Where asphalt widths exceed 54 feet, fire hydrant spacing shall be independent

from one side of the street to the other side of the street. A fire hydrant on one side of the wide street will not be included in fire hydrant spacing on the other side of the street.

- H. The City Fire Marshall may require additional fire hydrants.
- I. Fire hydrants shall be installed at the entrance to all cul-de-sacs. Fire hydrants must be placed at the beginning of a curb radius or at the end of a curb radius.
 - 1. If two cul-de-sacs or a cul-de-sac and a through street back onto each other AND if the centerline to centerline distance of the two streets does not exceed 260 feet AND if the length of the cul-de-sac(s) does not exceed 350 feet, the fire hydrant may be installed on a common property line of the lots backing onto each other at the main street.

IV. Isolation valve placement

- A. Isolation valves shall be placed at the entrance to all cul-de-sacs.
- B. Isolation valves shall be placed at intervals not to exceed 800 feet.
- C. Isolation valves shall be placed at all intersections on at least two branches of a "T" intersection and three branches of a 4-way intersection. These valves shall be installed in the intersections, at the extension of property lines.
 - 1. An additional valve will be required if the sum of the pipelines on the third or fourth branch exceeds 1,000 feet.
 - 2. An additional valve will be required if the pipeline(s) beyond the branch may continue in service when the adjacent valves are shutdown.
- D. Isolation valves shall be installed near fire hydrants, points of curve, points of tangent, or common property lines.
- E. Isolation valves for private fire lines and other private service lines larger than 3 inch shall be installed at the mainline connection.
- F. Isolation valves shall be installed within 10 feet of the upstream and downstream ends of an augured or trenched casing

V. Water service connections

Pipe and pipe fittings installed after January 4, 2014 shall be "lead free" in accordance with Section 1417 of the Federal Safe Drinking Water Act. They shall be certified as meeting ANSI/NSF 372 or Annex G of ANSI/NSF 61.

- A. All residential building lots shall have a 3/4-inch culinary water lateral installed unless a fire sprinkling system is required. Plans must note the size of the lateral to be installed.
 - 1. The complete service connection includes the corporation stop and service saddle for PVC or direct tap for ductile iron, 3/4 inch type "K" copper or HDPE CTS-OD SDR-9 poly tubing, a cast iron meter yoke, angle stop, backflow angle valve, stainless steel stiffener inserts at all poly pipe connections, 21 inch X 36 inch concrete or approved PVC meter box, cast iron frame and cover.
- B. Residential lines may be increased to 1-inch copper or HDPE CTS-OD SDR-9 poly if the developer requests the increase.
 - 1. A note will be added to the dedication plat indicating the increased line size.

2. The complete service connection includes the corporation stop and service saddle for PVC or direct tap for ductile iron, 1 inch type "K" copper or HDPE CTS-OD SDR-9 poly tubing, a cast iron meter yoke, angle stop, backflow angle valve, stainless steel stiffener inserts at all poly pipe connections, 21 inch X 36 inch meter box, cast iron frame and cover.
- C. The water meter shall be installed at the center of the building lot.
 - D. The tubing shall extend to the outside edge of the public utility easement, which is:
 1. Typically 8 feet past the sidewalk where a park strip is provided.
 2. Typically 11 feet past the sidewalk where the sidewalk abuts the curb & gutter.
 - E. All residential meters shall be placed between the curb & gutter and sidewalk if a park strip is provided.
 - F. All residential meters shall be placed 18"-24" behind the sidewalk where it abuts the curb.
 - G. Residents with interior fire sprinkler systems typically are required to install a 2 service line and a 1.5-inch meter with backflow prevention unless approved by the Fire Marshall.
 1. A note must be added to the dedication plat indicating the lateral and meter size, and the lots that will be serviced with a fire suppression system.
 2. All residential 2-inch meters shall be installed in a 4-foot manhole section.
 - H. Multi-family units and private residential subdivisions
 1. Multi-family and private residential subdivisions will require a master meter with a backflow assembly in a separate vault for meters larger than 2-inches.
 - a. The backflow assembly shall be installed in a separate manhole/vault after the master meter vault. Adequate access and 12 inches of clearance on all sides of an APWWA approved backflow assembly is required. The backflow assembly and vault are private. The level of protection of the backflow assembly is determined by the type of development being proposed.
 2. Meter size required will be based on submitted fixture units. The meter shall be sized by determining the maximum fixture count as established in the International Plumbing Code and as follows:

a.	Bathtub / shower	1.4 units
b.	Lavatory	0.7 unit
c.	Dishwasher / sink	1.4 units
d.	Flush tank toilet	2.2 units
e.	Clothes washer	1.4 units
 3. The maximum flow allowed by meter size and the acceptable service sizes are shown in the table below:

Meter Size (inches)	Continuous Flow (gpm)	Acceptable Service Size (inches)
5/8	15	3/4
3/4	20	3/4
1	30	1 or 1-1/2
1-1/2	75	1-1/2 or 2
2	250	2 or 3
3	500	3 or 4
4	1000	4 or 6
6	1600	6
8	2800	8

4. The meter size shall be increased to accommodate outdoor watering.
5. A separate fire line is typically required.
6. A water service line may be connected to a fire hydrant line system where a loop system exists or is proposed and the following items are considered:
 - a. The fire hydrant system must have two separate connections to the city main to create the loop system.
 - b. Meters will be required at each connection.
 - c. The minimum combined system line size shall be 8 inch.
 - d. The dedication plat and CCR's for the development shall specify waterline responsibility and ownership.
- I. Commercial connections shall be sized according to the peak domestic fixture count and outdoor use as determined by the City Engineer.
- J. Commercial meters shall be installed near the right-of-way, at a location acceptable to the City Engineer. See "Commercial Site Development Checklist" for commercial development water standards.

VI. Pipeline materials, construction, and testing

A. Materials

1. All waterlines, between 3 inches and 12 inches in diameter shall be class 51 ductile iron pipe or C-900 DR14 PVC pipe. All waterlines larger than 12 inches in diameter shall be class 51 ductile iron pipe.
2. All gate valves shall be non-rising stem, resilient seat valves, ductile iron bodies. All valve body assembly bolts shall be stainless steel. All valves 12 inches and larger shall be butterfly valves.
3. All private fire lines for hydrants and/or suppression systems must be class 51 ductile iron pipe or C-900 DR14 PVC pipe in the public right of way. Material used for underground piping in the private areas must meet NFPA25 fire code requirements.
4. All fire hydrants shall be minimum 48 inch bury, 6-inch barrel, 4 ½ steamer and 2 - 2 ½ nozzle hydrants.
 - a. Clow
 - b. Mueller
5. "MEGA-LUG" joint restraints or pre-approved acceptable equal shall be used on all pipeline loop construction. All joint restraints shall use T-bolts

and nuts coated with Fluoropolymer Star-Blue corrosion preventer or pre-approved acceptable equal.

6. "MEGA-LUG" joint restraints or pre-approved acceptable equal shall be used on all waterline connections and fittings where C-900 DR PVC pipe is installed. All joint restrains shall use T-bolts and nuts coated with Fluoropolymer Star-Blue corrosion preventer or pre-approved acceptable equal.
7. Where flange kits or bolt packs are installed, all flange kits or bolt packs shall use bolts and nuts coated with Xylan 1424 series fastener class coating for corrosion prevention or pre-approved acceptable equal.
8. All waterlines shall have a minimum 12 ga. insulated tracing wire installed with the pipe. The tracing wire shall be installed under the haunches of the pipe prior to backfilling.
 - a. Tracing wires shall terminate inside of all valve boxes, meter boxes, and at all fire hydrants using SnakePit tracer box style CD14*TP with blue locking cover. At service saddles and tapping sleeves, the tracing wire shall not be allowed to be placed between the saddle and the pipe. A grounding rod shall be installed at all tracer system terminal points.
 - b. Tracing wire shall be copper wire with blue insulation rated for direct burial. All wire connectors shall be 3M DBR direct bury splice or pre-approved acceptable equal and shall be watertight to provide electrical continuity.
 - c. All tracing wire shall be tested for continuity in the presence of the Public Works Inspector prior to asphalt placement. Any tracing wire found not to be continuous after testing shall be repaired or replaced by the contractor prior to asphalt placement.
9. Direct tapping of C-900 DR14 PVC pipe is not permitted.
 - a. Service taps up to 2" in size shall be made through the use of service saddles. All service saddles shall be Romac style 202NS or pre-approved acceptable equal.
 - b. For taps larger than 2", tapping sleeves shall be used. The sleeve shall be designed for use on C-900 DR14 PVC pipe. Taps are allowed up to size-on-size.

B. Construction

1. All waterlines shall be capped or plugged at the end of each day's construction and at all other times the line is not under direct observation by the contractor.
2. The waterline pipe shall be bedded in gravel where the sub-grade material is wet and/or the material is unstable.
3. All fittings shall have an appropriate thrust block installed.
4. At the connection point to the main, there is a minimum separation of 15 feet for lines 6 inches and greater; 4 feet for smaller building laterals; and 18-inches for ¾ inch pipe.

C. Testing - All tests shall be witnessed by the Public Works Inspector

1. The line shall be tested for leakage by raising the internal pipe pressure to

at least 200 psi. This pressure shall be maintained for a period of at least 2 hours without dropping.

2. The line shall be disinfected for a period of at least 24 hours. The line shall pass a microbiologic test with no coliform present and no bacteria colonies present.
3. All fire hydrants shall be operated from full open to full closure to assure proper operations. The flow shall be controlled by the auxiliary valve.
4. All valves shall be operated full open to full close. Then shall be left in the full open position.

