3.0 BASIS FOR EVALUATION

3.1 IRRIGATION NETWORK CONDITIONS

The hydraulic conditions in the GPID facilities vary widely by season. The condition that was chosen by the City to be modeled is the winter drainage scenario, which corresponds to the period when the larger storm events generally occur. In this scenario, the gates (referred to as spills) from the irrigation canals are typically open to allow flow into the creeks and river. A few exceptions to this were discovered in the calibration process. Most irrigation laterals (drainage ways branching off the main canal) are closed under the winter scenario. Only drainageways used as drainage spills remain open. Figures 5A through 5D in Appendix A show the locations of each spill.

For the winter drainage scenario, irrigation water has been shut off and is not passing through the canals for distribution. The only water entering the canal system is from rainfall runoff. The scope of this project includes the evaluation of only one drainage scenario. It is possible that a storm event during the irrigation season, when the canals are already full, presents an equal or greater risk to the system. When additional funding becomes available, the summer condition should be evaluated.

3.2 PLANNING CRITERIA

Stormwater system planning criteria encompass the fundamental standards of performance in evaluating the existing system and planning for future expansion of the system. After reviewing regional, industry, state, and federal standards, the criteria ultimately selected and applied in this study were tailored to fit the needs of Grants Pass.

The aim of establishing planning criteria is to provide consistent guidelines and methods with which to evaluate the existing and future system.

To establish planning criteria for Grants Pass, established policies of other communities were investigated. Findings from these investigations and recommended standards for Grants Pass are summarized in Table 3-1. Some communities directly adopt the standards developed by others. This is the case with Josephine County, which uses the ODOT/APWA standards. For this reason, Josephine County was not included in the table as a separate column. Other smaller communities' standards were also considered, but were not included in Table 3-1. Additional details on the basis for each item's recommendation are provided in the following sections.

Table 3-1: Storm Drainage Design Criteria Comparison

Item	Grants Pass (Recommended)	Grants Pass 2007 SWMP	ODOT	Eugene	Ashland	Portland
Model Approach	SWMM (runoff)	SWMM (runoff)	SBUH	TR55, Rational, HEC-1, SWMM	TR-55, Rational	Various
Storm Distribution	NRCS 1A	NRCS 1A	NRCS 1A	Specific Historic Storms	NRCS 1A	NRCS 1A
24 hr Storm Precipitation	NOAA	NOAA	NOAA	Specific Historic Storms	NOAA	NOAA
PVC "n" value	0.013	0.010*	0.013	None Specified	0.011	0.013
Min. Pipe Diameter	12"	None Specified	12"	None Specified	12" for trunklines	12"
Design Storm: For Conveyance	25 yr	25 yr	50 yr	25 yr - sewers & channels 50 yr - culverts on arterials	25 yr for sewers 50 yr for culverts	25 yr
Design Standards For Detention Facilities on New Developments	Pre- and post-development runoff the same up to 50yr, 100yr overflow	None Specified	10 yr volume with 100 yr emergency overflow	Must Bypass 100 yr through Overflow	Overflow supports 25 yr event for <50cfs, or 100 yr >50cfs	Maximum Practicable
Detention Facilities Allowed Inside Floodway/ Flood Plains?	Floodway: No Floodplain: with Approval	None Specified	Floodway: No Floodplain: Yes	Has specific instructions for facilities above and below 500 ft.	None Specified	Floodway: No Floodplain: No
Infiltration Policy	Case-by-Case	Yes, with requirements	Not Allowed	Yes, with requirements	Discussed in Master Plan	Allowable
Roof Drains to Gutter or Yard?	Yard	Pervious Areas**	Gutter	None Specified	None Specified	Gutter

*From City of Grants Pass Sanitary Sewer Design Standards & Specifications
**From Grants Pass Comprehensive Plan

3.3 POLICY AND STANDARDS

3.3.1 Design Storms

The design storm is a theoretical storm event with typical characteristics for storms in a given region. The design storm becomes the standard used to measure the performance of the storm drain system.

