NORTH LOGAN CITY DESIGN STANDARDS TECHINICAL MANUAL

CHAPTER 300 – STORM WATER DESIGN STANDARDS

Chapter Outline

300. STORM WATER DESIGN STANDARDS PURPOSE AND APPLICABILITY. These standards cover the criteria and methodology to be utilized by the designers in the design, planning, evaluation, and reports associated with the design of storm water and related irrigation facilities. Any deviations from these criteria must be approved by the City Engineer in writing prior to initiating and again before finalizing the design. Where any deviations may also affect a canal company, a written approval of the canal company will also be required. All designs completed must utilize and comply with the most current edition of the City Standards and Specifications.

301. DEFINITIONS. The following definitions apply to their use within this chapter. Most of these definitions are further defined by state and federal law in which case the specific definitions in such law apply.

(1) Certified Percolation Test: A saturated soil percolation test completed in accordance with Utah Administrative Rule, R317-4-5 with the exception that the test shall extend 2.0 feet below the bottom of the proposed invert of the pond. These tests shall be done in accordance with the certification requirements by a "qualified individual" as defined in R317-11.

(2) Detention: The detaining or holding of water on site and releasing the water from the site into a pipeline, channel, or other water bodies at a slower rate than would otherwise occur.

(3) DEQ: Utah Department of Environmental Quality

(4) Detention Basin: A pond or basin, either above ground or below, that catches the storm water runoff from a contributing area and uses the detention process.

(5) DWQ: Utah Division of Water Quality, a division of the DEQ.

(6) EM 1110-2-1601: Engineering and Design – Hydraulic Design of Flood Control Channels, CECW-EH-D, US Army Corp of Engineers, June 1994

(7) EPA: United States Environmental Protection Agency

(8) HEC-11: Design of Rip-Rap Revetment, Hydraulic Engineering Circular No. 11, US Dept. of Transportation, Federal Highway Administration. (FHWA-IP-89-016, March 1989)

(9) HEC-22: Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, US Dept. of Transportation, Federal Highway Admininstration. (FHWA-SA-96-078, August 2001).

(10) NOI: A notice of intent to construct permit obtained from the DWQ which is required for all construction on areas greater than or equal to 1.0 acres.

(11) NOT: A notice of termination to construction submitted to the DWQ upon the stabilization of 70 percent of the project site that required a NOI.

(12) PWD: Public Works Department

(13) Retention: The retaining or keeping of water on site and preventing its release from the site by any method other than infiltration or evaporation. Retention Basin: A pond that is built to capture and retain the design storm on site and dispose of it through infiltration.

(14) Return Frequency: The frequency or likelihood of a storm of occurring. A 100-year storm has a one (1) percent chance of occurring in any given year while a 10-year storm has a ten (10) percent chance of occurring in any given year. This should never be interpreted as happening only once every 100 or 10 years for the two given examples.

(15) Spread Width: The width of water flow as measured from the flow-line of the gutter into
the asphalt.

(16) Stream Alteration Permit: A permit that is obtained through the Utah Division of Water Rights and is necessary anytime construction impacts a stream, wetland, riparian zone, or other water body defined as the waters of the U.S.

(17) Storm Event: The event and hydrograph that define the design volume of precipitation, duration of the storm, intensity of the storm, and the pattern in which the precipitation falls.

(18) SWPPP: A storm water pollution prevention plan which is required on any construction site.

(19) Underground Injection/Retention System: A system designed to be fully underground and to dispose of water, entirely or in part, through infiltration. These require a special permit from the DWQ known as a Class 5 injection well permit.

(20) Underground Injection Well: A facility, such as a pressured injection well, free draining injection well, sump, or other buried underground facility that infiltrates or injects surface water into the subsurface or groundwater system to eliminate surface runoff. Further defined by federal and state law.

(21) Wetlands Mitigation, or 404, Permit: A permit obtained through the US Army Corp of Engineers which allows the wetlands to be impacted and provides for required mitigation before the project can be approved.