VII. Special requirements

- A. If a development crosses a pressure zone boundary, the developer may be required to construct a pressure reducing valve station as determined by the Culinary Water Master Plan.
- B. If a development is located in an area not currently being served by the City culinary system, the developer may be required to construct storage facilities, pumping facilities and transmission lines.
- C. Services to be abandoned shall be disconnected at the main.
- D. Water mains to be abandoned shall be disconnected at the tee.
- E. Developments may be required to install sampling stations for water quality monitoring and sampling as determined by the City Engineer.
- F. Prior to final approval of any subdivision or development requiring water service from the City, the Developer shall dedicate to the City a sufficient number of water shares or rights, to provide a minimum of 3 acre-feet of water per acre of land proposed for development.
- G. All developments must submit an electronic PDF file and paper copy of the construction plans on 11" x 17" sheets at final approval for submittal to the Utah Division of Drinking Water.
- H. A "water/sewer crossing table" must be submitted to Layton City at final approval for submittal to the Utah Division of Drinking Water. The table must include information for all locations where the culinary water main crosses the sanitary sewer main. The table must include the development name, sheet number showing the crossing, road name where the crossing is located, station of the crossing, whether the water line will cross over or under the sanitary sewer, and the clearance between the water line and the sanitary sewer. An example table is shown below:

Development Name
Layton City – PWS 06018
Water/Sewer Crossings

Sheet	Road	Crossing Station	Crossing	Clearance
PP-01	Layton Street	1+50	Over 8" sanitary sewer	60"
PP-02	Main Street	5+00	Over 8" sanitary sewer	24"

I. Steel Casing Construction

1. ASTM A53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield strength of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus a minimum 4 inches.
2. Fillet weld joints continuous around casing and reinforce joints to withstand jacking operations.
3. Use casing spacers CCI Pipeline Systems Model CSP or CSC or acceptable equal to center pipe within casing. Minimum of three spacers per length of pipe.
4. Install neoprene rubber end seal with stainless steel bands CCI Pipeline Systems Model ESC or ESW as applicable or acceptable equal at each end of casing.

The ownership and maintenance of these improvements will become the City's upon completion of the work and acceptance by the City. Private ownership of these types of improvements is allowed only as determined by the construction Staff.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

SANITARY SEWER SYSTEMS

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

SANITARY SEWER SYSTEMS

- I. Sanitary sewer size and slope design.
 - A. Minimum size is 8 inch.
 - B. Minimum flow velocity is 2 feet per second, 2 fps.
 - C. Maximum flow velocity shall be 11 fps.
 - D. Larger lines will be installed if the projected capacity exceeds the 8-inch line capacity.
 - 1. Future connections require increased capacity.
 - a. Individual residential connections are assumed to require .0021 cfs capacity.
 - b. Future subdivision development will assume to have a specific number of connections per acre based on the general plan and anticipated zoning.
 - c. The following table shows maximum capacity of 8 inch, 10 inch, and 12-inch lines at different slopes. The capacities shown are the number of residential connections and the number of acres for each line size and slope.

Slope %	8 inch conn./acres	10 inch conn./acres	12 inch conn./acres
0.20	not allowed	not allowed	737/210
0.30	not allowed	555/158	903/258
0.40	353/101	641/183	1043/298
0.50	395/113	717/204	1166/333
0.75	484/138	878/250	1428/408
1.00	559/159	1014/289	1649/471

- 2. Larger lines may be installed where the slope requires larger line size to accommodate existing surface gradient, as indicated in the table above.
- E. The developer's engineer shall review the entire subdivision sanitary system to determine that the line with the least capacity has adequate capacity as determined above.
- F. The minimum slope for a dead-end line with less than 8 connections shall be one percent, (1.00 %). This will occur in cul-de-sacs and on dead-end spans.
 - 1. The minimum number of connections on a 12-inch sewer line at 0.20% will be 45 connections.
 - 2. The minimum number of connections on a 12 inch sewer line at 0.30% will be 30 connections.
 - 3. The minimum number of connections on a 10-inch sewer line at 0.30% will be 28 connections.

- G. Sewer lift stations that service more than one residential or business unit are not allowed, unless the elevation of the development project is lower than any sewer gravity feed line, regardless of the distance or easements required to complete a gravity connection. The area that meets this requirement is located below the “bluff.” Individual sewer lift stations that service one residential or business unit are allowed under specific guidelines (see Section IV).

II. Sanitary Sewer Line Placement

- A. The sanitary sewer lines are placed typically 9 feet south and west of the street centerline.
- B. Sanitary sewer lines shall not be placed in sidelot or rearlot property lines unless all alternatives are exhausted.
 - 1. The developer may be required to change street alignment to accommodate sanitary sewer line placement.
 - 2. Sanitary sewer lines that are approved for sidelot or rearlot installation shall have a 20-foot easement provided.
 - 3. Sanitary sewer lines that are approved for sidelot or rearlot installation shall provide for vehicular access to all manholes.
- C. The minimum sanitary line depth shall be 5 feet from finish ground elevation to top of pipe.
- D. The maximum depth of the sanitary sewer line shall be 20 feet from finished ground elevation to top of pipe.
- E. Manholes shall be placed no closer than 5 feet to the lip of the gutter on a street curve.
- F. The sanitary sewer line shall not extend more than 5 feet past the street centerline on street curves.
- G. The sanitary sewer line shall not cross outside of the lip of gutter location at the outside of the street curve.
- H. Lines shall be extended to the boundary of the development.
- I. Where a subdivision is constructing a new street over an existing sanitary sewer line, the developer will relocate the line to comply with the placement standards.

III. Manhole size and placement determination.

- A. Manholes shall be installed as follows:
 - 1. Maximum spacing is 400 feet.
 - 2. Change in alignment.
 - 3. Change in slope.
 - 4. Junction with other lines 8 inch in diameter or larger, (or 6 inch in diameter with multiple users/commercial).
 - 5. Within 30 feet of the upstream and downstream ends of an augured or trenched casing.
- B. Minimum size manhole shall be four foot (4') inside diameter.
- C. Five-foot (5') inside diameter manholes shall be used for all locations as follows:
 - 1. Intersection of three sewer lines.
 - a. A 6-inch multi-user/commercial line connecting to an 8-inch or larger main line.

- b. NOTE - No more than four lines will be permitted in one manhole.
 - 2. A change of grade with an algebraic difference of five percent (5.0 %).
 - a. A cast-in-place manhole is required.
 - 3. Change in alignment where the interior angle is greater than 70° but less than 90° and at 90° bends.
 - D. a. Pipeline alignments that have interior angles less than 70° shall have two manholes placed to divide the angle. Manholes shall be placed at the end of all lines with service connections attached to the line. This includes cul-de-sac lines and/or lines intended for future extension.
 - E. Manholes shall have a minimum of 0.2' fall within the trough.
 - F. Drop manholes shall be installed where a step of 20 inches or more is designed in the sanitary sewer line. (A drop of less than 20 inches is allowed with a slide.)
 - 1. Drop manholes shall be 5-foot diameter.
 - 2. All plumbing for drops shall be on the exterior of the manholes, with an additional manhole over the plumbing. The top of the pipe shall be cut-out to provide access.
 - G. Manholes shall be set to within 12 inches of the final street grade. The manhole shall be raised to grade with concrete or cast iron grade rings, and shall have a 8-inch thick, 12-inch wide concrete collar.

IV. Sewer service lateral size and placement

- A. All residential connections shall have an individual service connection. The sharing or joint use of residential lines is not allowed.
 - 1. In the case where a sewer lateral is extended to the building lot, but is at an elevation higher than the anticipated lowest floor elevation:
 - a. The developer shall define on the dedication plat the elevation of the sewer lateral and a note indicating gravity service is not available below that elevation.
 - b. The use of individual sanitary sewer pumps or lift stations is acceptable in locations where gravity sewer systems cannot be constructed, only if the pump and pressurized lines remain on the individual lot that utilizes the pump station.
 - 2. If one building lot requires a gravity sewer line to cross another downhill building lot, the separate sewer lateral shall be extended to the uphill lot, providing that a specific easement for that service line is granted by the downhill owner to the uphill owner. The use of public utility easements is not allowed.
- B. Residential service lines shall be 4-inch PVC pipe.
 - 1. The service lateral shall be installed 10 feet downstream from the center of the building lot.
 - 2. The service lateral shall be either a wye or a tee on the mainline.
 - 3. The service lateral shall be installed so that the top of the 4-inch line is not lower than the top of the mainline.
 - 4. The service lateral shall extend to the property on a minimum slope of 2.0%. A 6-inch line may be installed where the slope is 1.0%.
 - 5. The contractor will install identifier tape one foot over the top of the lateral

- for the entire length of the lateral, and the tape will say 'Sewer'.
- C. All commercial connections shall have individual connections based on unit ownership.
 - 1. If one building site has one or more buildings and has one owner or one group of owners, (such as a partnership or a condominium venture) but is divided into two or more units, only one connection per building will be allowed. An example may be a strip center, which is built on one lot but contains several stores. Only one service is provided.
 - 2. If several buildings are built on separate lots as part of an over-all development scheme, one connection per unit will be required.
 - D. Commercial connections will be required to submit calculations showing the anticipated peak flow demand OR the number of fixture units for the sanitary system.
 - 1. The International Plumbing Code will dictate the size of the line depending on the submitted information.
- V. Pipe line materials, construction and testing. (Testing to be witnessed by the Public Works Inspector)
- A. 4 inch and 6 inch service lines shall be PVC 3034 pipe.
 - B. 8 inch to 12 inch sewer lines shall be PVC ASTM 3034 pipe. Fifteen inch (15") and greater sewer lines shall be extra strength concrete.
 - 1. PVC pipe shall have a minimum of 12 inches of 1 1/2-inch minus sewer rock placed for bedding, blinding pipe sides and cover over the line.
 - 2. PVC lines shall be tested for deflection after the trench has been back-filled, compacted and/or settled.
 - 3. Concrete pipe shall be bedded in a minimum of 6 inches of gravel (to spring-line).
 - 4. The backfill around and over the pipe shall be compacted to a minimum of 95%. Import borrow material is required for backfill of trenches between November 1, and April 1. This requirement may be extended by the Public Works inspector, dependant on condition of native soils. See standard drawing ST-ST-01.
 - 5. Compaction tests shall be conducted every 200 linear feet along the trench for each lift. (Maximum lift is 18 inches).
 - C. All lines shall have an air test after all service lines are installed, all manholes are constructed, and at least 80% of the backfill material has been placed and compacted.
 - D. All lines shall be televised after the system has passed the air test.
 - 1. The video recording will be reviewed to determine that the laterals are correctly installed
 - 2. The recording will determine that no "low-spots" exist.
 - 3. The recording will determine that the line has been properly cleaned by using power flushing equipment, ensuring that all sediment and waste materials have been vacuumed from the system.
 - 4. The video shall display a continuous location identifier, showing the section being reviewed, by identifying the beginning and ending manhole,

