2. Public education and outreach.

3. Public involvement and participation.

4. Illicit discharge detection and elimination.

5. Construction site run-off control.

6. Post-construction run-off control.

Current permit fees are $670 for the initial application and $330 for each year of coverage under the permit.

In 2003, DEQ completed its total maximum daily load (TMDL) study for the North Coast Subbasins. The study includes the Nehalem River and its tributaries. Its purpose was to establish water quality goals within the North Coast Subbasins. A TMDL is the total quantity of a specified pollutant that enters the water body without violating water quality standards. The Federal Clean Water Act (CWA) requires the establishment of TMDLs for water quality limited bodies of water under Section 303 (d) of the CWA. Nehalem Bay, adjacent to Wheeler, was listed in 1998 as water quality limited for fecal coliform. The TMDL study found, based on modeling, that water quality standards, for fecal coliform near Wheeler, were generally met during the later summer, and that the greatest violations of water quality standards were likely to occur in the late fall and early winter. Dry weather data for fecal concentrations were well below the pollutant criteria (14 MPN/100 ml). Exceedence of the fecal criteria is the basis for DEQ's requirement that the City prepare this storm water drainage master plan. The City has not been required to be permitted under the Phase II program.

5.3 FISH AND WILDLIFE

Storm water improvements often involve natural waters such as streams or rivers and may directly impact fish passage or health. In 2001, Oregon adopted laws regarding fish passage requirements that must be addressed prior to the installation, replacement, or abandonment of an artificial obstruction. This applies to waters in which native, migrating fish are currently or historically present. **Oregon Department of Fish and Wildlife (ODF&W)** has developed a set of fish passage guidelines that reflect the new laws.

NOAA Fisheries and the **U.S. Fish and Wildlife Service (USFWS)** share responsibility for implementing the Endangered Species Act (ESA). NOAA manages marine species including anadromous salmon while USFWS manages freshwater species. Listing of an endangered species protects it from a "take" as defined by federal law. "Take" can be construed as harm, harassment, pursuit or hunting, shooting, catching, killing, wounding, trapping, or collecting. A take can also result from actions, which if repeated sufficiently, could result in harm; consequently, activities that reduce habitat, food supply, or affect water quality could also qualify as a "take". All federal agencies, including funding agencies, are required to consult with NOAA Fisheries (or USFWS) on any activity that may affect a listed species.

5.4 REMOVAL AND FILL REGULATIONS

Removal or fill of 50 cubic yards or more of material in waters of the State requires a permit from the **Oregon Department of State Lands (DSL)**. "Waters of the State" include bays, flowing, and intermittent streams, lakes, wetlands, and other natural waterways. Streams that are designated as essential salmon habitat require a permit regardless of the quantity of removal or fill. Certain activities or projects are exempt from state removal-fill requirements. These activities include, but are not limited to: maintenance or reconstruction of existing serviceable structures (such as drainage ditches); maintenance or reconstruction of recently damaged parts of roads or transportation structures; fish passage structures; or maintenance, repair, removal, and replacement of culverts.

Permits issued by DSL include various conditions and may require some type of mitigation to compensate for environmental impacts to wetlands. Permits specify when in-water work can be conducted consistent with information provided by ODF&W.

Projects requiring a DSL permit will often require a permit from the **U.S. Army Corps of Engineers**. DSL and the Corps have a joint permit application form which streamlines the application process.

5.5 RIGHT-OF-WAY (ROW) CROSSINGS

Crossings of state highways require coordination and approval by the **Oregon Department of Transportation (ODOT)**. ODOT maintains stringent design standards that must be incorporated into approved projects. ODOT also coordinates with other agencies such as ODF&W on issues and requirements applicable to the project.

Railroads also have minimum design standards for crossings to ensure the integrity of the railway. Railways often view crossings as a source of income. Negotiations for crossings of rail ROWs often focus more on contractual terms and easement costs rather than on technical or design issues. The Port of Tillamook Bay owns and operates the railway through Wheeler.

5.6 OTHER REGULATIONS

Construction activities within a floodplain as designated by the **Federal Emergency Management Agency (FEMA)** should be coordinated with the agency to ensure compliance with all agency requirements. FEMA's primary concern is to not adversely impact the floodplain.

For construction activities that disturb one acre or more, an NPDES General Permit 1200-C is required. This is issued by **DEQ** and requires the preparation, submittal, and review of an application for the permit. Requirements include: general project and site information, a land use compatibility statement signed by the local planning department, and the $670 application fee. An erosion and sedimentation control plan specific to the project must also be prepared. The plan must be approved by DEQ prior to the commencement of any construction activities.

5.7 CITY ORDINANCES AND REQUIREMENTS

Wheeler does not currently have a comprehensive set of requirements regarding stormwater management and erosion control. Current requirements are limited to the provision of culverts across all newly constructed driveways.

SECTION 6: HYDROLOGIC/HYDRAULIC ANALYSIS

6.1 GENERAL

Hydrologic/hydraulic analysis involve computations that predict runoff and routes stormwater through a drainage system. Hydrologic computations result in estimates of peak flows and runoff volume. Peak flows are used to size pipes, culverts, or open channels (ditches). Runoff volume is used to size detention if it is required to protect downstream reaches of a drainage system. The analysis was accomplished by use of computer models that simulate runoff from a defined storm intensity, and parameters that describe land use and soil characteristics.

