CITY OF NAMPA

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100 DRAINAGE AND STORMWATER MANAGEMENT DESIGN POLICY

101 GENERAL OVERVIEW

This Design Policy is to complement the City of Nampa Stormwater Management Plan prepared by the City to comply with the EPA Stormwater Phase II Final Rule. This Policy is intended to provide design guidelines to comply with the Stormwater Management Plan.

102 STORMWATER MANAGEMENT GOALS

It is the intent of these Management Goals that downstream drainage systems and water quality not be adversely affected by upstream development. Therefore, this drainage and stormwater management Design Policy addresses two distinct system goals: flow controls, and water quality protection. These goals must be addressed and achieved for the Design and construction phases of all development project.

102.1 FLOW CONTROLS

Management of stormwater flow involves the design and implementation of a flow control system to achieve the following objectives.

1. Mitigate downstream impacts from an increase in stormwater flows resulting from land development activities.

2. Accommodate the stormwater flows from natural flooding of upstream lands and developments by providing adequate conveyance facilities through the development sites.

102.2 WATER QUALITY PROTECTION

Management of stormwater quality involves the design and implementation of an on-site treatment facility to achieve the following objectives:

1. Mitigate impacts to surface and groundwater resources resulting from storm runoff due to land development activities.

2. Eliminate or reduce, the source of water pollutants through the development of on-site facilities to treat the stormwater runoff to comply with EPA Standards.

103 DESIGN OVERVIEW

103.1 GENERAL RULES - FOLLOWING RULES SHALL APPLY:

1. All upstream drainage privileges shall be maintained.

2. Existing Systems
   The regulations contained in this policy manual are not to be applied retroactively to any existing stormwater system. Any stormwater system in place as of the date of adoption of this policy manual, and discharging to an existing storm stormwater system, may continue to discharge. The modification of any existing stormwater system or the addition of impervious areas that increase runoff volumes shall constitute “development” and render the existing system subject to the provisions of this policy manual.

3. Extension of Existing Systems
   Existing stormwater~~,~~ and/or drainage conveyances for upstream or downstream properties shall be extended across the new or modified development. The conveyance may be relocated within the development, but the relocated facility must meet the applicable requirements of this policy manual and the requirements of any other entity with jurisdiction. In no case shall a conveyance facility be reduced in size from the predeveloped condition.

4. A stormwater drainage system established for any new or modified development must conform to the capabilities and capacities of the existing downstream drainage system.

5. Discovered Deficiencies and/or Problem
   If an existing stormwater system is found to have a drainage deficiency or problem associated with a proposed development, and if the proposed development will impact the identified deficiency or problem, then the development shall remedy the situation or participate with the City to resolve any existing deficiency or problems. The City will determine the required level of City participation.

6. Discharge Rule
   Any development proposing to discharge off-site, in compliance with this policy manual, shall notify in writing the owner of the ditch, drain, watercourse or pond into which discharge shall occur. In addition, the design of discharging facilities shall be subject to the review and approval of the entity operating or maintaining the ditch, drain, watercourse or pond. Any approval shall be in writing.

7. Engineer's Rule

The design of any storm drainage system shall be under the responsible charge of a professional engineer licensed in the State of Idaho and having requisite training and experience in stormwater system design. All drawings, calculations, and reports shall be signed and sealed by the Engineer in responsible charge.

A drainage system, which fails to function as designed and meet the requirements of this policy, shall be redesigned, reworked and/or reconstructed at the expense of the owner or developer until the approved design intent is achieved.

8. Private Property Contribution Rule

While each property owner within a development is generally responsible for the stormwater and drainage generated on their property, it is anticipated that some stormwater from private property will enter the public stormwater system. The stormwater system shall be designed to accommodate the anticipated flow from outside the right-of-way based on the development design and grading

9. Acceptable Risk Rule

Runoff from storms larger than the design storm is not accounted for in the calculations. Storms larger than the design storm may occur and cause property damage, injury or loss of life. This policy is not intended to remove all risk.

10. Ownership Intent

The stormwater, collection, conveyance, treatment and disposal systems must meet city standards and be turned over to the City for continuous operation and maintenance. The systems must be within the public right-of-way or acceptable city easement. The City will not be responsible to maintain the vegetative matter or synthetic liner as part of it's operation and maintenance responsibility. All BMP's requiring vegetative matter to meet the requirements of the BMP, the requirements must be met prior to acceptance by the City.