One parameter of a design storm is the total depth of rainfall expected to occur over a given time period, or duration. Another parameter is the recurrence interval, or the average time interval between equal events. For example, a 100-year storm event is likely to occur on average once every 100 years, or in other words, has a 1% percent chance of occurring any given year. The National Oceanic and Atmospheric Administration (NOAA) has published isopluvial charts showing rainfall depths for a range of recurrence intervals in certain geographic areas. Table 3-2 presents the rainfall depths for the City of Grants Pass obtained from the NOAA isopluvial charts.

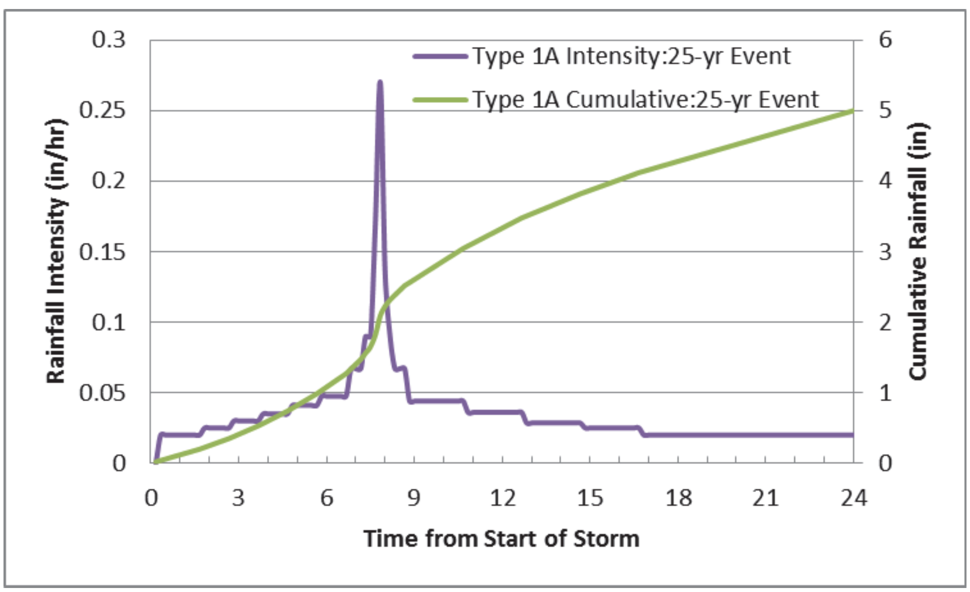
Table 3-2: 24-hour Storm Depths

Storm Event	Precipitation (in)*
2-year	3.0
5-year	3.7
10-year	4.1
25-year	5.0
50-year	5.5
100-year	5.9

*Source: NOAA Atlas 2, Volume X

Another parameter of a design storm is how the given amount of precipitation is distributed over the duration of the storm (temporal distribution). A hyetograph illustrates the typical temporal distribution of a storm. The hyetograph shape is theoretical and is based on historical data collection and extrapolation. The Natural Resource Conservation Service (NRCS) has developed region-specific hyetographs for the State of Oregon. For Grants Pass, the NRCS recommends the use of a Type 1A distribution. The 25-year storm hyetograph is illustrated in Chart 3-1.

Chart 3-1: Type 1A 25-year, 24-hour Hyetograph



Selection of a design storm is a matter that balances level of service with economic feasibility. Grants Pass does not currently have design standards for conveyance or detention facilities. The 25-year storm event is recommended as the design storm for conveyance (more specifically, the stormwater system should be capable of carrying the runoff from the contributing area for the 25-year storm event without flooding). Detention facilities should be designed to hold the 50-year storm event, with overflows capable of safely conveying the 100-year storm event.

For detention facilities, the post-development runoff from the 50-year storm cannot exceed the pre-development runoff from the 50-year storm. In addition to the 50-year storm, the detention facility should serve the same function for limiting post-development runoff from smaller storm events (i.e. 25, 10, 5 & 2 year). This recommendation is typical of what many other communities in Oregon have established. Pre-development conditions should be defined as ideal hydrologic conditions prior to any manmade development (i.e. prairies and grasslands).

