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 - \( Q = C I A \)
   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.

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

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.)

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>HORIZONTAL OFFSET FROM BACK OF CURB TO CENTERLINE OF PIPE</th>
<th>VERTICAL OFFSET FROM TOP OF CURB TO PIPE FLOWLINE (minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>.94'</td>
<td>2.75'</td>
</tr>
<tr>
<td>15&quot;</td>
<td>.94'</td>
<td>3.00'</td>
</tr>
<tr>
<td>18&quot;</td>
<td>1.25'</td>
<td>3.25'</td>
</tr>
<tr>
<td>21&quot;</td>
<td>1.25'</td>
<td>3.50'</td>
</tr>
<tr>
<td>24&quot;</td>
<td>1.25'</td>
<td>3.75'</td>
</tr>
<tr>
<td>27&quot;</td>
<td>3.87'</td>
<td>4.00'</td>
</tr>
<tr>
<td>30&quot;</td>
<td>4.00'</td>
<td>4.25'</td>
</tr>
<tr>
<td>36&quot;</td>
<td>4.25'</td>
<td>4.75'</td>
</tr>
<tr>
<td>42&quot;</td>
<td>4.50'</td>
<td>5.50'</td>
</tr>
<tr>
<td>48&quot;</td>
<td>4.75'</td>
<td>6.00'</td>
</tr>
</tbody>
</table>

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. Vehicular access shall have a maximum slope of 10% and a minimum 10’ wide drivable surface capable of handling 65,000 lbs.

4. Storm drain lines that are approved for sidelot or rearlot installation shall be installed in steel casing from manhole/box to right-of-way.

F. Lines shall be extended to the boundary of the development and sized according to the City's storm drainage master plan.

G. 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.

H. No structures are allowed within the FEMA 100 year flood plain boundary unless a CLOMR and LOMR has been filed and approved through FEMA.

I. 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.

J. 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, dependent 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. Geotextile Mirafi #140 fabric or approved equivalent shall be installed over all trenching backfill prior to placement of roadbase or subgrade. Minimum width shall match trench width.

F. 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.

G. When storm drain pipes run through a clean-out/inlet and the outlet increases in size, the tops of the pipes shall be aligned.

H. 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.

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.
   5. Storm drain pipe within casing shall be locking joint pipe.
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. Subsurface detention will only be allowed in high density urban areas and commercial areas and must be approved by the City Engineer. All subsurface detention facilities shall be private to be owned and maintained by the property owners and/or the HOA. A professional engineer, licensed in the State of Utah, shall design subsurface detention with engineering judgment.

   a. The following conditions must be met with any subsurface application:
      i. The system shall be designed and constructed in accordance with the manufacturer’s specifications.
      ii. The system shall include a pre-treatment system with off-line pollutant storage to capture and treat storm water flow prior to entering the subsurface detention system. An engineered plan shall be submitted for the system showing the effectiveness of the treatment.
      iii. A plan shall be provided for maintaining and monitoring the system.
      iv. The design shall include a surface impoundment area to capture and force storm water into the subsurface detention system designed for the 100-year storm event. The surface impoundment area can be incorporated into the design of the common parking and landscaped areas and should be large enough to minimize slopes and visual impact.
      v. The design shall provide specifications for aggregate used in the subsurface system, particularly regarding void space as applicable.
      vi. The design shall comply with detention requirements established by the City-approved storm water drainage studies.
      vii. The landscape design shall avoid placement of trees within 10 feet of the subsurface detention system.
      viii. In locations where the subsurface basin is located in traffic areas, the product specified shall be traffic rated.
      ix. Other utilities shall not be allowed through or under the subsurface basin

b. The infiltration rate during the storm event will not be considered when sizing the basin. The infiltration rate will be used to estimate the time to empty the basin after the maximum volume is reached and/or the design storm event has ended.

