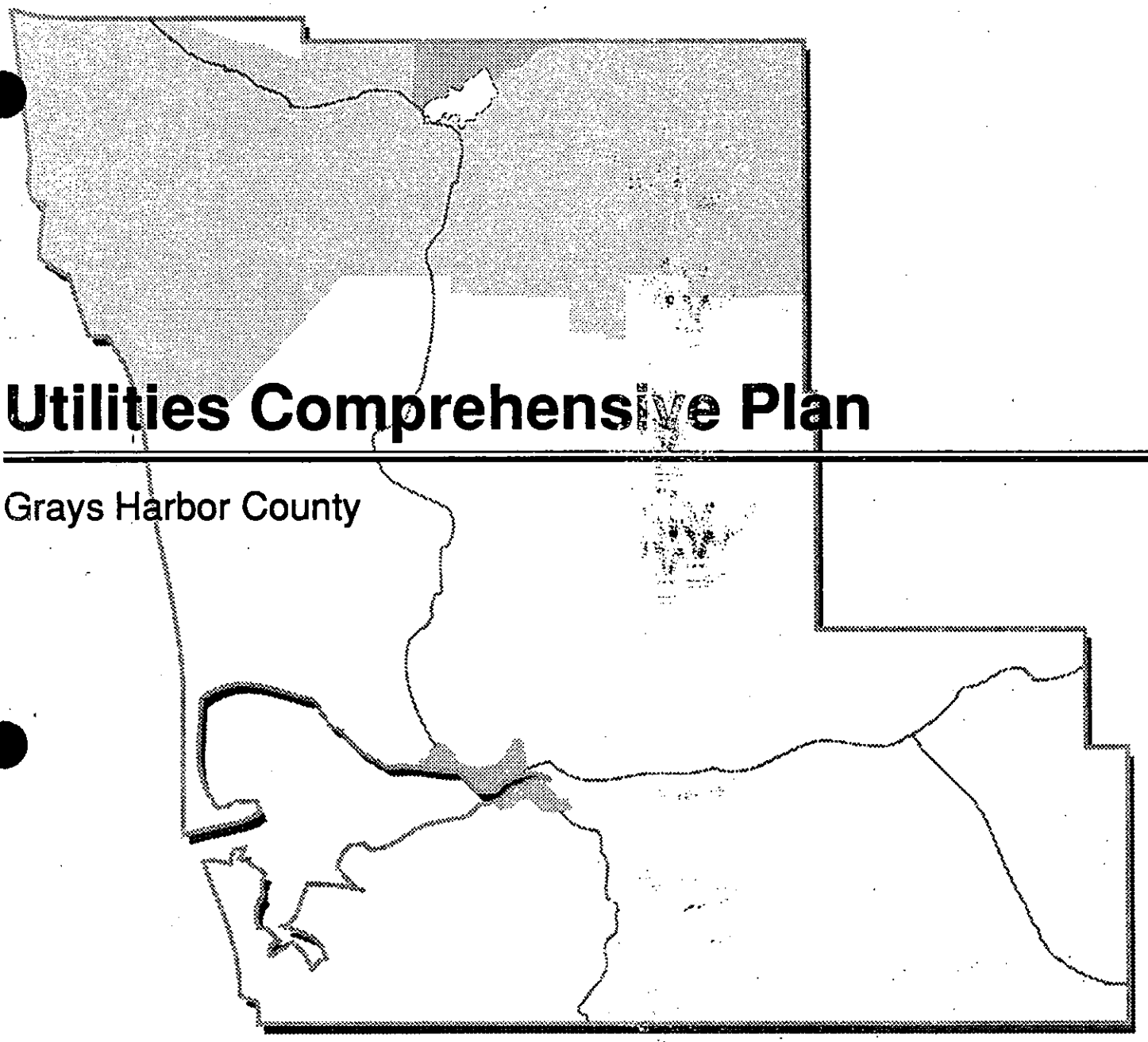


Utilities Comprehensive Plan

Grays Harbor County

October 1991

Parametrix, Inc.
Camp Dresser & McKee, Inc.
Economic & Engineering Services, Inc.

GRAYS HARBOR COUNTY UTILITIES COMPREHENSIVE PLAN

PHASE I

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October 1991

Certificate of Engineer

Utilities Comprehensive Plan

Grays Harbor County

The technical material and data contained in this manual were prepared under the supervision of the undersigned, whose seal, as a professional engineer license to practice as such in the State of Washington, is affixed below.