11. Location

Stormwater conveyance components may be located in public right-of-way or on private property in easements subject to the following conditions:

A. Public Right-of-Way

Only pipelines, gutters and low maintenance conveyance swales may be located in a public right-of-way. The positioning of a pipeline or gutter in the right-of-way is subject to the review and approval of the City Engineer, and in all instances pipelines must maintain State of Idaho mandated separations from potable water lines. Manholes should be positioned per the Utility Corridor Plan Detail (DP – 1).

B. Easements

Pipelines and open channels may be located on private property if easements

for construction, maintenance and operation of the pipeline or channel are provided. The easement shall specifically exclude encroachments and obstructions (including trees and shrubs) which affect maintenance or replacement of the pipe. Required easement widths shall be at the discretion of the City Engineer, but no less than 15 feet. Easements for pipes running along property lines shall be situated such that the centerline of the pipe is offset at least the greater of 3 feet or 1.5 pipe diameters from the property line. Any pipeline in excess of 5 feet in depth requires special easement consideration to ensure maintenance access.

12. Handicap Guidelines

Applicable Handicap accessibility guidelines shall be incorporated in grading and drainage design. (ICC-ANSI A 117.1)

13. Multiple Use Facilities

Stormwater conveyances shall be designed to convey stormwater runoff from upstream areas, using both the primary and secondary systems and the design storms indicated in Table 1. Stormwater and irrigation water (live or return) shall not be combined except in major drains, where, in the opinion of the City, separation is not feasible. Use of the drain must be approved by the irrigation entity.

14. Hydraulic Capacity

Hydraulic capacity may be calculated by various acceptable methods for open channels and pipe such as Hazen-Williams Formula, Darcy-Weisbach Equation and Manning Equation.

15. Velocities

A. Open Channels

Velocities in open channels at design flow shall not be less than 1.5 feet per second (fps) and not greater than the velocity, determined from channel conditions, to erode or scour the channel lining or 5 fps, whichever is less. Super-critical velocities should be avoided and will require energy dissipation facilities

B. Pipe

Velocities in pipe shall be a minimum of 2 feet per second (fps) at the design flow and shall not be more than 8 feet per second (fps), unless the pipe is designed for higher rates and pre-approval has been obtained from the City Engineer.

16. Energy Dissipaters

Energy dissipaters shall be provided when outflow velocity exceeds 5 feet per second (fps) or when, in the opinion of the City Engineer, significant erosion or scour is likely.

17. Catch Basins
Catch basin inlets shall be designed to accommodate the design flow.

18. Siphons
Siphons shall not be used as cross drains.

103.2 GLOSSARY:

1. CONVEYANCE SYSTEM:
A stormwater conveyance system includes any pipeline, ditch, swale, borrow pit, channel, gutter, drain, watercourse or river having as one of its purposes the transporting of stormwater runoff.

2. CONVEYANCE SYSTEM - PRIMARY

The primary conveyance system shall be designed to accommodate the peak discharge and total volume of the design storm frequency in Table 1. The primary system consists of catch basins, drop inlets, street gutters, conveyance swales (allowed only where there is no curb and gutter) and pipe systems. In general, the primary conveyance system should convey the design storm to the receiving waters (surface or ground) with the maximum treatment and the minimum impact or inconvenience to the public.

3. CONVEYANCE SYSTEM - SECONDARY

The secondary conveyance system shall be designed to accommodate the peak flow and total volume of the design storm frequency in Table 1. The secondary system conveys stormwater to the receiving waters (surface or ground) after the capacity of the primary system has been exceeded. In general, the secondary conveyance system will convey the design storm to the receiving waters with some impacts and inconvenience to the public.

4. DETENTION
The temporary storage of stormwater runoff in a structural device (BMP) to reduce the peak discharge rates and to provide settling of pollutants.

5. DETENTION POND
A constructed pond that temporarily stores stormwater runoff and releases it at controlled rates.

6. DEVELOPMENT:
Any manmade change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard.

7. RETENTION:

Retention facilities are designed to accept all the runoff from the site and retain the runoff until it percolates into the surrounding ground or evaporates.