302. DESIGN REQUIREMENTS All projects, irrespective of the size or type, shall meet these requirements. Where projects are governed by a state or federal agency, their standards shall take precedence. All designs shall be in compliance with the City's

constructions standards and specifications. Subsequent sections within this chapter identify the required methodology based upon the size and type of the project.

(1) Storm Event Design all storm water facilities associated with new development for the 100-year event. The storm duration is subject to the size of the contributing area and the project as discussed in Section 303, Hydrologic Calculation. Existing development shall be required to construct storm water facilities to detain and treat runoff anytime at the time of remodeling or reconstruction of any facilities under the same policy as the International Building Code. However, the return frequency and design duration may be modified under extreme conditions at the direction of the City Engineer with approval of the agency managing the receiving waters.

(2) Allowable Storm Water Discharge The storm water runoff leaving the site during the design storm is limited to the lesser of:

- 0.2 cfs per acre, or
- Discharge prior to development, current or pre-existing (Historical Flow).

Where insufficient information or where costs of the analysis of the pre-existing conditions are not justified for sites less than 1.0 acre, the runoff shall be limited to 0.1 cfs per acre and documented as such on the site plan in the appropriate table.

(3) Curb and Gutter Flow Design

(a) The flow depth in the gutter shall not be allowed to exceed the lesser of the top back of curb elevation (TBC) or the peak drive way approach elevation during the required storm event. This includes a combination of piping, curb and gutter, and drainage swales.

(b) Where the flow depth is exceeded, storm drain inlets and a piped system shall be required and appropriate actions taken to eliminate overtopping of the curbs and flooding private property.

(4) Channel Design

(a) Channel side slopes shall not be steeper than 3:1 (H:V) unless they are concrete. Where they are incorporated into landscaping, flatter slopes may be required. This will be evaluated on a case by case basis.

(b) Channel velocities shall be slow enough to prevent scour, and where possible, facilitate further settlement of sediments unless the channel is used to deliver irrigation water as well. If the channel will also carry irrigation water, maintain velocities above 2 ft/sec if possible, but at no time exceed 4 ft/sec.

(c) Where rip-rap is used, design shall be in accordance with EM-1110 from the US Army Corp of Engineers or HEC-11 from the Federal Highway Administration.

(d) Free board on the channels shall be in compliance with the Bureau of Reclamation, Design of Small Canal Structures.

(e) Channel maintenance easements shall be maintained as required in the City and Canal Company agreements. Channel Easements shall be shown graphically on all recordable plats and engineering construction drawings.

(5) Pipe Design

(a) For storm water pipes, roughness coefficients listed in the table included in Section 304. (2) of these standards that coincide with the accepted pipe materials in the City's Standard Specifications, most current edition shall be used.

(b) Maintain velocities in the pipes at design flows sufficient to prevent sediment deposition and low enough to prevent scour damage to the pipe.

(c) Pipe outlets shall have a flared end discharge unless more stringent methods of energy dissipation are required.

(d) Minimum diameter of storm drains shall be:

- 12 inches for laterals
- 15 inches for trunk lines
- 18 inches under any UDOT right of way.

(e) Pipe sizes shall not decrease in the downstream direction.

(f) Maximum flow depth in the pipe during the design storm shall not exceed 0.85 times the diameter of the pipe.

(6) Detention Basins

(a) Detention basins or other equivalent methods to limit the storm water release rate and improve the water quality when approved by the City Engineer, are required prior to discharge into any canal or water course.

(b) All detention basins shall be sized to meet the requirements of Section 305. (1) of this chapter.

(c) Side slopes shall not be steeper than 3:1 (H:V).

(d) For Basin construction on generally level terrain,(Below 5% slope) the maximum depth at the emergency overflow location of the pond shall be three feet plus one (1) foot of freeboard above the emergency overflow and a maximum water depth of three (3) feet below the emergency overflow. All other basin construction in naturally steeper slope regions (Above 5% slope) requires special design, approval, and permitting including safety precautions on a case by case situation.

(e) All basins shall be stabilized with rocks or planted vegetation to prevent internal erosion. Vegetation or other stabilization must be maintained.

