SECTION 1: INTRODUCTION

1.1 BACKGROUND

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.

1.2 PURPOSE AND SCOPE

The purpose of the project is to develop a Storm Water Drainage Master Plan for the City of Wheeler that will address the City's level of impact on water quality in Nehalem Bay and make recommendations for capital improvements and policies to improve water quality.

1.3 FUNDING ACKNOWLEDGMENT

This project was funded in part by a grant from the United States Environmental Protection Agency under assistance agreement C9-000451-04 to the Oregon Department of Environmental Quality, and in part by local Oregon Lottery proceeds with a technical assistance award from the Water/Wastewater Financing Program administered by the State of Oregon Economic and Community Development Department.

1.4 AUTHORIZATION

The City of Wheeler retained HGE, Inc., Architects, Engineers, Surveyors & Planners on December 10, 2004 to complete this Storm Water Drainage Master Plan.

1.5 MASTER PLANNING OPINIONS OF PROBABLE COST (OPCs)

1.5.1 General

Opinions of probable cost (OPCs) presented in this master plan include four components, each of which is discussed separately in this section. It must be recognized that opinions of probable cost are preliminary, and based on the level of planning presented. As specific improvements proceed forward, it may be necessary to update the costs to reflect changes in project complexity or approach.

1.5.2 Construction Cost

Opinions of probable cost in this plan are based on preliminary layouts of the proposed improvement, actual construction bidding results for similar work, published cost guides and the author's construction cost experience within the state of Oregon.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the opinions of probable cost presented herein. For this reason, it is common engineering practice to relate the costs to a particular index that varies in proportion to long term changes in the national economy. The Engineering New Record (ENR) Construction Cost Index is most commonly used. It is referenced to an initial value of 100 for the year 1913.

All costs in this plan are based on the July 2005, ENR Construction Cost Index value of 7422. Opinions of probable costs should be updated at the actual time of completing funding applications, and prior to a general obligation bond election. When the community secures financing, a "reserve factor" should be added at that time for estimated increased cost due to inflation. Since 1994, construction costs have increased an average of 2.8 percent each year. Opinions of probable costs can be prepared at any future day by comparing the future ENR Construction Cost Index with the index value of 7422; however, this approach is generally only considered valid for a 2 or 3 year period since construction techniques and materials change with time. If time has elapsed in excess of 2 or 3 years, opinions of probable cost should be updated by an engineer.

1.5.3 Contingencies

In recognizing that the opinions of probable cost are based on preliminary design, allowances must be made for variations in final quantities, bidding market

conditions, adverse construction conditions, unanticipated specialized investigations, and other difficulties that cannot be foreseen at this time. A contingency factor of 10 percent of the construction cost has typically been added.

1.5.4 Engineering, Construction Observation, and Construction Management

Engineering, construction observation, and construction management costs have been assumed at 20 percent of the construction cost. This includes costs for the engineering company to conduct preliminary surveys, perform detailed design analyses, prepare construction drawings, prepare construction specifications, conduct construction stakeout surveys, provide partial construction observation during construction, administer construction related activities such as change orders, and to prepare record drawings.

1.5.5 Legal and Administrative

An allowance of 5 percent of the projected construction cost has been added for legal and administration. This allowance is intended to include internal project planning and budgeting, grant administration, liaison, interest on interim financing, legal services, review fees, legal advertising, and other related expenses associated with the project.

1.5.6 Opinion of Probable Cost Summary

Opinions of probable costs presented in this study include a combined allowance of 35 percent for contingencies, engineering, legal and administrative costs.

SECTION 2: PHYSICAL ENVIRONMENT

2.1 GENERAL

The City of Wheeler is located in Tillamook County, Oregon, approximately 22 miles north of Tillamook. It has a current (July 2004) population of 410 persons (Source: Population Research Center, Portland State University). The drainage area of Wheeler extends from sea-level to 1300 feet and includes 4,400 acres.

2.2 CLIMATE

Wheeler has a mild marine climate with an average annual temperature of 50 degrees[1]. Summers tend to be dry and warm; winters tend to be cool and wet. Snow or temperatures below freezing are relatively uncommon.

Precipitation events for Wheeler have been mapped by the National Oceanic and Atmospheric Administration (NOAA)[2]. A summary of precipitation volumes for different frequency events are summarized below.

Frequency Events	Rainfall Volume
2-yr, 24-hour	4.0 inches
5-yr, 24-hour	5.0 inches
10-yr, 24 hour	5.5 inches
25-yr, 24-hour	6.5 inches
50-yr, 24-hour	7.0 inches
100-yr, 24-hour	8.0 inches

2.3 LANDSCAPE FEATURES

Wheeler is situated on the east bank of Nehalem Bay and is surrounded by hillsides that extend upwards to approximately 1,300 feet in elevation. The area on the west and north side of Highway 101 is predominantly flat. Most of the developed parts of the City are on the surrounding hillsides.

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[1] Based on NOAA data for Tillamook for the period 1948 to 2001.

[2] Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. NOAA Atlas 2, precipitation-frequency atlas of the western United States, Volume X - Oregon. National Oceanic and Atmospheric Administration, National Weather Service, Silver Springs, Md.