c. Water quality shall be addressed in accordance with current state regulations. At a minimum, measures shall be taken to reduce sediment and hydrocarbons from storm runoff. Inflow and outflow locations
should be such that detention time is enhanced to allow time for settling to occur. A skimming device should be placed on the outflow device to reduce floating debris that enters the downstream system.

d. The developer shall obtain an Underground Injection Control (UIC) permit and submit a copy with the development application for any projects designed to exclude an outlet. UIC systems are not allowed in public right-of-way or property.

e. Subsurface infiltration systems may be allowed as approved by the City Engineer. The permeability of the native soil shall be considered for infiltration systems.

   i. Infiltration testing shall meet the requirements set forth in Development Standards and Guidelines Section 8 – Geotechnical Information

   ii. A soil report shall be submitted to indicate if the water will infiltrate within forty-eight (48) hours of a storm event. This shall be documented with a certified test and included in the soil report.

f. Subsurface infiltration system shall not be allowed under the following conditions:

   i. The basin is located within Zone 1 or Zone 2 of a drinking water source protection zone.

   ii. Areas with previously documented high seasonal groundwater

   iii. Areas within existing or proposed rights-of-way and easements.

   iv. Areas that do not achieve the minimum 10-foot setback from all existing and proposed buildings and neighboring properties.

g. Infiltration designs shall include systems that minimize above ground standing water and mosquito hazards.

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. Detention basins shall have an overflow spillway capable of releasing the 100-year storm event and provide a route to a safe location that will not damage adjacent property.

D. The developer may be required to provide the land for the regional detention basin as determined by the City Engineer.

E. The maximum depth for surface 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.

F. The maximum slope on a surface detention basin berm shall be 3:1 (H:V). Minimum basin floor slope is 1.0%. The developer is required to submit detailed construction specifications for detention basins 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 basin 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.

G. Detention basins shall have a gravity discharge pipe connection to an approved storm drain system.

H. Surface detention basins will be surveyed before they are landscaped to verify the required capacity has been constructed.

I. The Developer will be required to landscape the surface detention basin. A landscaping plan shall be submitted for review and approval.

J. Clay core for basin berms and floor may be required. Specifications for clay material are available in the Engineering department.

K. A sub-surface drain around the perimeter of the basin, one (1) foot below the pond floor, may be required.

L. As-builts of the basin will be required.

M. Maintenance agreements are required for surface and subsurface detention basins, private pipes, and other post construction BMP’s located on private property.
STORM WATER POLLUTION PREVENTION REQUIREMENTS

I. STORM WATER POLLUTION PREVENTION PLAN AND “NOTICE OF INTENT”

A. Operators and owners of construction activity that disturb one acre or greater are required to get a Storm Water Permit from the Division of Water Quality (DWQ), however many construction sites that disturb less than one acre are also required to get a permit. A site that is less than one acre is required to get permit coverage if it is part of a "common plan of development or sale" that is over one acre.

B. A Storm Water Pollution Prevention Plan (SWPPP) is required to be in hand before the Notice of Intent (NOI) can be submitted.

C. A NOI from the Utah State Division of Water Quality shall be obtained for final approval. The SWPPP shall be prepared according to the DWQ’s “SWPPP Construction General Permit (CGP) Template” and submitted electronically as part of the construction plan submittal. A copy of the NOI and SWPPP shall be submitted to the City before a pre-construction meeting can be scheduled.

D. The NOI, as well as the SWPPP shall remain on the construction site during the entire construction period.

E. Erosion control measures shown on the plans shall be constructed prior to any other construction associated with the development. A field inspection of the control measures shall be conducted by the Layton City Public Works Inspector prior to commencing the other construction activities. These measures shall be maintained and adjusted as needed throughout the life of the project and reflected in the SWPPP.

F. 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 Best Management Practices (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 Code 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 one working day or a notice to stop work order may be issued.

B. As-Built Plans: Any long term 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) or (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.