(f) All basins must have a water treatment method to prevent heavy sediment, floatable debris, or petroleum products from leaving the containment area.

(g) Where orifice and snouts are used, the orifice size is limited to not less than three (3) inches in diameter to prevent clogging.

(h) Emergency overflows and the flow path of the overflows shall be mapped to natural streams, canals, or city approved drainage system for purpose of flood mapping using existing topographic mapping.

(i) The emergency overflow shall be designed to pass the full 100 year event.

(j) Other utilities (for example water lines, sewer lines, gas lines, power lines, phone lines, etc.) shall not be allowed through the detention pond or within 5 feet of the pond berms without specific written permission from the respective utility.

(k) The invert or lowest point in the basin shall be not less than 12-inches above the existing or historical groundwater levels (whichever is higher).

(7) At Grade Retention Basins

(a) All retention basins shall be sized to meet the requirements of Section 305. (2) of this chapter and to contain 100 percent of project site runoff from the design storm.

(b) Side slopes shall not be steeper than 3:1 (H:V).

(c) For Basin construction on generally level terrain, (Below 5% slope) the maximum depth shall be three feet plus one (1) foot of freeboard above the design Full limit. All other basin construction in naturally steeper slope regions (Above 5% slope) requires special design, approval, and permitting including safety precautions on a case by case situation.

(d) All basins shall be stabilized with rocks or planted vegetation to prevent internal erosion. Vegetation or other stabilization must be maintained.

(e) All basins shall drain within 3 days (72 hours) from the end of the storm event. This is to be documented with a certified percolation test and documented in the soils report.

(f) Possible emergency overflows and the flow path of the overflows shall be mapped for purpose of flooding management.

(g) The emergency overflow shall be designed to pass the full 100 year event.

(h) Other utilities (for example water lines, sewer lines, gas lines, power lines, phone lines, etc.) shall not be allowed through the retention pond or within 5 feet of the pond berms without specific written permission from the respective utility.

(i) The invert or lowest point in the pond shall be not less than 12-inches above the existing or historical groundwater levels (whichever is higher).

(8) Underground Detention, Retention, and Injection Systems

(a) Underground retention and injections systems, including sumps, are not allowed in drinking water source protection zones.

(b) All underground detention and retention systems are to be sized to meet ALL the requirements pertaining to the regulations of this entire chapter 300.

(c) Underground systems shall provide adequate access points for cleaning and maintenance.

(d) All underground systems shall drain by discharge (underground detention systems) or infiltration (underground retention systems) within 3 days (72 hours) from the end of the storm event. This is to be documented with a certified test and included in the soils report.

(e) Sumps shall provide adequate water quality treatment to prevent contamination of the ground water aquifer.

(f) Emergency overflows and the flow path of the overflows shall be mapped for flooding management purposes.

(g) The emergency overflow shall be designed to pass the full 100 year event.

(h) Other utilities (for example water lines, sewer lines, gas lines, power lines, phone lines, etc.) shall not be allowed through or under the underground retention system without specific written permission from the respective utility.

(i) Registration with the DWQ and a Class 5 Injection Well Permit are required for all Injection systems.

(9) Water Quality/Treatment Requirements

(a) The storm water containment system shall be designed to remove oils, greases, and any other floatable petroleum products and allow sufficient time or methods for solids to settle and remain as storage within the containment area.

(b) Total dissolved solids of the receiving waters must not be increased above 350 mg/L and the discharge water must not exceed 1000 mg/L.

(c) All contaminants shall be stored to prevent impact by storm water and to contain any spilled materials on site. The location and methods of this storage shall be shown on the design plans.

(10) Irrigation Canals and Systems All irrigation canals, pipes, ditches, channels, structures, diversions, and other portions of the system shall be designed for the full range of base flows including historical maximum flows, historical minimum flows, and the full water right flow. These design flows must to be approved by the associated canal company in writing and the City Engineer.