104 PEAK RATE OF FLOW

The peak rate of flow shall be determined for use in designing individual components of the drainage system and to examine pre-development and post-development peak flows. The minimum design storm frequencies for the general components of the stormwater system are listed in Table 1.

104.1 CALCULATION METHODOLOGY

The peak rate of flow shall be calculated using the Rational Method for areas up to and including one hundred (100) acres. The Soil Conservation Service (SCS) method TR No. 55 shall be used for areas up to 2,000 acres.

Design method and calculations shall be shown in a Drainage Report submitted with the construction plans.

TABLE 1 - DESIGN STORM FREQUENCIES

Location	Return Frequency		
	Primary Conveyance System	**Secondary Conveyance System**	**Storage Facilities**
Urban Areas	**50 year**	**100 year**	**100 year**
Rural Areas	**25 year**	**100 year**	**100 year**

Minimum Runoff Coefficients to be use in the Rational Method Formula:

Developed Areas Runoff coefficients are as follows:

TABLE 2A – SURFACE RUNOFF COEFFICIENTS

	Surface		Coeff.
	Roofs	**:**	**0.95**
	Pavement and Concrete	**:**	**0.90**
	Gravel Surfaces	**:**	**0.40**
	Vegetative Landscaped Areas	**:**	**0.20**
	Turf Grass	**:**	**0.10**
	Typical Undeveloped	**:**	**0.15**

Undeveloped Areas:

TABLE 2B – SOIL RUNOFF COEFFICIENTS

	Soil Type	Slope		Coeff.
	Clay – Loam and Clay	**0-2%**	**:**	**0.13**
	Clay – Loam and Clay	**2-7%**	**:**	**0.18**
	Clay – Loam and Clay	**> 7%**	**:**	**0.25**
	Sandy and Sandy Loam	**0-2%**	**:**	**0.05**
	Sandy and Sandy Loam	**2-7%**	**:**	**0.10**
	Sandy and Sandy Loam	**> 7%**	**:**	**0.15**

A site specific weighted runoff coefficient must be determined and used in the stormwater calculations.

104.2 PEAK RATES OF FLOW

Peak rates of flow for design storms shall be included on the design drawings.

105 PEAK RUNOFF VOLUME

Runoff volumes shall be calculated for use in determining storage requirements for retention and detention facilities. Volumes shall be calculated based upon return frequencies listed in Table 1.

105.1 CRITERIA FOR CALCULATING RUNOFF VOLUMES

The design volume shall be the maximum accumulated volume over a 24 Hr. Period. Evaluate each storm duration interval shown on the IDF Curve (see Exhibit A) Percolation may be taken into account. Volumes shall be included on the plans.

Volumes and design methodology shall be shown in a drainage report submitted to the City with the preliminary plat and final construction drawings.

106 CONVEYANCE SYSTEM DESIGN CRITERIA

106.1 GENERAL OVERVIEW

This section is devoted primarily to the design of pipelines, gutters and channels.

106.2 PIPE STANDARDS

1. Size
   Pipe size shall be dictated by peak flow and hydraulic capacity. Minimum pipe diameter shall be twelve (12) inches.

2. Depth of Bury
   The pipeline shall have a minimum depth of twelve inches, (12”). Additional depth may be required based on traffic loads and Manufacturer’s recommendations.

3. Material
   The pipe shall be Class III reinforced concrete or SDR 35 PVC, both with watertight joints. Any piping designed to be under continuous pressure shall be designed and specified accordingly. Other pipe materials may be acceptable with prior approval of the City Engineer and when supplied with watertight joints. See the City of Nampa Supplemental Specifications to the ISPWC Section 601, Part 2.2 for an expanded list of acceptable pipe.

107 STREET SECTION (GUTTER) CAPACITY

Street gutters and conveyance swales may provide stormwater conveyance up to their hydraulic capacity. Conveyance swales are only allowed when there is no curb and gutter. Beyond that hydraulic capacity, subsurface piping or flow routing will be required to facilitate proper drainage. The minimum gutter grade shall be 0.40 %. Gutter and conveyance swale flow shall be intercepted by an underground conveyance or storage system at a maximum spacing of 750 feet.

107.1 HYDRAULIC CAPACITY

The hydraulic capacity of a street section to convey water can be calculated by using the Manning Equation.

