

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.