(11) Storm Water Pollution Prevention Plan Storm water pollution prevention plans (SWPPP) are required on all projects in City boundaries and every project must comply with City standards and specifications, whether approved by the city or not. Table 302-1 summarizes the requirements of the SWPPP. General Landscaping activities for project sites contained within existing SWPPP authorizations or less than 1.0 acre in size are exempt from this requirement.

Table 302-1, SWPPP Requirements

Contributing Area Size	Minimum Requirements
Less than 1.0 Acre	Erosion and sediment control plan, dust control plan, debris and garbage control plan, post construction BMPs, Inspection and maintenance plan, record keeping and training, and final stabilization. These can be on a standard design sheet as detailed notes with supporting details.
1.0 Acre and larger.	A full SWPPP using the EPA template downloadable from the DWQ including all elements. Maps and figures in the document must also address construction sequence, total area of site and area to be disturbed, pre and post runoff analysis, identification of receiving waters, map of drainage patterns with outfall locations and downstream flow paths, locations of structural controls, and locations of equipment and material and chemical storage, and methods of containment. Additionally, the document must include a map identifying where each BMP is to be used and provide details for the implementation of the BMPs.

303. HYDROLOGIC CALCULATION

(1) Design Methodology Numerous methodologies and hydrologic methods are available. While, in some cases, these other methods might provide a more favorable estimate, they are not acceptable to North Logan City unless approved by the City Engineer. Table 303-1 summarizes the required methods based on the area contributing flows to the system, including offsite flows.

Table 303-1, Hydrologic Methods Required

Contributing Area (Acres)	Methodology Required
Less than 1.0 Acre	Rational Method, Time of concentration = 10 minutes
1.0 Acre to 10.0 Acres	Rational Method, Time of concentration calculated.
Greater than 10.0 Acres to 200 Acres	Rational Method, Time of concentration calculated and subject to additional requirements of different hydrologic and hydraulic conditions. Verify with the City Engineer the methods and requirements prior to initiating projects.
Greater than 200 Acres	Design Professional/City, consultant based design

(2) Design Hydrographs The design hydrographs to be used for each storm vary based on the size of the area being modeled and designed. Table 303-2 summarizes the hydrograph which shall be used during the design.

Table 303-2, Required Design Hydrograph

Contributing Area (Acres)	Methodology Required
Less than 1.0 Acre	Rational Method, Complete site coverage (Block Method)
1.0 Acre to 10 Acres	Rational Method, Complete site coverage with reasonable allowable soak time reduction.
Greater than 10.0 Acres	SCS Type II Storm curve.

(3) Design Frequency and Duration All Subdivision storm water calculations with contributing areas less than 640 acres (1 square mile) shall be based on the 100-year, 24 hour event. For individual sites without large contributing areas, designs may address the 100-year, 50-year, 25-year, or 10-year events with reasonable duration, upon approval from the City Engineer. Other site calculations not found within these categories shall be City/Design professional, consultant based design criteria.

(4) Design Duration Design duration shall be based on the criteria summarized in Table 303-3.

Table 303-3, Required Design Durations for Storm Water Systems

Larger of Contributing Area or Project Area (Acres)	Pipes, Channels, Inlet Spacing	Detention Basin and Facilities	Retention Basin and Facilities
Less than 1.0 Acre	10 Minutes assumed time of concentration	Storm generation actual	Storm generation actual
1.0 Acre to 10.0 Acres	Calculated Time of Concentration	24-hours	48-hours
Greater than 10.0 Acres	Calculated Time of Concentration	24-hours	48-hours

The amount of rainfall and the intensity-duration tables for different rainfall events are included in Table 303-4 and Table 303-5 for use within the City. Data compatibility with North Logan City models is mandatory. This data is taken from the National Weather Service, Logan Radio KVNU site.