107.2 DEPTH OF WATER

1. Primary System
   During storm events less than or equal to the design storm for the primary system the street and gutter section may be used to convey water to a catchment with the following encroachments. If no curb exists, flow may not encroach onto adjacent property.

   A. Local Streets
   No curb or sidewalk overtopping.

   B. Collector Streets
   No curb overtopping, the flow spread must leave at least one 10-foot lane free of water.

   C. Arterial Streets
   No curb overtopping, the flow spread must leave at least one 12 foot lane in each direction free of water.

2. Secondary System
   During storm events less than or equal to the design storm for the secondary system the street, swale and gutter section may be used to convey water to a catchment with the following inundation criteria:

   A. Local and Collector Streets
   All stormwater must be contained in a designed section and must remain at least 1' – 0" below all building finished floors. The depth of water over the gutter flow line shall not exceed 12-inches, and shall not exceed 1-inch at the roadway crown or 6" in depth at the back of sidewalk.

   B. Arterial Streets
   All stormwater must be contained in a designed section and must remain at least 1' – 0" below all building finished floors. The depth of water at the roadway crown shall not exceed 1-inch.

3. Ponding of Water
   Ponding of water at low points during design storm event is not allowed.

4. Collector and Arterial Streets Valley Gutters
   Cross drain valley gutters are not allowed across collectors and arterial streets.

5. Street Grades Velocities
   Mean velocities in the gutter at peak flows should not exceed 8-feet per second. Excessive velocity shall be checked through diversion of runoff, drop inlet structures or redesign of the street.

108 CRITERIA FOR STORMWATER RETENTION/DETENTION

108.1 Subdivisions, Multi-Lot Developments

1. Site Runoff
   In general, stormwater runoff shall be retained on the development site. In areas where a defined pre-development discharge existed and the post-development discharges are permitted by downstream owners and operators, off-site, pre-development discharge rates may be allowed if the downstream system has proven, adequate capacity.

2. Location of Stormwater Facilities
   All stormwater facilities (including conveyance facilities) shall be located either in the public right-of-way or an easement in a common area.
   Sand and Grease Traps shall be installed immediately behind the curb and gutter or sidewalk if the sidewalk if adjacent to the curb. If it is necessary to install the trap in the sidewalk, the design shall specify flush, locking lids.

108.2 Single Lot Developments

1. Commercial and Industrial
   All site generated stormwater and surface water shall be retained on-site, except as allowed for through a variance. Variances may be needed in special circumstances such as developments in the downtown core.

2. Residential
   Site generated storm and surface water may be discharged into the public right-of-way if there is an existing system within the right-of-way and has proven, adequate capacity. This capacity may be proven with engineering calculations and approved by the City and if it can be shown that the lot drainage was included in the overall drainage for the development.

109 RETENTION/DETENTION FACILITIES

109.1 GENERAL

The following criteria apply to both retention and detention facilities.

109.2 MULTI-USE

When possible, retention/detention facilities should be designed as open surface facilities for multi-use. Maximum side slope steepness is 5:1 and maximum water depth

is 1' – 0". If the facility is not designed for multi-use, it shall be fenced with a 6-foot high chain link fence with gates as needed for maintenance and operations access.

109.3 AGENCY COMPLIANCE

Idaho Department of Water Resources (IDWR) and Department of Environmental Quality (DEQ) Requirements must be met.

Retention facilities which incorporate percolation beds for stormwater management shall conform to Title 42, Chapter 39, Idaho Code, and to the Idaho Department of Water Resources Rules for Waste Disposal and Injection Wells and to DEQ BMP's.

109.4 SEDIMENT CONTROL

1. Sand and Grease Traps
   Flows into retention/detention facilities shall flow through an appropriately sized sand and grease trap with a throat velocity of less than 0.5 feet per second at design flows. The system may be designed as an offline system that treats the 50 year storm flows and passes higher flows. For location criteria see 108.1 (2).

2. Sediment Storage
   Storage volumes required for design runoff volumes shall be increased by a minimum of 15% to accommodate sediment storage.

109.5 PERCOLATION DESIGNS

Any facility that allows water to percolate into the soil will be considered percolation design. This includes both above ground and below ground facilities. Facilities utilizing percolation designs shall not intercept the groundwater table. The bottom of the facility shall have a minimum 3-foot vertical separation from the seasonal high groundwater and/or bedrock. The 3-foot separation between the bottom of the facility and the seasonal high groundwater table shall contain a fine aggregate material to treat the water prior to entering the groundwater. The fine aggregate material shall meet the gradation requirements of filter sand as specified in ISPWC Section 801.