- along with a footing indicator.
5. The Contractor shall furnish a CD of the lines televised. Each manhole section video shall be a separate file on the CD. The Contractor shall also furnish a map of the lines televised with each manhole/box labeled according to the corresponding number/name found on the video and a hard copy of an information sheet for each manhole section video which will need to include the development name, the excavation contractor name, and the location of any defects found.
- E. Manhole bases may be pre-cast using the design as a guide for stub orientation.
1. Pre-cast manholes are not allowed where the change of grade has an algebraic difference of 5.0 % or greater.
 2. Pre-cast manhole bases shall be placed on a minimum of 8 inches of gravel rock.
- F. Poured-in-place manhole bases shall conform to the following standards:
1. The concrete base shall be at least 10 inches thick.
 2. The sub-grade material shall be gravel rock where the existing material is wet or is unstable.
- G. Manhole sections shall be tongue & groove, pre-cast concrete sections with cast-in-place vinyl steps.
- H. The frame and cover shall be cast iron, similar to the D&L Supply model #A-1180.
- I. Steel Casing Construction
1. ASTM A53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield strength of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus a minimum 4 inches.
 2. Fillet-weld joints continuous around casing and reinforce joints to withstand jacking operations.
 3. Use casing spacers CCI Pipeline Systems Model CSP or CSC or acceptable equal to center pipe within casing. Minimum of three spacers per length of pipe.
 4. Install neoprene rubber end seal with stainless steel bands CCI Pipeline Systems Model ESC or ESW as applicable or acceptable equal at each end of casing.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

STORM DRAIN
AND SWPPP

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

STORM DRAINAGE IMPROVEMENTS

- I. Storm drain size determination
 - A. The minimum pipe line size for the public storm drain systems shall be 15 inch for the main line, (12 inch allowed for one inlet box at 1.0% minimum slope).
 - B. The maximum pipe line size for the public storm drain system shall be 48 inch.
 - C. The typical bicycle-safe inlet grate is assumed to have an inlet capacity of 3.0 cfs.
 - D. The use of the rational method is acceptable for developments less than 3 acres in size.
 1. Rational method - $Q=CIA$
 - a. Q, the total cubic feet per second discharge
 - b. C, the typical runoff coefficient
 - (1) 0.90 for asphalt, concrete, roofs
 - (2) 0.60 for gravel surfaces
 - (3) Residential
 - (a.) 0.20 for agriculture/ open space
 - (b.) 0.45 – R-1-6
 - (c.) 0.43 – R-1-8
 - (d.) 0.40 –R-1-10
 - (e.) 0.35 – R-S
 - (f.) 0.60 – 5.1-10 DU/Ac
 - (g.) 0.65 – 10.1+DU/Ac
 - (h.) 0.70 – Mobile Homes
 - (4) Non-residential
 - (a) 0.90 – CP, CH, P-B
 - (b) 0.75 – B-RP
 - (c) 0.90 – M-1, M-2
 - (d) 0.40 – Schools
 - (e) 0.70 – Churches
 - (f) 0.90 – Hospitals
 - c. I, the rainfall intensity; inches per hour
 - d. A, the land area in acres
 2. The drainage sub-basins shall be determined by the placement of inlet boxes, and by reviewing the land contour characteristics.

E. The following table provides the rainfall information for storm drainage calculations.

	10 year return	100 year return
5 min.	.34 - .37 (4.05 - 4.46)	.45 - .49 (5.41 - 5.92)
10 min.	.52 - .56 (3.1 - 3.36)	.7 - .77 (4.2 - 4.59)
15 min.	.62 - .68 (2.48 - 2.72)	.84 - .92 (3.36 - 3.68)
30 min.	.74 - .86 (1.48 - 1.72)	1.16 - 1.28 (2.32 - 2.56)
60 min.	.94 - 1.08 (.94 - 1.08)	1.50 - 1.62 (1.50 - 1.62)
360 min.	1.46 - 1.78 (.243 - .296)	2.14 - 2.54 (.356 - .423)
720 min.	1.82 - 2.30 (.1516 - .1916)	2.62 - 3.34 (.2183 - .2783)
1440 min.	2.14 - 2.78 (.089 - .0115)	3.18 - 3.90 (.1325 - .1625)

Total Rainfall in inches (Inches per hour)

The information in the above table was taken from a DAVIS COUNTY FLOOD CONTROL report distributed November 26, 1986 by Sid Smith, Davis County Flood Control Director. The report was prepared by WEATHERBANK for Davis County. Rainfall intensities for the 5 and 10 minute periods are interpolations of the Davis County data.

1. Areas located west of I-15 use the lower rainfall intensity amounts. Areas east of I-15 use the higher rainfall amounts.
 2. Storm drainage collections systems are designed for the 10 year return storm. Time of concentration will be used to determine the time of the storm, which generally ranges between 10 to 20 minutes.
 3. Storm drainage detention basins are sized by the 100-year return storm.
- F. The developer shall use other hydrologic/time routing programs for larger parcel development, and submit the results along with the storm drain master plan at the preliminary approval stage. Runoff coefficients listed in Section I “D” and rainfall intensities listed in Section I “E” shall be used. Calculations for weighted runoff coefficients can be submitted and used for commercial developments. Time of concentration of each sub-basin shall be used to determine the time of the storm.
- G. Storm drainage collections systems shall be designed for the 100-year return storm (minimum), if a low point is created with no street surface outfall. (See Streets pg. 3). The pipe shall be designed for the 100-year storm from the low point to a natural channel or detention basin.

- H. Storm drain pipes shall connect to and discharge into an approved storm drain system that is owned and maintained by Layton City, or a natural channel maintained by Davis County Flood Control, specified by County ordinance. Use of irrigation ditches, pipes, or other private drain system for discharge of storm water from the development is not allowed.
 - I. Lift stations or pumping of storm water is not allowed under any circumstance.
- II. Surface drainage control
- A. The developer shall prepare a drawing showing the proposed control of all surface drainage at rearlot and sidelot lines.
 - B. The developer shall install the necessary collection system to convey the surface drainage at rearlot and sidelot locations to the storm drain system.
- III. Storm drain line placement
- A. The storm drain line shall be installed on the south and west sides of the street.
 - B. The minimum slope on storm drain pipeline is 0.4%.
 - C. The following table indicates the centerline location of the pipe in relation to the back-of-curb location and the minimum storm drain depth from the top of the curb to the pipe flowline. (See Standard Drawing ST-SD-01 in Appendix.)

PIPE DIAMETER	HORIZONTAL OFFSET FROM BACK OF CURB TO CENTERLINE OF PIPE	VERTICAL OFFSET FROM TOP OF CURB TO PIPE FLOWLINE (minimum)
12"	.94'	2.75'
15"	.94'	3.00'
18"	1.25'	3.25'
21"	1.25'	3.50'
24"	1.25'	3.75'
27"	3.87'	4.00'
30"	4.00'	4.25'
36"	4.25'	4.75'
42"	4.50'	5.50'
48"	4.75'	6.00'

- D. The storm drain centerline shall not extend more than 3 feet beyond the lip of the gutter on either the pavement side or property side of the gutter.
- E. Storm drain lines shall not be placed in sidelot or rearlot property lines, or behind handicap ramps at intersections, unless approved by the City Engineer.
 - 1. The developer may be required to change street alignment to accommodate storm drain line placement.
 - 2. Storm drain lines that are approved for sidelot or rearlot installation shall have a 20-foot easement provided. Ten (10) feet will be added to the easement width for each additional utility.

3. Storm drain lines that are approved for sidelot or rearlot installation shall provide for vehicular access to all cleanouts or manholes.
- F. Lines shall be extended to the boundary of the development and sized according to the City's storm drainage master plan.
 - G. Developments, which do not require land drain systems, shall install drain lines with the storm drain system along the frontage of each lot. Each lot shall have access to the storm drain system or drain line.
 - H. The lowest finished floor elevation of any structure adjacent to a stream or channel must be a minimum of 1.0 feet above the FEMA 100 year flood plain boundary/elevation.
 - I. No structures are allowed within the FEMA 100 year flood plain boundary unless a COMR and LOMR has been filed and approved through FEMA.
 - J. A dissipation structure or mechanism is required on pipes with slopes greater than 20% or as required by the City Engineer. Anchors may also be required on steep slopes.
 - K. Storm drain pipes shall not be designed to function under pressure conditions.
- IV. Inlet / Cleanout box placement
- A. Cleanouts or manholes shall be installed as follows:
 1. Maximum spacing is 400 feet.
 2. Change in pipe alignment.
 3. Change in pipe slope.
 4. Junction with other lines.
 5. Within 10 feet of the upstream and downstream ends of an augured or trenched casing.
 - B. Inlet boxes shall be placed so that no more than 700 feet of street surface is allowed to "sheet drain".
 - C. 4-foot diameter manholes shall be installed on all required locations where the depth of the pipe (finish grade to top of pipe) exceeds 54 inches, or installation of standard manhole steps are required in the storm drain box.
 - D. A double inlet box shall be installed at low points of vertical curves and at the low points of downgrade cul-de-sacs or dead-ends. Storm drain pipe discharge shall be sized for 100-year return storm (minimum).
 - E. Adequate inlet capacity shall be provided to collect large area developed storm runoff. The total peak runoff determined by the rational method divided by 3.0 cfs will determine the minimum number of inlet grates required.
 - F. Inlet boxes shall be the "hooded" style of inlet box.
 - G. Pipes over 24 inch diameter require a combination box on the main line, so that the pipe is located in the asphalt street section, not under the curb and gutter.
- V. Pipeline materials, construction, and testing
- A. All storm drain lines in the public right of way shall be reinforced concrete pipe.
 - B. Concrete pipe shall be bedded in a minimum of 6 inches of gravel (to spring-line).
 - C. The backfill around/over the concrete pipe shall be compacted to a minimum of 95%. Import borrow material is required for trench backfill between November 1 and April 1. This time period may be extended by the Public Works inspector,

dependant on condition and quality of native soils.