Table 303-4, Depth-Duration Summary Table, (KVNU) Logan Station (inches)

ARI (Years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr
10	0.23	0.35	0.44	0.59	0.73	0.88	0.98	1.28	1.64	2.04	2.33
25	0.31	0.47	0.58	0.78	0.96	1.13	1.23	1.56	1.98	2.41	2.75
50	0.37	0.57	0.70	0.94	1.17	1.36	1.45	1.79	2.24	2.71	3.08
100	0.45	0.68	0.85	1.14	1.41	1.61	1.71	2.05	2.52	3.02	3.42

Table 303-5, Intensity-Duration-Frequency, (KVNU), Logan Station (inches/hour)

ARI (Years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr
10	2.80	2.13	1.76	1.18	0.73	0.44	0.33	0.21	0.14	0.09	0.05
25	3.68	2.80	2.31	1.56	0.96	0.56	0.41	0.26	0.16	0.10	0.06
50	4.46	3.40	2.81	1.89	1.17	0.68	0.48	0.30	0.19	0.11	0.06
100	5.40	4.10	3.39	2.29	1.41	0.81	0.57	0.34	0.21	0.13	0.07

(5) Runoff Coefficients North Logan City has established standard runoff coefficients that shall be used to ensure compatibility of results from the base model and each individual project. Calculations differing from these values without approval shall be returned to the design professional for corrections.

a) Rational Method Table 303-6 identifies the rational equation runoff coefficients that shall be used.

Table 303-6, Required Runoff Coefficient

Condition	**Rational Method**
Asphalt	0.95
Concrete Pavement	0.95
Grassed Open Space (slopes less than 2 percent)	0.15
Grassed Open Space (slopes greater than 2 percent)	0.20
Natural Landscape (slope greater than 6 percent)	0.45
Natural Landscape (determining factor “Frozen Soil”)	0.75
Graveled Areas	0.85
Roof Top	0.85

[(1)]Residential Lots <8000 sq-ft	0.70
[(1)]Residential Lots, 8000 sq-ft to ¼ acre	0.50
[(1)]Residential Lots, ¼ acre to ½ acre	0.45
[(1)]Commercial Business Areas	0.75
[(1)]Industrial Areas	0.85

[(1)] Where the weighted values are less than these coefficients, or insufficient data is available outside of the project area, use these values. In no case will values less than the provided coefficients, be used.

(b) SCS Method The SCS method, as developed in TR-55 by the Soil Conservation Service in 1950s, requires more engineering interpretation than the rational method since it is also necessary to address the soil conditions, vegetative cover, and the antecedent soil condition (AMC) being evaluated. There are four primary soil conditions available in the SCS method, grouped as A, B, C, and D.

- **Group A** soils typically are gravels and sands with fast infiltration rates and low runoff potential. While there are Group A soils on some of the benches and along the Logan river in some places, as soon as any landscaping with topsoil occurs, the storm water benefit of these soils is lost. As a result, the Group A classification shall not be used.

- **Group B** soils have moderate infiltration rates when wetted and consist of moderately well drained soils with moderately fine to course textures, typically without clay.

- **Group C** soils have slow infiltration rates if thoroughly wetted and consist of soils that have a layer that impedes vertical infiltration.

- **Group D** soils have a slow infiltration rate if thoroughly wetted and consist of clays, usually with high swelling potential, soils with a permanent high water table, soils with a clay pan or hard pan later near the surface, and shallow soils over an impervious material.

  (i) Soil maps and references available from the Natural Resource Conservation Service will identify the group associated with each soil class. HOWEVER, the designer needs to consider the effects of the final landscaping, such as the use of top soil, as part of his design.

  (ii) In addition to the soil group, the antecedent moisture condition (AMC) must also be considered. For the average case, the SCS has defined AMC II to apply as the definition of the conditions preceding most annual floods. For this purpose, AMC II will be used for all PWD approved projects.

(iii) Upon selecting the soil group, the appropriate curve number can be selected from various standard references and text books. A common free reference is the HEC-HMS technical reference manual which can be downloaded from the Army Corp of Engineers HEC website.

(6) Time of Concentrations Calculations There are numerous equations for calculating the time of concentrations. While many may be applicable to various locations, Table 303-7 identifies the methods that shall be used in determining the time of concentrations within North Logan City.