The seasonal high groundwater table elevation shall be established and used for the facility design. The elevation of the seasonal high groundwater table shall be determined from a monitoring well established at the facility site and monitored during the high groundwater season. If available, the District Health Department groundwater records may be used to establish the probable highest groundwater elevation.

Alternatively, a site assessment of the area immediately around the proposed facility may be conducted by a licensed hydro-geologist or by a Professional Engineer, licensed in the State of Idaho. The site assessment shall include an evaluation of the soil strata at least six feet below the bottom of the proposed facility to determine if the

probable maximum high groundwater elevation will encroach into the facility. A sealed site assessment report shall be submitted to the City for review and approval. This elevation may be used as the groundwater elevation in lieu of data from monitoring wells monitored throughout a year.

Regardless of the method used in determining the groundwater elevation, the elevation shall be shown on the drawings and referenced to a nearby benchmark (within 300 feet) that will be maintained and accessible during and after development. The benchmark may be moved if it is referenced to the original benchmark and shown on the record drawings.

If groundwater is encountered during construction of the facility at an elevation higher than that shown on the plans, the facility shall be re-designed to account for the higher elevation. Approval of the new design and construction drawings by the City Engineer is required.

109.6 FACILITY SITES

1. Multi-Lot Developments
   No street drainage facility will be allowed on any single-family or multi-family lot.

2. Single Lot Developments
   Single lot developments may not accept off site drainage that exceeds historical flows and must meet the requirements of Section 108.2.

3. Easements
   Detention/retention facilities not located in the public right-of-way must have City drainage and access easements with no encroachments, which would adversely impact drainage or operation and maintenance, including accesses for removal and reconstruction of the facility.

109.7 DESIGN

Facilities shall be designed to accommodate the runoff from a design storm with a 100 year return frequency. Emergency overflows shall not be allowed to discharge into irrigation facilities without prior written permission from the owner and/or operator of the facilities and applicable regulatory agencies. No freeboard is required unless an embankment is constructed as part of the pond.

110 RETENTION FACILITIES

Retention facilities are designed to accept all the runoff from the site and retain the runoff until it infiltrates into the surrounding ground or evaporates.

110.1 DESIGN CRITERIA

Retention facilities shall be designed to accommodate the runoff volume from the design storm as described in Section 104 and 105, Runoff Volume, with allowance for sediment and freeboard as indicated in this policy, respectively.

Percolation facilities shall be designed such that no visible water exists 24 hours after the storm event for the primary conveyance storm and 72 hours after the secondary conveyance storm.

111 PERCOLATION PONDS

111.1 DESIGN

Percolation ponds are to be designed to contain the design inflow without overflowing. See Table 1. Percolation ponds shall be designed dissipate 90 percent of the design storm runoff into the ground within 24 hours of the storm event. Percolation ponds shall be off-stream facilities and emergency overflows into irrigation facilities shall not be allowed.

Porosity for pond sizing shall be reduced by 15% from new material values to account for silt/sediment accumulation as the pond ages.

111.2 CONDITIONS WHERE PERCOLATION FACILITIES ARE NOT ALLOWED.

When any of the following conditions exist, disposal of stormwater by percolation is not allowed. A separate permit may be required by the Idaho Department of Water Resources when any of these conditions exist.

1. Seasonal high groundwater is less than three (3) feet below the percolation surface of the pond.

2. Bedrock or impervious soils are within three (3) feet of the percolation surface of the pond.

3. The percolating surface is on top of fill unless the fill is clean sand or gravel and demonstrates groundwater quality degradation will be mitigated.

4. The surface and underlying soil are SCS Hydrologic Group C, or the saturated percolation rate is less than 0.25 inches per hour.

5. The facility is located within 100 feet of a domestic well. If the domestic well is

part of a public drinking water system the facility has a “Direct Influence” on the well. “Direct Influence” is determined according to Idaho Rules for Public Drinking Water Systems (IRPDWS), Ch. 515.