- D. Compaction test shall be conducted every 200 lineal feet along the trench for each lift. (Maximum lift is 18 inches).
- E. ADS or other alternative pipe to be used outside of the public right of way, which shall be owned and maintained by Layton City, shall be identified as an alternate material on the preliminary plans and will require approval by the City Engineer. Bedding detail requirements shall be identified and approved on the preliminary plans.
- F. When storm drain pipes run through a clean-out/inlet and the outlet increases in size, the tops of the pipes shall be aligned.
- G. All storm drain lines shall be televised after roadbase installation and prior to asphalt placement.
 - 1. The video recording will determine that no “low spots” exist.
 - 2. The video recording will determine that the line has been properly cleaned, using power-flushing equipment. Sediment and waste material shall be vacuumed out of the system.
 - 3. The video shall display a continuous location identifier, showing the section being reviewed, by identifying the beginning and ending manhole or box, along with a footage indicator.
 - 4. The Contractor shall furnish a CD of the lines televised. Each manhole section video shall be a separate file on the CD. The Contractor shall also furnish a map of the lines televised with each manhole/box labeled according to the corresponding number/name found on the video and a hard copy of an information sheet for each manhole section video which will need to include the development name, the excavation contractor name, and the location of any defects found.
- H. Steel Casing Construction
 - 1. ASTM A53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield strength of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus a minimum 4 inches.
 - 2. Fillet weld joints continuous around casing and reinforce joints to withstand jacking operations.
 - 3. Use casing spacers CCI Pipeline Systems Model CSP or CSC or acceptable equal to center pipe within casing. Minimum of three spacers per length of pipe.
 - 4. Install neoprene rubber end seal with stainless steel bands CCI Pipeline Systems Model ESC or ESW as applicable or acceptable equal at each end of casing.

VI. Storm detention basins

- A. Storm detention basins shall be sized for the 100-year return storm. The typical release rate will be 0.2 cfs/acre. However, this rate may be decreased by the City Engineer. Local basins are not allowed, unless recommended by the Storm Water Master Plans, and approved by the City Engineer. The size and location will be determined by the City Engineer.

1. Underground detention will only be allowed in high density urban areas and must be approved by the City Engineer.
 2. Volume in a pipe system will not be considered as storage.
- B. The developer will be required to extend discharge lines to the basin or the nearest collection point and/or collection line.
 - C. The developer may be required to provide the land for the regional detention basin as determined by the City Engineer.
 - D. The maximum depth for detention basins shall be 42 inches, plus an additional 12-inches of free board to the top of the berm. Depths greater than 3.5 feet require the City Engineer's approval.
 - E. The maximum slope on a detention pond berm shall be 3:1 (H:V). Minimum pond floor slope is 1.0%. The developer is required to submit detailed construction specifications for detention ponds and berms. Minimum requirements include dimensions of berm, materials, specifications, lift requirements and compaction, storage capacity, high water mark and top of berm elevations.
 1. The detention basin shall include a separate inlet and outlet pipe with a control structure located in the pond berm. A detail of the control structure shall include an orifice plate and overflow wall in the structure. A bypass pipe for low flows may be required as part of the detention basin.
 - F. Detention ponds shall have a gravity discharge pipe connection to an approved storm drain system.
 - G. Detention ponds will be surveyed before they are landscaped to verify the required capacity has been constructed.
 - H. The Developer will be required to landscape the detention basin. A landscaping plan shall be submitted for review and approval.
 - I. Clay core for pond berms and floor may be required. Specifications for clay material are available in the Engineering department.
 - J. A sub-surface drain around the perimeter of the pond, one (1) foot below the pond floor, may be required.
 - K. As-builts of the pond will be required.
 - L. Maintenance agreements are required for detention basins and other post construction BMP's located on private property.

STORM WATER POLLUTION PREVENTION REQUIREMENTS

I. STORM WATER POLLUTION PREVENTION PLAN

- A. A Storm Water Pollution Prevention Plan (SWPPP) is required for final approval. The SWPPP shall be prepared according to the Utah Pollutant Discharge Elimination System (UPDES) – General Permit for Discharges from Construction Activities and submitted as part of the construction plans. The SWPPP plans shall be on sheets the same size as the construction plans and will meet the requirements of the construction permit and include sufficient information to evaluate the potential impacts of all proposed development of the site, both present and future, on the water resources, and the effectiveness and acceptability of the measures proposed for managing storm water generated at the project site. The intent of the review process is to determine if the SWPPP meets the permit’s requirements and the control measures proposed for the project will be adequate for the management of storm water run-off from the proposed development. For development or redevelopment occurring on a previously developed site, an applicant shall be required to include within the storm water pollution prevention plan, measures for controlling existing storm water runoff discharges from the site in accordance with the standards of this ordinance.
- B. The SWPPP shall include an erosion control plan which implements the proposed “best management practices” (BMP’s) to prevent erosion, control sediment, and address storm runoff leaving the construction site. The plans shall explain in text and drawings the Best Management Practices (BMP’s) to be used and the locations of the proposed BMP’s. A manual with a listing of BMP’s for Davis County is available in the Layton City Engineering Department, or on-line at <http://www.laytoncity.org/public/Depts/PubWorks/downloads.aspx>. The SWPPP must include at minimum the following BMP’s:
1. Concrete washout
 2. Equipment and vehicle tracking device/wash down area
 3. Inlet protection
 4. Run-off containment
 5. Temporary and permanent slope stabilization
 6. Portable toilet protection
 7. Inspection sheet and schedule
 8. Name and contact information of the contractor’s/owner’s certified inspector
- C. The Utah Administrative Code (UAC) R317-8-3.9 requires the operator(s) (owner, developer, contractor, etc.) of a construction site which will grade one acre or more per common plan (includes all phases of development) to obtain coverage under the UPDES General Permit for Storm Water Discharges from Construction Activities. A construction storm water activity permit issued by the Utah State Division of Water Quality shall be obtained for final approval. A copy of the permit (Notice of Intent) shall be submitted to the City before a pre-construction meeting can be scheduled. The original permit, as well as the SWPPP shall remain on the construction site during the entire construction period. The construction storm water activity permit can be obtained on-line from the State of Utah, Division of Water Quality. (See: <https://secure.utah.gov/stormwater>, and see “Online Application Process”).

- D. Erosion control measures shown on the plans shall be constructed prior to any other construction associated with the development. These measures shall be maintained and adjusted as needed throughout the life of the project.
- E. The Storm Water Pollution Prevention Plan shall be prepared in accordance with the requirements of Chapter 13.16 of the Layton City Code, adopted by Ordinance 06-41.

II. REVIEW AND APPROVAL

- A. The Public Works Engineering Department will review each Storm Water Pollution Prevention Plan to determine its conformance with the provisions of Chapter 13.16 of the Layton City Code. As part of the development review memo, the Public Works Engineering Department shall:
 - 1. Approve the Storm Water Pollution Prevention Plan;
 - 2. Approve the Storm Water Pollution Prevention Plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this regulation, and issue approval subject to these conditions; or
 - 3. Disapprove the Storm Water Pollution Prevention Plan, indicating the reason(s) and procedure for submitting a revised plan and/or submission.

III. INSPECTION

- A. An inspection of the installed BMP's shall be completed prior to any other construction associated with the development. The contractor is responsible for contacting the Public Works Inspector assigned to the project or the Erosion Control Inspector, or the Public Works Department at 801-336-3700 to schedule an inspection. Once an approved written inspection report has been completed, construction of the development may proceed.
 - 1. Periodic inspections, citations and violation notices may be completed by the Layton City Public Works Inspectors or Erosion Control Inspector, the City Building Inspectors, the City Ordinance Enforcement Officer or other designated agents as appointed by the Public Works Department.
 - 2. Any corrective actions listed in the inspection report as requiring immediate attention shall be addressed within 1 working day or a notice to stop work order may be issued.
- B. As Built Plans: Any storm water management practices located on-site after final construction is completed require submittal of actual "as built" plans. The plans shall show the final design specifications for all storm water management facilities and shall be certified by a professional engineer. These as-built plans shall be included with the final construction as-built plans as required by Layton City Development Guidelines and Design Standards. A final inspection by the Layton Public Works Department is required before the release of any performance securities can occur.

IV. DESIGN CRITERIA

- A. Storm water discharges from land uses or activities with higher potential pollutant loadings, known as "hotspots," may require the use of specific structural BMP's

and pollution prevention practices. Oil separators may be required on all sites identified as “hotspots” such as commercial land use sites, parking areas other than residential, mechanic shops, fuel stations, or associated parking areas, as determined by the City Engineer. Oil separators shall be capable of removing particulates down to 150 microns. Design and sizing requirements of oil separators shall be reviewed by the City Engineer prior to installation.

- B. Storm water discharges to critical areas with sensitive resources (i.e., cold water fisheries, recharge areas, water supply reservoirs) may be subject to additional performance criteria, or may need to utilize or restrict certain storm water management practices.
- C. If a development discharges into a waterway that is maintained by Davis County Public Works, the developer will be required to fulfill all requirements as set by Davis County Public Works as it relates to regulating the storm water that discharges into the channel. The developer is required to submit to Layton City a letter from Davis County Public Works stating that they accept the methods of storm water pollution control as shown on the development plans.
- D. Conveyance Issues: All storm water management practices shall be designed to convey storm water to allow for the maximum removal of pollutants and reduction in flow velocities. Best management practices (BMP’s) shall be designed to remove total suspended solids load (TSS) to the maximum extent practical. This shall include, but not be limited to:
 - 1. Maximizing of flow paths from inflow points to outflow points
 - 2. Protection of inlet and outfall structures
 - 3. Elimination of erosive flow velocities
 - 4. Providing of under drain systems, where applicable
- E. Notification of Spills. Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, or water of the U.S. said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services (911 or Fire Dispatch: 801-497-8300 of Davis County Environmental Health: 801-525-5100). In the event of a release of non-hazardous materials, said person shall notify the authorized enforcement agency in person or by phone or facsimile no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the Layton City Public Works Dept., 1925 North Fort Lane, Layton, UT 84041, within three business days of the phone notice.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

LAND DRAIN SYSTEMS

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

LAND DRAIN IMPROVEMENTS

- I. Land drain size determination
 - A. The minimum land drain size shall be 8 inch.
 - B. The land drain shall be sized to carry 0.8 cfs per 100 acres of developed area.
 - C. The land drain line shall have a minimum flow velocity of 1 fps.
 - D. The minimum slope on a land drain mainline pipe shall be 0.4%.

- II. Land drain line operation
 - A. Land drain lines shall be required in all areas of the City where footing and foundation drains are required per Layton City Municipal Code 18.40.020. Land drains shall also be required in all areas identified in the Geotechnical Report and as determined by the City Engineer. The proposal to place homes on-grade will not eliminate the need for the land drain system.
 - B. A land drain system shall be a separate system from the storm drain system. Land drain laterals shall not connect to storm drain lines.
 - C. Individual pumps or lift stations that serve one resident or business unit are allowed under specific guidelines in Section V. Combined lift stations or pumps that provide land drain service for more than one residential home or business are not allowed under any circumstance.