Table 303-7, Time of Concentration Calculations

Larger of Contributing Area or Project Area (Acres)	**Sheet Flow**	**Open Channel Flow**	**Piped Flow**
Less than 1.0 Acre	Less than 10 min(1)	Less than 10 min(1)	Less than 10 min(1)
1.0 Acre to 10.0 Acres	Calculated per HEC-22	Calculated per HEC-22	Calculated per HEC-22
Greater than 10.0 Acres	Subject to City Engineer Requirements	Subject to City Engineer Requirements	Subject to City Engineer Requirements

(1). For areas less than 1.0 acres, the total time of concentration adds to 10 minutes.

(7) Total Allowable Discharge Design Flows The total discharge design flows to be used for design shall be the combination of the allowable design storm flows and base flows which may include the maximum irrigation diversion based upon water rights, whether the existing facilities have sufficient capacity or not, and maximum return flows from sources upstream of the canal or irrigation ditch.

304. HYDRAULIC CALCULATIONS Hydraulic calculations shall be used for sizing pipes and open channels associated with the total design flows.

(1) Channel Design Channels shall be designed with a trapezoidal cross section using roughness coefficients associated with the final restored condition. The Manning's equation methodology shall be used for sizing and considering the associated backwater impacts from downstream conditions. Computer software can be used to calculate the channel size, but sufficient data and results shall be provided to validate the procedure, assumptions, and conclusions.

(2) Pipe Design For design of pipes and culverts, the designer shall demonstrate that the pipes meet the standard design requirements using Manning's equation for open channel flow and standard culvert calculation procedures to determine inlet and outlet control conditions. Full pipe flow designs are not allowed for gravity systems. For storm

water pressure mains from pump stations, either the Hazen-Williams or Darcy-Weisbach equations will be allowed. Roughness coefficients and assumptions shall be in accordance with Table 304-1 selected from various references.

Table 304-1, Mannings Coefficients for Pipe

Material	**Roughness "n"**
Smooth Interior HDPE or ADS Pipe	.010
Corrugated Metal Pipe (CMP)	.024
Concrete	.013
PVC	.010

The design and sizing may be done manually or with the use of computer software. However the results must be provided as part of the submittal review process.

(3) Spread Width Calculations Spread width calculations and depth of flow in the gutters shall be completed in accordance with HEC-22 methodology developed by the Federal Highway Administration (FHWA). These calculations can be completed using numerous available software or manually. However, the calculations must be documented and provided to the City for review for the design storms.

305. DETENTION AND RETENTION BASIN DESIGNS Detention or retention basins shall be used to reduce the peak flow rates to meet the discharge limitations and to provide water quality improvements by detaining the water and settling sediments and other contaminants or by preventing the storm water from leaving the site. These basins shall be constructed as part of the individual development projects, both residential and commercial, and regional projects as outlined in the most current North Logan City storm water master plan.

(1) Detention Basins The detention requirements shall be calculated differently depending upon the size of the projects and the storm water contributing area as summarized by the Table 305-1

Table 305-1, Detention Basin Sizing Methodologies

Contributing Area Size	Method
Less than 1.0 Acre	Volume of runoff generated = volume of detention. (This can be done with a simple spreadsheet.)
1.0 Acre to 10 Acres	Volume of runoff generated = volume of detention minus discharge through the outlet only. Spreadsheet routing, and phasing of the hydrograph, or the use of more sophisticated models may be necessary or required.
Greater than 10 Acres	Subject to additional requirements by the City Engineer. Verify prior to initiating project.

- The Basin shall be designed to meet all of the requirements in Table 305-1. The outlets shall be modeled as a function of the depth of the Basin. In most cases, this results in a depth-discharge curve and a depth-storage curve being created for the Basin and used in routing or phasing of the hydrographs. These curves shall be provided to the City Engineer for review as part of the calculations.

- While the magnitude of flows from a storm larger than the design storm is unknown, the emergency overflows shall be sized sufficient to pass the full design storm to prevent jeopardy to the detention basin and provides for the normal outlet to fully fail, or a second design storm to occur prior to the basin fully draining.