111.3 PERCOLATION RATES

Soil borings or test pits shall be taken at the pond sites to classify soil types. Percolation rates shall be determined for design. A percolation test for the site specific soil conditions at the depth of the bed can be used. The table below presents typical percolation rates. These values may be used based upon soil testing without an on-site percolation test. In no event will a rate exceeding 8 inches per hour be allowed.

TABLE 3 – ALLOWABLE PERCOLATION RATES

SCS Group and Type	Percolation Rate (Inches/Hour)	Percolation without Pretreatment (Inches/Hour)
A. Sand	**8**	**2**
A. Loamy Sand	**2**	**1**
B. Sandy Loam	**1**	**.5**
B. Loam	**0.5**	**.25**
C. Silt Loam	**0.25 ***	**0**
C. Sandy Clay Loam	**0.15**	**0**
D. Clay Loam & Silty Clay Loam	**<0.09**	**0**
D. Clays	**<0.05**	**0**

***Minimum rate, soils with lesser rates should not be considered as candidates for percolation facilities.**

111.4 SAND AND GREASE TRAPS

Properly sized standard sand and grease traps shall be installed upstream of percolation facilities. Sand and Grease Traps shall be installed immediately behind the curb and gutter or sidewalk if the sidewalk if adjacent to the curb. If it is necessary to install the trap in the sidewalk, the design shall specify flush, locking lids.

111.5 GROUND WATER ELEVATIONS

Groundwater elevation shall be established in accordance with Section 109.5. If groundwater is encountered during construction of the facility at an elevation higher than that shown on the plans, the facility shall be re-designed to account for the higher elevation.

Water quality testing may be required by the City, Idaho Department of Water Resources, IDEQ or Southwest District Health Department.

112 PERCOLATION BEDS

112.1 DESIGN

Percolation Beds are to be designed to contain the design inflow without overtopping. See Table 1. The water is stored within the effective void volume and percolates into the ground.

The storage volume shall accommodate the design storm. The design of the facility shall assume that the bottom of the trench is impervious. The surface infiltration shall be calculated using the full side-wall area of the trench. This reduction will provide a factor of safety and account for the time required to fill the volume and variations in hydraulic head.

The facility shall have an appropriate approved filter fabric placed between the storage media and the surrounding soil.

Bed sizing shall be increased by 15% from new material values to account for silt/sediment accumulation as the bed ages.

Acceptable engineering design formulas shall be used in determining storage volumes and percolation rates in the Vadose Zone.

112.2 CONDITIONS WHERE PERCOLATION FACILITIES ARE NOT ALLOWED

If any of the conditions described in Section 111.2 exist, disposal of stormwater by percolation is not allowed.

112.3 SAND AND GREASE TRAPS

Properly sized standard sand and grease traps shall be installed upstream of any percolation Bed.

112.4 MONITORING WELLS

Two monitoring wells shall be installed at each percolation facility. One monitoring well shall be established prior to construction to verify the groundwater elevation used in design and for long term monitoring of the quality and water surface of the groundwater. See Section 109.5. The second shall be installed during construction and used to monitor the depth of water within the storage medium. The location and elevation of the wells shall be shown on the drawings and referenced to a nearby benchmark (within 100 feet) that will be maintained and accessible during and after construction. The benchmark may be moved if it is referenced to the original elevations and shown on the record drawings.

112.5 DIFFERENT SOIL STRATA CHARACTERISTICS

Soil borings or test pits shall be used at the bed sites to classify soil types and depths. When the soil strata has different percolation characteristics, the relative rate for that depth of soil shall be used. The percolation rates described in Section 111.3 shall apply.

112.6 MATERIALS

Table 4 indicates the effective void volume for typical materials used in the percolation bed. The Design Engineer may determine void volumes for other materials by laboratory analysis and submit them to the City for review and approval.

TABLE 4 - VOID VOLUME OF TYPICAL MATERIALS

Material	Void Volume (%)
Blasted Rock	**30**
Washed drain gravel	**33**
Uniform sized gravel (1-1/2")	**40**
Graded gravel (3/4" minus)	**30**
Sand	**25**
Pit run gravel	**15 – 25**

113 DETENTION PONDS

113.1 DESIGN

The design of any detention pond requires consideration of several factors, such as size of the pond; minimum free board depth; maximum allowable depth of temporary ponding; recurrence interval of the storm being considered; storm duration; timing of the inflow; allowable outflow rate; and the length of time water is allowed to remain in the pond. The design goal is to leave downstream areas with the same hydrology that existed before development.