New detention facilities should not be located in a mapped floodway for the 100-year event as delineated by FEMA. Facilities in the 100-year floodplain need careful review to ensure they are designed to function during a 100-year flood event. The 100-year storm event for a stormwater basin does not necessarily coincide with the 100-year flood event for a given floodplain. The 100-year floodplain is influenced by many factors from a much broader river basin area.

The 2007 master plan recommended a policy that the 2-year post-development runoff volume should not exceed ½ the pre-development runoff volume for new developments. This policy is intended to improve stormwater quality and mitigate flooding from smaller storm events. However, it is important to recognize that any amount of runoff could be problematic to the receiving waters depending on pollutant type and concentration. The volume of flow is not necessarily directly correlated to the resulting stormwater quality. Regardless, policies like this are common because direct stormwater quality monitoring and treatment is not generally practiced.

3.3.2 Pipe Parameters

There are three parameters that are generally established for system analysis and design: pipe minimum roughness, minimum size, and minimum slope.

A roughness value (Manning's n) is typically established in city codes to set a minimum value allowed for design calculations based on PVC pipe. It is recommended that Grants Pass adopt 0.013 to be used as the Manning's n value for PVC pipes. Though manufacturers often claim lower Manning's n values based on laboratory testing (which would imply greater conveyance capacity, potentially alleviating more flooding), a more conservative n value will add a factor of safety and account for flow variations that occur in the field.

The minimum size for storm pipes should be 12 inches in diameter, in order to pass stormwater and unexpected debris through the system without clogging or surcharging.

The 10 States Standards, generally accepted in the design industry when designating minimum pipe slopes, are recommended for Grants Pass. These standards account for a minimum velocity of 2 feet per second when the pipe is flowing full, assume a Manning's n pipe roughness of 0.013. The following table provides minimum slopes for pipe sizes under these conditions. The minimum slopes from Grants Pass Sanitary Sewer Standard Specifications are also provided in Table 3-3 for reference. Though flatter slopes are allowed in 10 States Standards for pipelines 24 inches and larger, these are difficult to construct, and so a minimum slope of 0.12% is recommended below. A maximum velocity of 10 feet per second is recommended to reduce premature wear on pipe joints and manhole sections caused by high system velocities.

Table 3-3: Minimum Pipe Slopes

Nominal Pipe Size (inches)	Minimum Slope - 10 States Standards (Feet per 100 Feet)	Minimum Slope –City Sanitary Sewer Standard Specifications (Feet per 100 Feet)
12	0.22	0.22
14	0.17	N/A
15	0.15	0.16
16	0.14	0.16
18	0.12	0.12
21+ and larger	0.10	0.12

Pipes in the model were assumed to be clean and free of debris. While it is not likely that pipes are completely clean, this criteria prevents a recommendation for a costly capital improvement in areas of flooding caused by a clogged pipe that could be mitigated by simply cleaning the pipe.

3.3.3 Infiltration Policies

Constructed infiltration systems are not needed for conveyance in Grants Pass because there is a sufficient amount of volume available in the existing creeks in Grants Pass to pass the 25-year event. Future water quality regulations may, however, require infiltration. DEQ maintains strict regulations for underground injection systems, which are avoided if infiltration is not allowed. Soil conditions in Grants Pass can vary greatly, making it difficult to establish a blanket standard for infiltration facilities. Keller Associates recommends the City's standards allow for infiltration facilities on a case-by-case basis with supporting geotechnical data and conformance to DEQ's regulations.

3.3.4 Roof Drains

Roof drains should drain to the yard to slow the arrival of runoff to the stormwater system, potentially reducing peak flows. There are differing opinions throughout Oregon regarding this policy. The fertilizer, pesticide, and animal droppings from lawn runoff can lead to water quality concerns downstream. However, since most events will infiltrate and stay onsite, Keller Associates recommends a policy of draining to the yards.