- As part of the design, a percolation test shall be completed at the site of the Basin with the hole excavated to at least two feet below the design invert. As the hole is dug, the soils shall be logged and photographed, with particular care given to 1) when saturated soils were encountered, 2) the elevation of the water table, and 3) the presence of "mottling" in the soil showing the historical presence of groundwater. This information shall be used in establishing the final invert elevation as required in Sections 305. (1),(2),(3).

(2) Retention Basins The retention requirements shall be calculated differently depending upon the size of the projects and the storm water contributing area as summarized by the Table 305-2.

Table 305-2, Retention Basin Sizing Methodologies

Contributing Area Size	Method
Less than 1.0 Acre	Volume of runoff = volume of retention. (This can be done with a simple spreadsheet.)
1.0 Acre to 10.0 Acres	Volume of runoff generated = volume of retention. Spreadsheet routing of the hydrograph or the use of more sophisticated models are allowed.
Greater than 10.0 Acres	Subject to additional requirements by The City Engineer. Verify prior to initiating the project.

- As part of the design, a percolation test shall be completed at the site of the pond with the hole excavated to at least two feet below the design invert. As the hole is dug, the soils shall be logged, with particular care given to 1) when saturated soils were encountered, 2) the elevation of the water table, and 3) the presence of "mottling" in the soil showing the historical presence of groundwater. This information shall be used in establishing the final invert elevation as required in Section B.

- Since these Basins are dependent upon infiltration to dispose of the storm water, the designer shall designate methods of completion for the Basin to maintain the infiltration rates determined by the certified percolation test. Note that where question of the effectiveness of the restoration and completion of the basins interior is present, the City may require the contractor to complete a new certified percolation test with a test hole not exceeding 6 inches to demonstrate the soils are not sealed by compaction.

(3) Underground Retention and Injection Systems (Sumps) Sumps, underground retention systems, and other underground injection systems are not allowed in drinking water source protection zones. Maps of these zones are available for review from the City Engineer. Additionally, this type of treatment of Storm Water Control shall only be considered as a last resort when other forms of storm water control are available, or feasible. Prior approval of this type of control measure will be required from the City Engineer.

306. WATER QUALITY TREATMENT All designs shall provide for performance that will meet or exceed the more stringent requirements between the City, DWQ, and EPA. Primary best management practices (BMPs) for erosion and sediment control. Performance evaluations are acceptable with the appropriate documentation.

307. IRRIGATION BASE FLOWS:

(1) Water Right Flows The design flow will be the maximum flow allowed by the water course water right. Obtain the water righted flows and the lateral flows directly from the canal companies. These must be documented in a letter signed by an authorized canal company representative to be accepted by the City. Primary canal company contacts are available from the City.

(2) Return Flows Many of the Irrigation canals receive return flows from the upstream canals. It shall be necessary to take the return flows into consideration and to discuss them with the canal companies. Again, the agreed upon flows must be obtained in accordance with the canal company guidelines and respective canal agreements with North Logan City.

308. STORM WATER POLLUTION PREVENTION PLAN All elements of the EPA template available from the DWQ website must be met without respect for project size.

309. STORM WATER SUBMITTALS:

(1) Submittals Required for Hydrologic Calculations Every review package shall provide basic hydrologic calculations in accordance with these specifications and methods.

(2) Submittals Required for Water Quality/Treatment Requirements The water quality control and treatment methods shall be defined in the SWPPP and on associated additional specifications shall provide sufficient information for the contractor to build the system and ensure that it will meet the required performance specifications.

(3) Submittals Required for SWPPP A completed SWPPP prepared in accordance with Section B.11 shall be submitted with the review package. For all construction sites 1.0 acre or larger, copies of the Notice of Intent (NOI) from the Utah Division of Water Quality shall be submitted. Additionally, copies of all additional permits which may be required for the project including stream alteration permits, wetlands permits, Class 5 injection well permits, groundwater discharge permits, etc., shall be included with the SWPPP.