Notable watercourses, from north to south, include: Zimmerman Creek, Gervais Creek (also known as Jarvis Creek), Vosburg Creek, and an unnamed creek near Dichter Drive.. Lower portions of the creeks include marsh/wetlands that are influenced by the tides. Gervais Creek is an exception: the lower, natural portion of the stream no longer exists. Gervais Creek runs underground via a 36" diameter pipeline that jogs through downtown and discharges near the docks in the marina. Parts of Zimmerman Creek have also been relocated to facilitate development.

2.4 SOIL CHARACTERISTICS

Most of Wheeler has been mapped by the Soil Conservation Service (SCS)[1]. The area west of (approximately) Vosburg Creek was not mapped; however, the geology and topography of this area is similar to that of the mapped area and is assumed to share similar soil characteristics.

Some commercial development along the waterfront is on imported fill over tidal flats. The remaining (developed) parts of the City are Astoria silt loam. Astoria soils are derived from weathered soft shale. Astoria soils are characterized by: good natural drainage, moderate subsurface permeability, medium runoff, high water-holding capacity, good root penetration, moderate erosion potential, high organic content, and are very strongly acidic. Most of the developed area is characterized by predominantly 20-40 percent slopes. Astoria soils, 20-40 percent slope, are noted by SCS as including isolated or intermittent pockets of various other soil type including: Chitwood soils in sloping concave areas; Knappa, Hebo, or Meda soils in transitional zones along terraces and fans; and Hembre soils in transitional area near basalt bedrock. Astoria soils are typically underlain by soft, fractured siltstone at 50 to 77 inches below the surface.

Hillsides above the developed parts of the City are primarily Hembre silt loam associated with 40-60 percent slopes. Hembre soils are typically underlain by basalt bedrock at 30 to 48 inches below the surface. Hembre soils (40-60 percent slopes) are characterized by: rapid runoff, severe erosion hazard, good natural drainage, moderate to high water holding capacity, deep root penetration, moderately high in organic material, and very strongly acidic.

The northwest (undeveloped) part of the City includes an area of Coquille soils. These soils are very poorly drained and subject to tidal overflow. The area includes the marsh

[1] Soil Conservation Service. 1957. Soil Survey, Tillamook Area, Oregon. United States Department of Agriculture Soil Conservation Service in Cooperation with Oregon Agricultural Experiment Station, Washington, D.C.

that surrounds Zimmerman Creek and is visible east of Coast Highway 101.

2.5 NATURAL VEGETATION

Natural vegetation in the area is predominantly forests of Douglas-fir, hemlock, cedar, and red alder with an understory of salal, braden fern, red huckleberry, and salmonberry. Riparian area extends along the streams and includes tidal marshes near the stream mouths. Marsh vegetation includes rushes, sedges, and grasses.

2.6 RECENT FLOODING

The 100-year flood elevation in Wheeler is 10 feet (NGVD)[1]. Mapped floodplains are generally north of Highway 101 and the railroad; exceptions include the tidal influenced areas that extend up Vosburg Creek and Zimmerman Creek. The map appears to be out of date for the Gervais Creek area since it shows the floodplain extending east over the railway and highway right-of-ways and up "Jarvis" Creek. This was probably the case when Gervais Creek was free flowing (and this is how it is depicted on the flood map); however, Gervais Creek was relocated long ago and Highway 101 built up such that Rorvik Street at the highway is higher in elevation than the east end of Rorvik Street.

The diversion of Gervais Creek to a 36" pipe is reported to have been completed in the early 1900's. The pipe passes under developed properties (see Figure 4.4 for a general indication of the pipe location). One of the properties, the Wheeler Station Building, has experienced basement flooding several times in recent years. Documented occurrences include: 1982, December 1994, January 1995, 1996, November 2000, January 2001, December 2002, and February 2003. Elevation of the basement is approximately 11 feet above a "zero" tide. High tides can range upwards of 8+ feet at Wheeler. Basement flooding is noted to occur during periods that include a high tide and recent heavy rain resulting in (relatively) high flows in Gervais Creek. Photographs provided by the occupant clearly show surcharging out of the top of the manhole, behind the basement door, where the 36" line makes an approximate 90° bend. Flooding is limited to the building basement and the immediate area behind the building. Basement flood depths ranged from one foot to slightly over four feet (as documented by the occupant with painted lines on the basement door frame).

Gervais Creek also has potential to flood the east part of Rorvik Street if the intake

[1] U.S. Department of Housing and Urban Development, Federal Insurance Administration. Flood Insurance Rate Map (for) City of Wheeler, Oregon (Community-Panel Number 410203 0001 C). November 16, 1977.

SECTION 3: SOCIO-ECONOMIC ENVIRONMENT

3.1 ECONOMIC CONDITIONS AND TRENDS

A summary of 2000 Census data is provided below as documentation of current economic conditions in Wheeler.