6.2 DESIGN STORM FREQUENCY

Storm recurrence frequencies of 25 years, 50 years, and 100 years for a 24-hour event were modeled for all basins. The storm frequency indicates the period over which the occurrence of one storm of that magnitude is statistically probable. Storm intensity, and consequent stormwater flow, increases with larger recurrence frequencies. Selection of the appropriate design storm affects sizing of proposed improvements which, in turn, affects construction costs. Many communities have infrastructures sized for 5-year events; however, sizing for 25-year events is the current standard for smaller urban streets. ODOT requires a 50-year design storm for drainage across state highways. The 100-year storm can be used to reduce the possibility of highway overtopping or to otherwise protect critical facilities. For Wheeler, a 25-year event is recommended for general City planning, and a 50-year event for planning of all work along or across Highway 101. The 100-year event is included primarily for comparative purposes. Regardless of the event selected as the basis for analysis and design, it is possible that some areas may still exhibit localized flooding during large storm events.

Precipitation-frequency statistics were obtained from the 1973 *NOAA Atlas 2, precipitation-frequency atlas of the western United States, Volume X -Oregon, and are listed in Section 2.2.*

6.3 HYDROLOGIC ANALYSIS

6.3.1 Hydrologic Model

Hydrologic and hydraulic modeling was performed using HydroCAD Version 7 software. HydroCAD is based on hydrologic techniques developed by the U.S.

Department of Agriculture Soil Conservation Service (SCS) of which, the principal technique for runoff determination is the SCS Unit Hydrograph procedure (SCS Technical Release 20, also known as TR-20).

6.3.2 Synthetic Rainfall Distribution

The SCS procedures utilize a synthetic rainfall distribution of the selected 24-hour design storm. A fraction of the total rainfall is allocated to each time interval over a 24-hour period. The allocation is non-linear and reflects the variations in rainfall intensity in a 24-hour period associated with typical storms in a given area. Wheeler is located in an area having a Type IA distribution[1]. HydroCAD automatically creates the synthetic rainfall distribution for the entered storm total and selected distribution type.

6.3.3 Curve Number

SCS developed a numerical characterization of potential runoff associated with various soil types and ground covers. Curve numbers also reflect consideration of runoff and infiltration rates for surfaces subject to prolonged wetting. This latter consideration resulted in the development of four hydrologic soil group categories:

Group A:	well drained.
Group B:	moderate drainage.
Group C:	poor drainage.
Group D:	very poor drainage.

Based on soil characteristics described in Section 2.4, Group B curve numbers were selected. Composite curve numbers were then developed for each basin based on a weighted average of land area in the basin and associated curve numbers. The curve number determination for Wheeler is included in Appendix 6.1. Curve numbers for both current and projected future (post-development) conditions were developed.

6.3.4 Other Parameters

Other input parameters for HydroCAD include (for each basin): total area and time of concentration. Time of concentration (T_C) is the time it takes for runoff to

[1] There are three other distributions (I, II, and III) used in other parts of the United States.

travel from along the longest flow path in the basin. The lag (or curve number) method was used to determine T_C for basins in Wheeler. It is generally applicable for basins of 2000 acres or less. The T_C equations are:

$$T_C = \frac{L}{6}$$

$$L = \frac{I^{0.8}(s+1)^{0.7}}{1900Y^{0.5}}$$

$$S = \frac{1000}{CN} - 10$$

Where:

T_C = Time of concentration (hrs.)
L = Lag time (hrs.)
I = Hydraulic length (ft.)
Y = Average land slope (percent)
S = Potential maximum retention (in.)
CN = Weighted curve number

and:

$$Y = 100\,\frac{Cc}{A}$$

Where:

C = Total contour length (ft.)
c = Contour interval (ft.)
A = Area (ft^2)

HydroCAD computes T_C based on entry of needed data and selection of the T_C method desired.

6.4 MODEL RESULTS

Model results are summarized in Table 6.1 by basin for both current and projected future conditions. HydroCAD results and data are included in Appendix 6.2.

Table 6.1: Current and (Projected) Future Peak Flows

Basin I.D.	Basin Area (Ac.)	Current Flows (cfs)			Projected Future Flows (cfs)		
		25-year	50-year	100-year	25-year	50-year	100-year
W1	394.6	80.4	100.9	145.4	114.6	138.8	190.7
C1	410.2	67.3	84.4	122.3	73.9	92.1	131.5
C2	2.4	2.2	2.5	3.1	2.2	2.5	3.1
C3	9.0	9.0	10.1	12.3	9.0	10.1	12.3
V1	1,936.5	279.5	347.2	498.2	279.5	347.2	498.2
V2	5.9	5.5	6.2	7.6	5.5	6.2	7.6
V3	22.9	8.6	10.5	14.6	21.0	23.7	29.2
V4	4.0	3.3	3.8	4.7	3.3	3.8	4.7
V5	7.5	8.3	9.2	11.1	9.8	10.7	12.6
V6	9.1	4.9	5.8	7.6	5.7	6.7	8.6
N1	5.3	2.8	3.3	4.4	3.6	4.2	5.4
N2	4.8	4.9	5.4	6.6	5.2	5.8	7.0
N3	11.2	7.9	9.1	11.6	10.1	11.4	14.1
N4	3.8	5.5	6.0	7.0	5.5	6.0	7.0
N5	1.9	2.1	2.3	2.8	2.1	2.3	2.8
G1	749.3	131.2	149.7	216.1	143.5	176.6	249.0
G2	30.2	21.0	24.1	30.6	24.1	27.4	34.3
Z1	169.4	34.2	43.5	63.8	34.2	43.5	63.8
Z2	97.9	23.3	28.7	40.3	29.8	35.9	48.8
Z3	14.2	12.3	14.0	17.3	13.3	14.9	18.4
Z4	268.5	49.1	62.1	90.8	49.1	62.1	90.8
Z5	18.3	5.8	7.2	10.2	8.5	10.1	13.6
Z6	8.5	12.5	13.6	15.7	12.5	13.6	15.7
Z7	138.5	25.9	32.7	47.9	25.9	32.7	47.9