Balancing the requirements is done through the development of three items: 1.) an inflow Hydrograph, 2.) a depth-storage relationship, and 3.) a depth-outflow relationship. These items are combined in a routing routine to get the outflow rate, depth of stored water, and volume of storage at any specific time, as the runoff passes through the detention pond. The storm interval to be used is specified in Table 1. The inflow/storage/outflow relationships shall be based on a storm duration that identifies a peak detention pond volume for the storm interval required. The design considerations and procedures are discussed in the following sections.

113.2 INFLOW HYDROGRAPH PROCEDURES

Generally accepted procedures for determining the inflow hydrograph include the Modified Rational Method and the SCS TR55 Method. The design storm shall have a return frequency obtained from Table 1.

113.3 MAXIMUM OUTFLOW RATE

Maximum outflow rate shall not be more than the pre-development rate of runoff for each storm return interval. It shall account for the initial soil abstractions from the site. The receiving system must be shown to be capable of accommodating the design flow.

113.4 GENERAL STRUCTURAL CRITERIA

The following list of general structural criteria shall be used to design stormwater detention ponds. Since each stormwater pond is unique and soil and other site conditions vary, these criteria may be modified at the discretion of the design engineer. The Engineer must submit written justifications for any modification to the City Engineer and obtain written approval.

1. Principal Outlets of Detention Facilities

   A. Outlet pipes shall be at least 12-inches in diameter. If risers are used, they shall be at least 12-inches in diameter. Trash racks or anti-vortex devices are required. All pipe joints are to be watertight.

B. Anti-seep collars , 8-inches thick, are to be installed along outlet pipes.

C. All principal outlet structures shall be reinforced concrete. All construction joints are to be watertight.

D. Suitable slope protection approved by the City shall be placed upstream and downstream of principal outlets as necessary to prevent scour and erosion. High velocity discharges require energy dissipaters.

2. Detention Components: Emergency Spillways

A. Emergency spillways shall be suitably lined and shall follow criteria contained in Hydraulic Engineering Circular No. 15 (United State Department of Interior Bureau of Reclamation).

B. Maximum velocities in emergency spillways shall be checked by the Design Engineer, based on the velocity of the peak flow in the spillway resulting from the routed Inflow/Outflow Hydrograph.

113.5 WATER QUALITY

For the purpose of protecting water quality in the receiving water, detention ponds shall retain the "first-flush" of storms. At a minimum, at least 0.2" of runoff from impervious area shall be retained (not discharged off-site). In all cases, the facility should be designed to empty within 72 hours of the design storm event.

114 IRRIGATION AND DRAINAGE FACILITIES

In general, stormwater conveyance and storage facilities shall be separate from non-stormwater systems such as irrigation and irrigation return flows. Existing non-stormwater systems rerouted or piped through new developments shall not be located in the public right-of-way except at crossings. Approved discharges of stormwater facilities into non-storm systems shall be at centralized, distinct locations.

115 REQUIRED SUBMISSIONS FOR DRAINAGE REVIEW

Note: The review is for the purpose of determining general conformance to City policies and requirements. The engineer in responsible charge is solely responsible for the design. All submissions shall be stamped and signed by a Professional Engineer licensed in the State of Idaho.

115.1 PRELIMINARY ENGINEERING DRAINAGE REPORT – SUBMIT WITH PRELIMINARY PLAT APPLICATION

The Drainage Report consists of the following:

1. Site Grading Plan.

2. Plan of new or modified drainage and irrigation (gravity and waste) water conveyance systems.

3. Calculations for anticipated stormwater facilities.

4. Geotechnical Engineering Report.

5. List of expected permits and discharge agreements that will be required.

115.2 FINAL DRAINAGE REPORT – SUBMIT WITH CONSTRUCTION DRAWINGS.

The Drainage Report consists of the following:

1. Final Site Grading Plan.

2. Final peak flow calculations for each event considered.

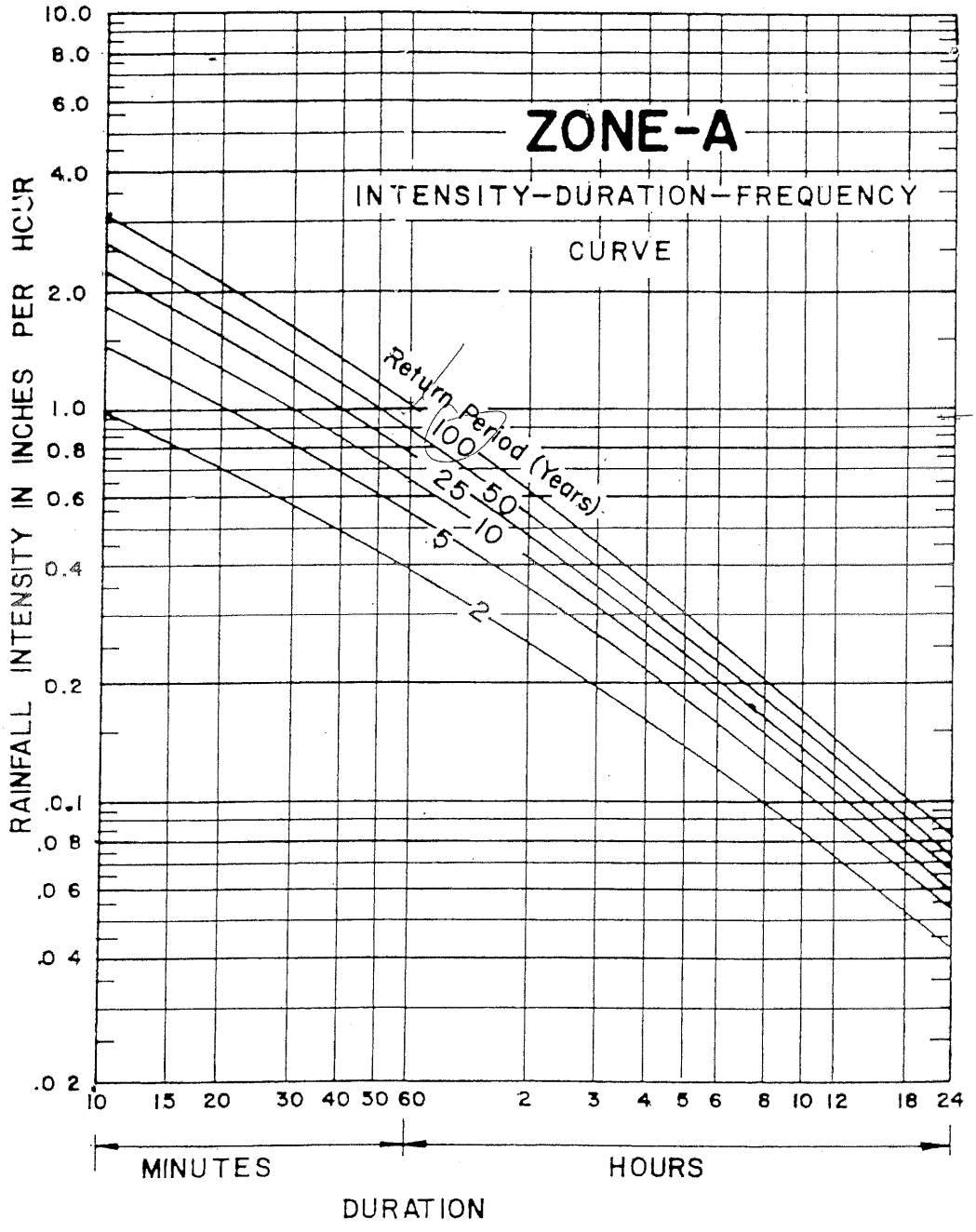
3. Final runoff volume calculations for each event considered.

4. Maintenance and operation manuals for stormwater facilities at the discretion of the City Engineer.

5. Updated Geotechnical Engineering Report.

6. Copies of associated permits and discharge agreements.

Exhibit A


ZONE-A
INTENSITY-DURATION-FREQUENCY
CURVE
RAINFALL INTENSITY IN INCHES PER HOUR
10.0
8.0
6.0
4.0
2.0
1.0
0.8
0.6
0.4
0.2
.0 1
.0 8
.0 6
.0 4
.0 2
Return Period (Years)
100
50
25
10
5
2
10 15 20 30 40 50 60 2 3 4 5 6 8 10 12 18 24
MINUTES
HOURS
DURATION