- III. Land drain line placement
 - A. The land drain system lines are typically placed 10.0 feet north and east of the street centerline.
 - B. Land drain lines shall not be placed in sidelot or rearlot property lines unless all alternatives are exhausted.
 1. The developer may be required to change street alignment to accommodate land drain line placement.
 2. Land drain lines that are approved for sidelot or rearlot installation shall have a 20-foot easement provided. 10 feet will be added to the easement width for each additional utility.
 3. Land drain lines that are approved for sidelot or rearlot installation shall provide for vehicular access to all manholes.
 - C. The lines shall be installed with a minimum cover of 4.5 feet from the top of the pipe to the finish ground elevation.
 - D. The lines should run parallel to and between 0.5 feet and 1.0 foot above or below the sanitary sewer line. The design should insure that there will be no conflict between the land drain line laterals and the sanitary sewer line laterals.
 - E. The lateral line will be installed within 5 feet of a common property line, at the lowest corner of the property. The contractor will install identifier tape one foot over the lateral, running the length of the lateral, with the wording 'Land Drain' on tape.

- IV. Manhole size and placement determination.
 - A. Manholes shall be installed as follows:

1. Maximum spacing is 400 feet.
 2. Change in alignment.
 3. Change in slope.
 4. Junction with other lines.
 5. Within 10 feet of the upstream and downstream ends of an augured or trenched casing.
- B. Minimum size manhole is four-foot (4') inside diameter.
- C. Five-foot (5') inside diameter manholes shall be used for all locations as follows:
1. Intersection of three land drain lines.
 - a. A 6-inch multi-user/commercial line connecting to an 8 inch or larger requires a manhole.
 - b. NOTE - No more than four lines will be permitted in one manhole.
 2. Change of grade with an algebraic difference of five percent (5.0 %).
 - a. Cast-in-place manhole required.
 3. Change in alignment where the interior angle is greater than 70° but less than 90° and at 90° bends.
 - a. Pipeline alignments that have interior angles less than 70° shall have two manholes placed to divide the angle.
- D. Manholes shall be placed at the end of all lines with service connections attached to the line. This includes cul-de-sac lines, and/or lines intended for future extension.
- V. Land drain service lateral size and placement
- A. All residential connections shall have an individual service connection. The sharing or joint use of lines is not allowed.
1. In the case where a land drain lateral is extended to the building lot, but is at an elevation higher than the anticipated lowest floor elevation:
 - a. The developer shall define on the dedication plat the elevation of the land drain lateral and a note indicating gravity service is not available below that elevation.
 - b. The use of individual land drain pumps or lift stations is acceptable in locations where gravity drain systems cannot be constructed, only if the pump and pressurized lines remain on the individual lot that utilizes the pump station.
- B. Residential service lines shall be 4-inch PVC pipe.
1. The service lateral shall be installed 5 feet uphill from the downstream property corner.
 2. The service lateral shall be either a wye or a tee on the mainline.
 3. The service lateral shall be installed so that the top of the 4-inch line is no lower than the top of the mainline.
 4. The service lateral shall extend to the property on a minimum slope of 2.0%.
 5. The contractor will install identifier tape one foot over the top of the lateral the entire length of the lateral and the tape will say "Land Drain."
- C. All commercial connections shall have individual connections based on unit

ownership.

1. If one building has one owner but is divided into two or more units, one connection will be allowed. If several buildings are built on separate lots or on a single lot with different names, one connection per unit will be required.

VI. Pipe line materials, construction and testing.

- A. 4 inch and 6 inch service lines shall be PVC 3034 pipe.
- B. 8 inch to 12 inch land drain lines shall be PVC ASTM 3034 pipe. 15-inch and larger lines shall be extra strength concrete.
 1. PVC pipe shall have a minimum of 12 inches of 1 1/2-inch minus sewer rock, for bedding, blinding pipe sides and cover over the line.
 2. PVC lines shall be tested for deflection after the trench has been backfilled, compacted and/or settled.
 3. Concrete pipe shall be bedded in 6 inches of gravel (to spring-line).
 4. The backfill around and over the pipe shall be compacted to a minimum of 95%. Import borrow material is required for trench backfill between November 1 and April 1. This requirement may be extended by the Public Works inspector, dependant on the condition and quality of the native soils.
 5. Compaction test shall be conducted every 200 linear feet along the trench for each soil lift. (Maximum lift is 18 inches).
- C. All land drain lines shall be televised after construction.
 1. The video recording will be reviewed to determine that the laterals are correctly installed.
 2. The recording will determine that no "low-spots" exist.
 3. The recording will determine that the line has been properly cleaned by power flushing equipment, ensuring that all sediment and waste materials have been vacuumed from the system.
 4. The Contractor shall furnish a CD of the lines televised. Each manhole section video shall be a separate file on the CD. The Contractor shall also furnish a map of the lines televised with each manhole/box labeled according to the corresponding number/name found on the video and a hard copy of an information sheet for each manhole section video which will need to include the development name, the excavation contractor name, and the location of any defects found.
- D. Manhole bases may be pre-cast using the design as a guide for stub orientation, and shall have a trough design similar to sanitary sewer manholes.
 1. Pre-cast manholes are not allowed where the change of grade has an algebraic difference of 5.0 % or greater.
 2. Pre-cast manhole bases shall be placed on a minimum of 8 inches of gravel rock.
- E. Poured-in-place manhole bases shall conform to the following standards:
 1. The concrete base shall be at least 10 inches thick.
 2. The sub-grade material shall be gravel rock where the existing material is

wet or is unstable.

- F. Manhole sections shall be tongue & groove, pre-cast concrete sections with cast-in-place vinyl steps.
- G. The frame and cover shall be cast iron, similar to the D&L Supply model #A-1180.
- H. Steel Casing Construction
 1. ASTM A53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield strength of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus a minimum 4 inches.
 2. Fillet weld joints continuous around casing and reinforce joints to withstand jacking operations.
 3. Use casing spacers CCI Pipeline Systems Model CSP or CSC or acceptable equal to center pipe within casing. Minimum of three spacers per length of pipe.
 4. Install neoprene rubber end seal with stainless steel bands CCI Pipeline Systems Model ESC or ESW as applicable or acceptable equal at each end of casing.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

GEOTECHNICAL INFORMATION AND
IRRIGATION SYSTEM IMPROVEMENTS

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

GEOTECHNICAL INFORMATION

- I. Minimum Information required for a Geotechnical Report
- A. Plan view showing boring locations
 - 1. Boring logs¹
 - a. Elevation
 - b. Drill or backhoe type
 - c. Samples
 - d. Field tests
 - e. Ground water level fluctuations
 - B. Laboratory tests-Performed in general accordance w/ ASTM
 - 1. Sieve analysis
 - 2. Atterberg limits
 - 3. CBR
 - 4. Direct Shear
 - 5. Consolidation
 - 6. Identify soils according to USCS
 - 7. Moisture density curves(s)
 - C. Engineer Analysis and recommendations
 - 1. Foundations and Retaining Walls
 - a. Allowable bearing capacity
 - b. Lateral loads Friction coefficients
 - c. Settlement
 - d. Drainage - Backfill information
 - e. Seismic loading
 - 2. Pavements
 - a. Traffic
 - b. Subgrade support value (CBR)
 - c. Pavement, roadbase, and subgrade thickness
 - d. Compaction requirements, including maximum lift thickness of backfill, and acceptability of backfill with native soils. Minimum requirements are set by City standards.
 - 3. Special Consideration
 - a. Site preparation - use of on-site materials
 - b. Expansive soils
 - c. Collapsible soil
 - d. Slope stability
 - e. Shallow ground water level - drainage, etc.
 - f. Surcharge / preloading (if used, developer needs to install settlement

¹ - The number and depth of borings/pits are to be determined for each specific project. However, as a minimum, the depth should be deeper than any anticipated excavation (cuts, foundations, utilities, etc.). The number of borings shall be determined by the geotechnical engineer/geologist and shall be compatible with the complexity/simplicity of the geology, subsurface conditions and the type of project.

- monitors and elevations benchmark.)
- g. Identification of geological hazards

D. Following the construction of the utilities in the street within the development and prior to submittal of the Final Dedication Plat for signatures, the Developer may be required to submit written documentation from the consulting Geotechnical Engineer, the Design Engineer and the Contractor, indicating that each have received and read the Geotechnical Report and have incorporated the recommendations into the design and construction of the development. (A standard form can be obtained from our Legal Department.)

II. Subgrade Soil Classification

A. The following table defines the soil classification:

Subgrade Soil Classification		
Subgrade Class	Characteristics of Soil	CBR Value
Very Poor Subgrade Soil	Clay & fine silt - Extremely soft and plastic when wet	<3
Poor Subgrade Soil	Clay, fine silt and sandy soils – soft and plastic when wet	3 - 8
Medium subgrade soil	Silty sands and some clayey sand-gavels, retain moderate degree of firmness with moisture	8 - 17
Good to Excellent subgrade soil	Gravelly sand, sandy gavels, retains strength when saturated.	>15

III. Armor coating or facing of soil slopes

Two acceptable types of armor facing

1. Well graded pit run gravel	Sieve Size	Percent Passing	Maximum Slope Angle H:V Height		
			<6'	>6'	>12'
	8"	90-100%	1½:1	1 ¾:1	2:1
	3"	60-90%			
	1"	40-80%			
	½"	30-50%			
	#4	20-40%			
	#200	0-10%			

2. Sieve Size	Filter Fabric & Rock Percent Passing	Maximum Slope Angle H:V		
		Height <6'	>6'	>12'
36"	90-100%	1:1	1¼:1	1½:1
18"	50-100%			
12"	20-100%			
4"	0-90%			
2"	0-20%			
#200	0-10%			

IV. Use of Filter Fabric for Street Construction

Normal woven or non-woven filter fabric is a viable material to use when a separation layer is needed over a soft subgrade and beneath granular fill. These materials provide some minor reinforcing for supporting loads, but primarily act to prevent the movement of muck fines up into the overlying crushed base or other clean granular material.

If reinforcement of soft subgrade is desired, a geo grid should be designed for the intended purpose.