Housing:

Housing Units (Total): 244
Occupied: 176 (72.1%)
Vacant: 68 (27.9%)
Owner Occupied: ..... 108 (61.4 %)
Renter Occupied: 68 (38.6%)
Housing Units Constructed Since 1970: 99 (40.6%)
Housing Units Constructed Since 1990: 32 (13.1%)
Average Household Size (persons per household): 1.98
Median Housing Value: 144,400
Median Rent per Unit: 455

Education:

High School Graduate or Higher: 79.6%

Employment:

Persons in Labor Force: 166 (47.8%)
Employed: 163 (47.0%)
Unemployed: 3 (0.9%)
Persons Not in Labor Force: 181 (52.2%)
Mean Travel Time to Work (minutes): 20.2

Income:

Median Household Income: $31,161/year
Poverty Status (% of Population): 10.9%
Percent Low/Moderate Income[1]: 45.8%

[1] From OECDD's List of 2005 OCDBG Eligible Applicants.

3.2 POPULATION

3.2.1 Historic Population

Decennial census population figures for 1980, 1990, and 2000 respectively are: 319, 335, and 391 persons. This represents an average annual growth rate (AAGR) of 0.49% for the period 1980 to 1990; and an AAGR of 1.56% for the period 1990 to 2000.

3.2.2 Recent Population

Population estimates from the Center for Population Research and Census at Portland State University (PSU) for the years 2001, 2002, 2003, and 2004 respectively are: 400, 400, 410, and 410 persons. The period 2000 to 2004 reflects an AAGR of 0.48%.

3.2.3 Projected Future Growth

Long term population forecasts for Tillamook County are provided by the Office of Economic Analysis (OEA). The County then allocates the growth to itself and the various municipalities within the County. To determine Wheeler's growth, the relative percentage of Wheeler's population to that of the County was examined for each year: 1980, 1990, and 2000. Wheeler's percentage ranged from a low of 1.51% in year 1980, to a high of 1.61% in 2000. The high and low percentage figures were used to estimate Wheeler's share of the OEA projected population figures for the County. Population projections for Wheeler range from a low of 499 persons (0.9% AAGR) to a high of 518 persons (1.0% AAGR), in year 2025. The approach does not take into account the steady increasing trend evident from 1980 to 2000, of Wheeler's relative percentage of county population.

Official population figures are for residents only and do not reflect seasonal occupants or visitors. According to Census 2000 figures, 52 (21.3%) of the City's 244 housing units are identified as "seasonal, recreational, or occasional use". Between 1990 and 2000, the number of housing units grew at 2.53% (AAGR); a much higher rate than population itself. The influx of seasonal or occasional use persons is likely to contribute as much to the rate of overall community development as resident population growth itself.

3.3 LAND USE

3.3.1 Current Land Use

Current land use is shown in Figure 3.1 based on Wheeler's Comprehensive Plan. A brief description of the land use categories is provided in Table 3.1.

In general, the areas south and east of Coast Highway 101 are predominantly residential with the notable exceptions of the downtown commercial area, estruarine areas associated with Vosburg Creek and Zimmerman Creek, and the public land extending up the hillside from the center of town[2]. Residential development is very active. Most of the undeveloped land, and much of the development activity, is on the upper hillsides.

3.3.2 Future Development

Residential development is anticipated to remain active into the foreseeable future. Most of the undeveloped residential properties are higher up on the hillside; these developments, by virtue of their location, are most likely to impact storm drainage needs. Commercial areas in the center of the City are largely built-out; consequently, commercial growth is most likely to occur as redevelopment in these areas. Redevelopment is less likely to impact storm drainage needs unless there is an increase in impermeable surfaces or other features that could affect runoff.

[2] Includes City Hall, Public Works, and City Park.

Table 3.1 Land Use Zoning Summary[3]	
Zone	**Zone Description**
R-1	**Residential 1.** The intent is to provide for a residential development consisting of conventional structures and manufactured homes.
R-2	**Residential 2.** The intent is to provide residential development consisting of conventional structures and manufactured homes. RV Parks and campgrounds on tracts of 10 acres or more may be permitted and Conditional Uses.
GC	**General Commercial.** The intent is to provide for a wide range of general retail and service business needs.
WRC	**Water-Related Commercial.** The intent is to provide for marine oriented commercial uses.
IND	**Water-Related Industrial.** The intent is to provide for marine oriented industrial and commercial uses which are compatible with the community's setting and natural values. In addition, certain non-water oriented uses may be permitted.
P	**Public Lands.** The intent is to protect certain publicly owned lands.
EN	**Estuarine Natural.** The purpose is to provide for preservation and protection of significant fish and wildlife habitats and other areas which make an essential contribution to estuarine productivity or fulfill scientific research or educational needs.

Table 3.1 Land Use Zoning Summary	
ED	**Estuarine Development.** The purpose is to provide for long-term maintenance, enhancement, expansion, or creation of structures or facilities for navigational or other water-dependent commercial, industrial, or recreational uses. Other commercial, industrial, or recreational facilities may be allowed subject to certain criteria.
MP	**Mitigation Site Protection.** The purpose of the Mitigation Site Protection zones is to protect identified mitigation sites from incompatible and preemptive uses that may prevent their ultimate restoration or addition to the estuarine ecosystem.

[3] Source: City of Wheeler Comprehensive Plan