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10/25/91
Date

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CHAPTER 1
EXECUTIVE SUMMARY

The Grays Harbor County Board of Commissioners entered into an agreement with Parametrix, Inc. for the preparation of an update to the 1971 Utilities Comprehensive Plan, prepared by RW Beck and Associates. The Utilities Comprehensive Plan update is funded in part by an $80,000 grant received from the Washington State Department of Community Development. The remainder of the planning effort is provided by local funds authorized by the Board of County Commissioners. County staff is continuing to research and apply for additional grant funds to support the utility planning effort and reduce the financial impact to the County.

1.1 OBJECTIVE

The objectives of the Board of County Commissioners and the Grays Harbor Public Works Department are to:

- Provide protection for public health and the environment through infrastructure improvements.
- Support economic growth and diversification within the County as it relates to infrastructure requirements.
- Provide assistance and guidance to the County for land use planning based on recommendations of the Utility Comprehensive Plan.

The Utilities Comprehensive Plan Update addresses three major infrastructure elements water, wastewater, and storm drainage. The 1971 Comprehensive Plan did not include a storm drainage element.

The Comprehensive Plan Update is presented in two reports. The Phase I document consists of an inventory of existing water facilities, including groundwater supply evaluation; an inventory of existing wastewater facilities including an evaluation of soil types for suitability of on-site wastewater disposal systems; and a review of storm drainage facilities in selected areas of the County. The Phase I component of the Comprehensive Plan includes a description of specific areas of concern for each of the utility elements, and outlines alternatives which will be considered to alleviate existing and anticipated problems associated with the areas of deficiency.

The Phase II document will provide an evaluation of identified alternatives presented in the Phase I Report. The Phase II document will outline preferred alternatives for each plan, a proposed implementation and capital improvement plan, as well as recommend proposed service area boundaries between Cities and the County to optimize utility services, and provide suggestions for future land use planning and zoning requirements.

The comprehensive plan update focuses on the more populated areas of Grays Harbor County. The study area is shown on Figure 3.1.1. Areas that were not evaluated as part of this study included the majority of the Quinault Indian Reservation and the low density areas in the north-east and southern portions of the County.

1.2 WATER

The water element of the Comprehensive Plan focused upon water quality, water rights issues, water quantity and management issues for existing and future municipal and industrial customers within the study area. The capacities of water utilities were evaluated and compared to present and projected potable water usage by the year 2000, this evaluation included provisions for a conservative range of potential industrial demands. Procedures to improve and promote well managed water utilities were also evaluated.

Background

The study included review of Class 1, 2, 3, and 4 Water Systems contained within the study area.

A hydrogeologic review of the study area was conducted by Richard Rongey and Associates to assess groundwater availability. A total of 1,800 well logs were reviewed along with review of 80 chemical analysis records and field sampling of 60 wells to assess the adequacy of the water quantity and quality of aquifers within the study area.

Economic and Engineering Services (EES) investigated existing public water systems to determine existing capacity for all class I and II water systems. EES completed a review of water rights investigations, potential conflicts for withdrawal of groundwater as it relates to surface water continuity requirements, review of Class 3 and 4 water system utility management, and impacts to existing public supply systems based on the requirements outlined in the Safe Drinking Water Act. Surface water continuity requires that the applicant for groundwater rights prove that adjacent surface water bodies are not impacted from actual groundwater withdrawal.

Problem Identification/Needs

Water Source

This study concluded that the majority of existing water systems have adequate capacity or water rights to meet domestic water demands into the year 2000. This demand does not, however, account for future industrial sites. Heavy industry could potentially impact water demand by 2 to 12 million gallons per day. Supplying the industrial water demand may be difficult for

certain areas of the County due to surface water continuity requirements. Table 1.1 summarizes current system capacities, water rights and peak day demand characteristics without industry.

Table 1.1 - Water Supply Summary

	Flows In Million Gallons Per Day		
Description	Year 2000 Demand[1]	Installed Capacity[2]	Water Right[3]
East County	5.2	8.2	7.7
Central County	14.9	23.7	288.9
North Beach	2.5	2.8	23.0
South Beach	3.4	3.1	5.0
North Central	1.0	1.0	11.9
North (Lake Quinault)	.2	.3	1.9

(1) Peak day potable demand estimates. Does not include new industrial demands. Data summarized in Table 3.2.2.