V. Flowable fill

Utility excavations and subsequent backfill are the source of many problems for paved streets. It is extremely difficult to nearly impossible to place the utility, and backfill the trench, so that some subsequent differential settlement does not occur at the pavement surface. Cost associated with supplying, placing in lifts, and compaction of conventional backfill materials is high and results are unsatisfactory to marginal. Therefore, "flowable fill" is a preferential backfill alternative for many utility installations beneath paved streets. Flowable fill generally consists of the following mix design or mixture of materials:

Per Cubic Yard

- 50 pounds of Portland Cement
- 200 to 400 pounds of Fly Ash
- 70% sand, 30% gravel by weight
- 35 to 40 gallons of water

This generally costs more than conventional backfill, but is worth the extra cost. Another alternative that now offers considerable advantage, in that utility cuts through the pavement are eliminated, is trench-less technology. Use flowable fill prior to the application of asphalt finished surface in all excavations of twelve inches (12") or less in width.

VI. Trench-less Technology

With recent advances in trench-less technology/directional drilling, many utilities can be placed beneath streets without making a pavement utility cut. This procedure should be used whenever feasible. When potholes are used to determine the location of utilities, pothole repairs will need to be made by back filling the hole with flowable fill and using Perma-Patch

or an equivalent for the top three (3) inches. Contractor may not pothole for utilities when depths can be determined by lifting manhole or valve covers.

VII. Grading permit requirements.

- A. Submit site plan for review and approval. The site plan must include a SWPPP; limits of excavation; re-vegetation plan; site stabilization plan/ truck route to haul material and location of haul site. Additional items may be required based on a review of the submitted items and size of grading site.

IRRIGATION SYSTEM IMPROVEMENTS

- I. Pressure irrigation systems
 - A. In areas served by Kays Creek Irrigation Company, Weber Basin Water District or by Davis Weber Canal Company, the developer shall install the pressure irrigation system.
 - 1. The system shall be installed if water is available to the site or is in the future service area for secondary water.
 - 2. The system shall be installed if water is apportioned to the land.
 - a. No water may be moved or transferred from the site without Layton City Council approval.
 - B. Lines 8 inches and larger shall be installed in the asphalt adjacent to the lip of the curb on either side of the street to avoid crossing the centerline at street curves. Lines 6 inches and smaller shall be installed in the 7.5 foot park strip or in the asphalt adjacent to the lip of the curb as directed by the irrigation company. If the park-strip is 4.5 foot wide, the location of the lines will be determined by the City Engineer and Irrigation Company. The design shall be reviewed by the City Engineer and approved by the irrigation company.
 - 1. The City Engineer may direct the lines to be installed at depths or locations different than the irrigation company minimum standards.
 - 2. The irrigation company shall provide a written statement approving the drawings before any final submittal is presented.
 - 3. If the secondary water provider is Davis and Weber Canal Company or Kays Creek Irrigation Company a copy of the signed application for service must be submitted for final approval in addition to approval of the drawings.
 - 4. Valve boxes shall have a triangle shape lid to distinguish from the circular culinary valve lid.
 - 5. PVC pipes shall be purple in color and tracing wire shall be coated black to distinguish from the blue culinary water lines.
- II. Flood irrigation systems
 - A. The developer shall provide adequate conveyance for flood irrigation wastewater to pass around a developed subdivision.
 - 1. The conveyance may be either a pipe system or a dug channel. Submit a written approval for the relocation of the system.

A pipe will be required if the system crosses any street or access way.
 - 2. The City Engineer and the local user shall approve the conveyance system.
 - B. The developer will be required to install a pipe system to convey any supply or waste ditch that passes through the proposed subdivision.
 - 1. The pipe size shall be determined and approved by the local user and City Engineer. The pipe system shall meet all standards and specifications defined for storm drain pipe systems.
 - 2. The pipe system shall be installed either in the park strip area or behind the sidewalk if there are any diversion or control structures.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

DEDICATION PLAT, WARRANTY AND
UTILITY SYSTEM ACCEPTANCE

APRIL 2016

James "Woody" Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

DEDICATION PLAT CONSIDERATIONS

- I. Information to be included
 - A. The name of the subdivision, in bold heading, at the top of the drawing (include PRUD if applicable).
 - B. Section, Township and Range
 - C. City and County name
 - D. Signature blocks for the City Attorney, City Planning Commission, City Engineer, City Mayor, Recorder, and major utility companies, with easement shown on plat.
 - E. Signature blocks for owner dedication with proper attest blocks
 - F. Owner's dedication narrative
 - G. Boundary description narrative
 - 1. Shall include the point of beginning tied to a found Davis County section monument.
 - 2. Shall have a tie to a second found Davis County monument for the establishment of the basis of bearing.
 - H. Boundary description, as a drawing, matching the narrative.
 - I. Dedication plat restrictions i.e. Utility restrictions, setback restrictions, access restrictions, or others are required as part of development.
 - J. Types and locations of all existing and proposed easements
 - K. Public utility and drainage easements are required in all subdivisions. The minimum width of easements shall be:
 - 1. On rear lot lines; ten feet on each side
 - 2. On front lot lines; seven feet
 - 3. On side lot lines; a total of ten feet with not less than three feet on one side of the lot line and seven on the other.
 - L. Front, side, and rear easements are required on all lots. In circumstances where a City utility traverses a lot or parcel to be developed, the easement width shall be provided as required by the City Engineer.
 - M. Slope easements shall be shown where required.
 - N. Buildable area must be shown on plat.
- II. Description closure requirements
 - A. The boundary shall close to within 0.015 feet.
 - 1. The boundary description shall be traversed in a clockwise direction around the subdivision boundary.
 - 2. The street centerline shall close to the boundary within 0.015 feet. The centerline is placed using the boundary information.
 - 3. Individual lot boundaries shall close to within 0.015 feet to the street boundary and to the subdivision boundary.
 - 4. The boundary shall match adjacent parcels.
- III. Centerline information
 - A. Distances from monument to monument.
 - B. Distance from PC to PT.

- A. Distance from centerline to right-of-way (Street ½ width)
 - D. Curve data to include
 - 1. Delta
 - 2. Radius
 - 3. Chord bearing and distance, and arc length.
 - a. Curves not tangent to the approach and departure segments shall also show the bearing to the center of the curve or the bearing for a tangent approach line.
 - 4. Prepare a table for numerous curves
- IV. Property and lot information
- A. The lot number shall use the phase number as the first digit.
 - 1. If the lot is #1 in phase 2, the lot number will be 201; or 2001.
 - B. The square footage of the lot shall be shown.
- V. Title report information
- A. The title report is used to determine the proper owner's signature blocks; the location of existing easements; and to determine that the dedication plat and the property owned are the same parcel.
 - 1. The title report and the dedication plat shall match exactly or include the entire subdivision and additional property. The report cannot be smaller than the subdivision.
 - 2. All easements shown on the title report shall be shown on the dedication plat AND the easement owner shall sign the dedication plat
 - 3. The City Attorney will review the title report and may direct the owner to remove specific easements or other encumbrances.
 - 4. All taxes shall be paid current prior to recording at County.
- VI. Davis County Recorder Standards
- A. The plat shall have a border size of 19" X 30"
 - B. The notary seal or lettering shall be clear and legible.
 - C. The subdivision title or heading shall be consistent throughout all narratives.
 - D. The owner(s)' signatures shall be exactly as found on the title report.
 - E. The scale shall be clearly shown and shall conform to the accepted standard, i.e. 1"= 20', 30', 40', 50', 60' or 100'.
 - F. All names shall be consistent on all narratives.
- VII. Vacating Recorded Easements
- A. A petition to vacate an easement must be filed with the Community Development Department for all recorded easements to be vacated
 - B. The developer must submit the legal description for the easement to be vacated.
 - C. All easements to be vacated must be approved by the City Council.
 - D. Easements must be vacated prior to the recording of the dedication plat.
- VIII. Quit Claiming Property
- A. The developer must submit the legal description for the property to be quit claimed from the City.

- B. All property to be quit claimed must be approved by the City Council by ordinance.
- C. Quit Claims must be recorded prior to the recording of the dedication plat.

LOT LINE ADJUSTMENT

To adjust a lot line between two private properties, legal descriptions of the existing lots and the new lots must be submitted for review and approval. The legal descriptions for the lots will need to include the establishment of new public utility easements (dedication to the City) adjacent to the new lot lines (typically 5 feet each side of the new lot line.) The legal descriptions will need to be submitted on a deed form with proper signatures. The Mayor will sign the documents as acceptance of the new PUE for the City. Once the document is approved, the deeds, along with the engineering staff report, will be filed with the County, which includes the exchange of title, an acknowledgement by each party, and the nod and new descriptions. A copy of the recorded document will need to be submitted to the City for our records. Recorded copies of the documents will need to be received prior to any development affecting the lot line adjustment.

If the lot line adjustment is in a subdivision with existing public utility easements (PUE's) the existing PUE's will need to be abandoned by submitting letters from the power, gas, phone, and any other applicable utility companies acknowledging they have no utility infrastructure in the existing easement and no interest in maintaining the easement. The City will abandon the existing PUE's by ordinance at a City Council Meeting. If the lot line is moved a minimal distance, the PUE's may not have to be abandoned and re-established.

WARRANTY

The start of the one-year warranty period for the culinary water system, sanitary sewer system, land drain system, storm drain system, lighting system, and street improvements will begin once the public works inspector notifies the Community Development Department all the construction has been completed including the 'punch list' items. The Community Development Director will issue a letter to the Developer with the warranty start date. At this time the escrow will be reduced to the 10 percent guarantee amount. Invoices are required for all releases from the escrow account and all items on the invoice must be included in the cost estimate used to establish the bonding amount.

The developer is responsible for ALL maintenance of the warranty items throughout the warranty period, even though the systems may be in use and operating. Development warranty periods will not begin during the months of November, December, January, or February.

At the end of the one year warranty period a final inspection will be completed and once all items on the final inspection punch list are completed a letter of FINAL SUBDIVISION ACCEPTANCE is issued by the Community Development Director to the Developer. This is typically the same time that the escrow is released and the City collects the funds for the slurry seal.

The developer's subdivision contract allows for a maximum of 18 months to complete all work. The contract will begin the day the preconstruction meeting is held. Following the 18 month period (or sooner if the work is completed earlier) and if the work is completed and is in satisfactory condition, the one-year warranty period will begin. If the work is not complete, the subdivision will be "red-tagged", no building permits will be issued, and no escrow funds will be released. The developer will be given notice to complete the project or apply for a time extension.

The City Engineer will determine if an extension is allowable. Extensions maybe allowed due to weather or previously unknown site conditions. If no extension is given, the developer will be required to complete the work or the City will complete the work and use the funds in the escrow account to cover all financial encumbrances.

The developer will be responsible for the placement of all sidewalk within the development. The placement of the sidewalk may be delayed until the actual construction of a house OR prior to the end of the 18 month contract period whichever occurs first.

AS-Constructed drawings - The developer is required to submit as-constructed drawings to the engineering department prior to the issuance of any building permits. The drawings shall show the location and size of all water service lines and meters, sanitary service lines, land drain lines, irrigation service lines and meters at each building lot or landscape area maintained by the HOA. The location shall be referenced to a property line. As-builts shall typically consist of 1-2 sheets and show plan view (no profiles) of the constructed improvements, with rim, grate, and/or top of box elevations, and flow elevations of all gravity fed utilities.

UTILITY-SYSTEM ACCEPTANCE

Sanitary Sewer System - The bonding held in escrow for the construction of the sanitary sewer system may be released once the following items have been completed: the lines have passed the required air test; the lines have been video recorded and the recording has been reviewed and found acceptable; the lines have been adequately backfilled, with required compaction tests; all laterals have been installed. The manholes are not placed to final grade, nor is the system acceptable for use at this time. The initial acceptance of the sanitary sewer system and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the sanitary sewer system will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Storm Drain System - The bonding held in escrow for the construction of the storm drain system may be released once the following items have been completed; the lines have been reviewed for alignment and found acceptable; the lines have been video recorded and the recording has been reviewed and found acceptable; the lines have been adequately backfilled, with required compaction tests. The cleanout and/or inlet boxes have not been placed to final grade at this time. The initial acceptance of the storm drain system and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the storm drain system will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Land Drain System - The bonding held in escrow for the construction of the land drain system may be released once the following items have been completed; the lines have been reviewed for alignment and found acceptable; the lines have been video recorded and the recording has been reviewed and found acceptable; the lines have been adequately backfilled, with required compaction tests; all laterals have been installed. The manholes are not placed to final grade, nor is the system acceptable for use at this time. The initial acceptance of the land drain system and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the land drain system will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Culinary Water System - The bonding held in escrow for the construction of the culinary water system may be released once the following items have been completed; the lines have been reviewed for alignment and found acceptable; the lines have passed the required static pressure test and the lines have passed the required microbiologic test. The water valve boxes have not been placed to final grade. The fire hydrants are installed but no acceptance test has been preformed. The water service lines have been installed but are not acceptable until the final placement of the meter boxes and the curb and gutter is complete. The initial acceptance of the culinary water system and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the culinary water system will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Curb and Gutter Placement - The bonding held in escrow for the construction of the curb and gutter may be released once the following items have been completed; the curb and gutter, including the inlet box covers and grates and cleanout box covers and decks and all handicap ramps. The curb and gutter has been tested for proper flow and the “low spots” and “bellies” will be removed and replaced. The initial acceptance of the concrete and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The developer will be cautioned that any damaged concrete between this time and the time of the final inspection must be removed and replaced. The final acceptance of the curb and gutter will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Water Service Meter Box Construction - The bonding held in escrow for the construction of the water service meter box may be released once the following items have been completed; the water service lines and the meter boxes have been reviewed for alignment and grade; the proper angle stops, yoke, fittings, backflow device, box, cover and frame have been reviewed and are acceptable. The initial acceptance of the lines/meter boxes and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The developer will be cautioned that the placement and the condition of the water meter structure will remain the developer’s or property owner’s responsibility until the meter is set.

Sub-grade and Roadbase Placement - The bonding held in escrow for the placement of the sub-grade and roadbase may be released once the following items have been completed; the sub-grade and roadbase have been placed to the proper grade and depth. The asphalt surface may be placed within five days of the roadbase approval or the developer will be required to obtain an additional inspection for the roadbase surface approval. All manhole covers and water valve covers within the roadway area are not to the final grade and the subdivision is NOT ready for occupancy. The initial acceptance of the subgrade and roadbase and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the sub-grade and roadbase placement will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Sidewalk Placement - The bonding held in escrow for the construction of the sidewalk may be released once the sidewalks have been installed at specific lots or locations. The escrow for those locations will be released. The initial acceptance of the concrete and the beginning of the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The developer will be cautioned that any damaged concrete between this time and the time of the final inspection must be removed and replaced. The final acceptance of the sidewalk will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.

Approval for Permits Prior to the Asphalt Placement - Approval for the issuance of building permits prior to the asphalt placement will be allowed if the roadbase is at final grade; the curb & gutter has been installed; the culinary water system has been approved; the fire hydrants are

operational; the sanitary sewer lines have been approved and the manholes are accessible; the land drain lines have been approved and the manhole are accessible; the storm drain lines have been approved and the boxes/manholes are accessible. Certificate of occupancy will not be issued until the asphalt is completed.

Asphalt Placement - The bonding held in escrow for the asphalt placement may be released once the asphalt surface has been placed and the subdivision is approved for occupancy; the manhole covers and valve box covers must be placed to final grade; the fire hydrants are operational. An initial punch list will be prepared in the near future and the one-year warranty will begin after the entire subdivision has been completed and the warranty punch list items corrected. The final acceptance of the asphalt will occur at the end of the one-year warranty and all items from the final inspection punch list have been corrected.



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

STREET LIGHTING

APRIL 2016

James “Woody” Woodruff, City Engineer
Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

STREET LIGHTING STANDARDS

- I. Prior to final approval of the proposed development, the City will inform the developer of the location for the street lights. The developer shall include a street lighting layout detail showing street light locations on all residential, commercial, and industrial development civil plans.
 - A. Street lights shall be placed on alternating sides of the street at 300 feet average spacing for residential streets.
 - B. Street lights shall be placed on alternating sides of the street at 250 feet average spacing for commercial, arterial and collector streets.
 1. Additionally, one street light shall be required at each road intersection and at each cul-de-sac. In cul-de-sacs, the light shall be placed on property lines away from end of cul-de-sac (snow storage area).
 2. Residential street lights will be placed at lot line boundaries to avoid unnecessary obstruction along the property frontage.
 3. A street light may be required to be placed at a location other than at the property boundary; for example, this may occur on a lot with an unusual long frontage.
 4. The City Engineer may require additional or fewer street lights based upon lighting conditions. Additional street lights may be required in locations where safety hazards or special traffic needs exist; examples include locations such as half block intersections, roadways with horizontals or vertical curves, parking lot entrances and exits, busy intersections, bridges and busy private or commercial driveways.
 - C. The Developer shall be assessed a street lighting fee which will be used by Layton City to purchase and install the street light assemblies for the development. The lighting fees shall be paid to the City before the pre-construction meeting can be scheduled.
 1. The Developer shall incur all costs for trenching, meters, conduit, and subsurface electrical lines to power the street lighting system.
 2. If an existing transformer is not available, the Developer will be required to coordinate and pay for one to be installed through Rocky Mountain Power.
 - D. Street lights will be installed within the new development by the City's contractor once all power has been provided to the site and typically prior to installation of sidewalk.

LAYTON CITY LIGHTING			Standard Drawing
Description	Detail	Type	
Arterial/Collector Streets & Commercial Areas			
Tear Drop Pole & Fixture	SL-01	LED	ST-LT-01
Single Light Fluted Pole & Fixture	SL-04	LED	ST-LT-06
Double Light Fluted Pole & Fixture	SL-03	LED	ST-LT-05

Residential Streets			
Standard Residential Pole & Fixture	SL-02	LED	ST-LT-02
Standard Residential (Optional)	SL-02A	LED	ST-LT-03
Standard Residential (Optional)	SL-02B	LED	ST-LT-04



DEVELOPMENT GUIDELINES
AND DESIGN STANDARDS

TRAFFIC STUDY

APRIL 2016

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Shannon Hansen, Assistant City Engineer – Development
Stephen Jackson, Assistant City Engineer – Capital Projects
Staff Engineers: Ryan Bankhead, Ashley Thoman, Mark Stenquist, Stacy Majewski, Amy Bean

TRAFFIC IMPACT STUDY

A Traffic Impact Study (TIS) shall be required for all developments which generate 100 or more peak hour trips (See Table 1.2). A TIS identifies existing traffic volumes and conditions, development traffic volumes and conditions and their combined impacts on the existing and future roadway system.

- I. TIS Evaluation: The specific analysis requirements and level of detail are determined by the following categories:

CATEGORY I – Developments which generate 100 or more peak hour trips but fewer than 500 trips during the morning or afternoon peak hour. A Category I Traffic Impact Analysis may also be required for sites generating less than 100 trips during the morning or afternoon peak hour for any of the following reasons:

1. The existence of any current traffic problems or concerns in the local area such as an offset intersection, a high number of traffic accidents, etc.
2. The sensitivity of the 'adjacent neighborhoods or other areas where the public may perceive an adverse impact
3. The proximity of project drive approaches to other drives or intersections.
4. Other specific problems or concerns that may be aggravated by the proposed development

Should such conditions arise the City Engineer will evaluate the need for the study based on technical merit.

CATEGORY II – Developments which generate 500 or more peak hour trips but fewer than 1,000 trips during the morning or afternoon peak hour.

CATEGORY III – Developments which generate 1,000 or more peak hour trips but fewer than 1,500 trips during the morning or afternoon peak hour.

CATEGORY IV – Developments which generate more than 1,500 trips during the morning or afternoon peak hour.

- II. Analysis Approach and Methods

- A. Study Area - The minimum study area will be determined by project type and size in accordance with the criteria in Table 1.1. The study area for the proposed development includes traffic signal controlled intersections; intersections without signal control and driveways to ensure their operation and level of service are adequately assessed. The City Engineer may require expansion of the study area when the minimum study areas identified in Table 1.1 do not provide sufficient information to meet the intent of the TIS guidelines. For example, a large (Category III) development in a rural area located two miles from a freeway interchange from which most of the trips are anticipated to access the development may require an enlarged study area to include assessment of the freeway interchange.
- B. Study Horizon Years - The study horizon years will be determined by project type and size in accordance with the criteria below:

Table 1.1

Analysis Category	Development Characteristic	Study Horizons	Minimum Study Area (b)
I	Small Development 100-499 peak hour trips	1. Opening Year	1. Site Access Drives 2. Adjacent signal controlled intersections within 1/4 mile and/or major street intersections without signal control and driveways within 500 feet
II	Moderate Development 500-999 peak hour trips	1. Opening Year 2. 5 years after opening	1. Site Access Drives 2. All signal controlled intersections within 1/2 mile and/or major street intersections without signal control and major driveways within 1/2 mile
III	Large Development 1,000 - 1,500 peak hour trips	1. Opening Year 2. 5 years after opening	1. Site Access Drives 2. All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile
IV	Regional Development >1,500 peak hour trips	1. Opening Year 2. 20 years after opening	1. Site Access Drives 2. All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile

Assume full occupancy and build-out for single-phase developments. Multi-phase developments may require assessment of up to three (3) horizon years corresponding to key phases as directed by the City Engineer.

C. Analysis Time Period

1. Both the morning and afternoon weekday peak hours are to be analyzed. If the proposed project is expected to generate no trips or a very low number of trips during either the morning or evening peak periods the requirement to analyze one or both of these periods may be waived by the City Engineer.
2. Where the peak traffic hour in the study area occurs during a time period other than the normal morning or afternoon peak travel periods (for example midday), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, these peak hours must also be analyzed.

D. Seasonal Adjustments - The traffic volumes for the analysis hours should be adjusted for the peak season if appropriate. Use of seasonal adjustment factors should be approved by the City Engineer. The intent is not to assess maximum peak hourly volumes, such as the day after Thanksgiving for a retail development, but to address peak seasonal volumes. For example, if traffic counts were collected in a retirement community in July, and the peak traffic period occurs

during the winter months, the counts should be adjusted to winter months.

- E. Data Collection Requirements - All data is to be collected in accordance with the latest edition of the *ITE Manual of Transportation Engineering Studies* or as directed by the City Engineer if not specifically covered in the *ITE Manual*.
1. Turning movement counts shall be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods. Available turning movement counts may be extrapolated a maximum of two years with concurrence of the City Engineer.
 2. The current and projected daily traffic volumes shall be presented in the report.
 3. Traffic accident data shall be obtained for the most current three year period available.
 4. Roadway geometric information shall be obtained including roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, and lane configuration at intersections.
 5. The location and type of traffic controls shall be identified.
- F. Trip Generation
1. The latest edition of *ITE's Trip Generation* shall be used for selecting trip generation rates.
 2. Site traffic shall be generated for daily; AM and PM peak hour periods. Adjustments made for "passer-by" and "mixed-use" traffic volumes shall follow the methodology outlined in the latest edition of *Trip Generation*. A "passer-by" traffic volume discount for commercial centers shall not exceed twenty five percent unless approved by the City Engineer or his representative.
- G. Trip Distribution and Assignment
1. Projected trips shall be distributed and added to the projected non-site traffic on the roadways and intersections under study. The specific assumptions and data sources used in deriving trip distribution and assignment shall be documented in the report.
 2. Future traffic volumes shall be estimated using information from transportation models, or applying an annual growth rate to the base line traffic volumes. The future traffic volumes shall be representative of the horizon year for the project development.
 3. In addition, any nearby proposed "on-line" development projects shall be taken into consideration when forecasting future traffic volumes. The increase in traffic from the proposed "on-line" projects shall be compared to the increase in traffic by applying the annual growth rate. If modeling information is unavailable, the greatest traffic increase from either the "online" developments, the application of an annual growth rate, or a combination of an annual growth rate and "on-line" developments, shall be used to forecast the future traffic volumes.
 4. The site generated traffic shall be assigned to the street network in the study area based on the approved trip distribution percentages. The site traffic shall be combined with the forecasted traffic volumes to show the

total traffic conditions estimated at development completion. A figure will be required showing daily and peak period turning movement volumes for each traffic study intersection. In addition, a figure shall be prepared showing the base-line volumes with site generated traffic added to the street network.

H. Capacity Analysis

1. Level of service shall be computed for signal controlled and non-signal controlled intersections as identified in the Study Area in Table 1.1, in accordance with the latest edition of the *Highway Capacity Manual*.
2. For signal controlled intersections, operational analyses shall be performed for time horizons up to 5 years. Operational analyses shall also be performed for street sizing. The planning method will be acceptable for time horizons beyond 5 years and is also acceptable for Traffic Impact Studies prepared at the Development Master Plan level, unless used for street sizing.
3. For urban roadways, and rural highways where signal controlled intersections are at or less than 1 mile apart, the capacity of the roadway is generally dominated by the capacity of the adjacent signal controlled intersections. Roadway levels of service need to be computed for these facilities.
4. For rural highways where the signal controlled intersections are more than 1 mile apart, the level of service on the highway shall be estimated in accordance with the latest edition of the *Highway Capacity Manual*.

I. Traffic Signal Needs -A traffic signal needs study shall be conducted for all arterial / arterial, arterial / collector and collector / collector intersections within the Study Area for the opening year. If the warrants are not met for the opening year, they should be evaluated for a 5-year horizon for Categories II, III and IV.

J. Accident Analysis - An analysis of the three year accident data shall be conducted to determine if the level of safety will deteriorate due to the addition of site traffic.

K. Speed Considerations - Vehicle speed is used to estimate safe stopping and cross-corner sight distances.

L. Improvement Analysis -The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

M. Certification - The TIS shall be prepared under the supervision of a Professional Engineer (Civil) registered in the State of Utah.

III. Study and Report Format

A. Introduction and Summary

1. Purpose of Report and Study Objectives

2. Executive Summary
 3. Site Location and Study Area
 4. Development Description
 5. Principal Findings
 6. Conclusions/Recommendations
- B. Proposed Development
1. Site Location (Vicinity Map)
 2. Land Use and Intensity
 3. Proposed Development Details
 4. Site Plan
 5. Access Geometry
 6. Development Phasing and Timing
- C. Study Area Conditions
1. Study Area
 2. Area of Significant Traffic Impact (Roadways, Intersections and Driveways)
 3. Influence Area
 4. Land Use
 5. Existing Land Use
 6. Anticipated Future Development
 7. Site Accessibility
 8. Existing and Future Area Roadway System
- D. Analysis of Existing Conditions
1. Physical Characteristics
 2. Roadway Characteristics
 3. Traffic Control Devices
 4. Transit/Pedestrian/Bicycle Facilities
 5. Traffic Volumes
 6. Daily, Morning and Afternoon Peak Periods
 7. Level of Service
 8. Morning Peak Hour, Afternoon Peak Hour, Other as Required
 9. Safety Related Deficiencies
 10. Data Sources
- E. Projected Traffic
1. Site Traffic Forecasts (Each Horizon Year)
 2. Trip Generation
 3. Mode Split (If Applicable)
 4. Pass-by Traffic (If Applicable)
 5. Trip Distribution
 6. Trip Assignment
 7. Non-site Traffic Forecasting (Each Horizon Year)
 8. Total Traffic (Each Horizon Year)

- F. Traffic and Improvement Analysis
 - 1. Site Access
 - 2. Level of Service Analysis
 - 3. Without Project (Include Programmed Improvements for Each Horizon Year)
 - 4. With Project (Include Programmed Improvements for Each Horizon Year)
 - 5. Roadway Improvements
 - 6. Improvements by Layton City or Others to Accommodate Non-site Traffic
 - 7. Additional Alternative Improvements to Accommodate Site Traffic
 - 8. Traffic Safety
 - 9. Sight Distance
 - 10. Acceleration/Deceleration Lanes, Left-turn Lanes
 - 11. Adequacy of Location and Design of Driveway Access
 - 12. Pedestrian Considerations
 - 13. Speed Considerations
 - 14. Traffic Control Needs
 - 15. Traffic Signal Needs (Base Plus 5-year Horizon)

- G. Internal Project Site Circulation (If Applicable)
 - 1. Conflict Points
 - 2. Vehicle/Vehicle
 - 3. Vehicle/Pedestrian
 - 4. Sight Distances
 - 5. Building Access Delivery Points
 - 6. Drive-through Lanes
 - 7. Design Features
 - 8. Widths of Internal Circulation Roadways
 - 9. Fire Lanes
 - 10. Access to Waste Containers

- H. Conclusions

- I. Recommendations
 - 1. Roadway Improvements and Phasing
 - 2. Site Access
 - 3. Internal Site Circulation
 - 4. Other

- J. Appendices
 - 1. Traffic Counts
 - 2. Capacity Analyses Worksheets
 - 3. Traffic Signal Warrant Studies
 - 4. Accident Data Summaries

- K. Figures and Tables – Category I Figures and Tables may be documented within the text. The following information should be provided:

1. Site Location
2. Site Plan
3. Existing Transportation System(s)
4. Existing and Future Area Development
5. Existing Peak Hour Turning Volumes
6. Future Transportation System
7. Estimated Site Traffic Generation (Daily and Peak Period)
8. Directional Distribution of Site Traffic (Daily and Peak Period)
9. Site Traffic (Peak Period)
10. Non-site Traffic (Peak Period)
11. Total Future Traffic (Peak Period)
12. Protected Levels of Service Including Existing, Horizon Year Non-site and Total Horizon Year (With Site Development) Conditions
13. Recommended Improvements

Table 1.2

Threshold for Traffic Impact Study Project Sizes Generating 100 Peak Hour Trips		
Land Use	Unit	Threshold
<u>Residential</u>		
Single Family	DU	100 DU
Condominiums/Townhomes	DU	175 DU
Apartments	DU	150 DU
Mobile Home	DU	180 DU
R.V. Park	SPACE	400 DU
Retirement Community	DU	250 DU
<u>Commercial</u>		
Walk-in Bank	1000 SF	5000 SF
Drive-in Bank	1000 SF	2000 SF
Shopping Center	1000 SF	6000 SF
Grocery Store	1000 SF	10000 SF
Convenience Store	1000 SF	1500 SF
Discount Store	1000 SF	16000 SF
Furniture Store	1000 SF	250000 SF
Lumber Store	1000 SF	30000 SF
Hardware / Paint Store	1000 SF	20000 SF
Auto Sales	1000 SF	40000 SF
Nursery Garden Center	ACRE	13.5 ACRES
Vehicle Repair	1000 SF	35000 SF
Bowling Alley	LANE	30 LANES
Gas Station	PUMP	6 SINGLE PUMPS
Health Club	1000 SF	24000 SF
High Quality Restaurant	1000 SF	13000 SF
Sit Down (High Turnover)	1000 SF	6000 SF
Fast Food (Drive through)	1000 SF	2000 SF
<u>Offices</u>		
Office	1000 SF	43000 SF

Office Park	1000 SF	60000 SF
Business Park	1000 SF	70000 SF
Research and Development	1000 SF	100000 SF
Government Office	1000 SF	9000 SF
Post Office	1000 SF	10000 SF
DU = Density Unit, SF = Square Feet		