(2) Reported for Class 1 water systems and assumed capacity for smaller public water systems equal to estimated 1990 peak day usage.

(3) Includes both groundwater and surface water rights reported as municipal and domestic rights in Department of Ecology's water right print-out.

Development of high production wells in the Chehalis River Valley Aquifer may be limited to "base flows" established on the Chehalis River and water authorized to the WPPSS Satsop Nuclear Plant. Minimum "base flow" requirements have already been set by Ecology for the Chehalis River. Therefore, it may be difficult to obtain additional groundwater rights in the Chehalis River Valley to provide a large amount of potable water and still meet the surface water continuity requirements. Water is authorized to the WPPSS Satsop Nuclear Plant by the Energy Facilities Site Evaluation Council. Development and use of water for the nuclear plant from the Chehalis River will further impact base flows and reduce the chance for additional withdrawal.

In order to supply potable water in large quantities, the Safe Drinking Water Act and specifically the Surface Water Treatment Rule (SWTR) must be considered. The SWTR outlines the requirements for treatment of surface water supplies or groundwater supplies under the direct influence of surface water. The City of Aberdeen is supplied by a surface water source without filtration treatment. The City also owns and operates an industrial water line which provides raw water to industrial customers such as ITT Rayonier and Weyerhaeuser. A comprehensive water plan is currently being prepared by the City. The need for additional treatment will be addressed in that document. The cost of treatment, if needed, may affect the financial ability of Aberdeen to supply water outside its existing service area.

Service Area Boundaries

Many of the Cities and Water Districts within Grays Harbor supply water to unincorporated Grays Harbor County on an as needed basis rather than limiting utility service to a defined service area boundary. This has created areas between purveyors that are not being provided with adequate service such as the area between the City of Westport and Grays Harbor Water District #1 at Grayland. The lack of defined service areas further promotes the development of smaller Class 2, 3 and 4 water systems and individual wells to provide domestic service to localized rural areas. There is the need for improved management of small utilities throughout the study area, especially in the North and South Beach areas.

Recommendations

Water Supply

Impacts of the surface water treatment rule on the Aberdeen Water System will be included in the Phase II document including the financial effects of supplying water outside the current service boundaries. The ability of the central portion of the County to supply heavy industrial users to support economic growth in the Harbor needs to be evaluated along with the ability of East County to obtain additional water rights in the Chehalis River Valley for industrial users. Concentration on industrial development to take advantage of properly managed systems with adequate sources of water to supply future demand is imperative.

Service Area Boundaries

Establish the roles of the County, Cities, and Water Districts to provide reliable water service to areas within unincorporated Grays Harbor County. Define responsibilities and utility review procedures between the County and Cities, especially in the unincorporated urbanizing areas. The County management role in other unincorporated areas also needs to be confirmed to ensure proper development of smaller utilities. The comprehensive land-use plan and zoning requirements need to be revised to direct growth toward established service areas and promote improvement of existing small systems and discourage new small systems and individual wells in areas of growing demand.

1.3 WASTEWATER

The wastewater section of the Utilities Comprehensive Plan Update includes 1) Review of County-wide on-site wastewater practices to determine if a potential threat to public health or the environment exists through improper wastewater disposal, 2) Review of sewage collection and treatment facilities to support economic growth, and 3) Recommend areas that can support industrial, commercial, or residential growth from wastewater collection and treatment systems or naturally occurring soil that are suitable for on-site wastewater disposal systems.

Background

This Section includes an evaluation of the SCS Soils Survey within the study area. Information pertaining to on-site waste disposal, evaluation of impacts to groundwater from on-site wastewater disposal and an evaluation of municipally owned and operated sewage treatment facilities.

The evaluation of soil suitability for on-site disposal systems was conducted by Steve Wert, a professional soil scientist. His research consisted of review of all Soil Conservation Service (SCS) maps available within the study area and limited field review as verification of descriptions found in the (SCS) data. Soils were classified into three major categories.

Category 1 Soils suitable for conventional on-site wastewater disposal systems.

Category 2 Soils with limitations which require specialized systems.

Category 3 Soils requiring complex on-site systems.

The SCS maps are generalized and developed into figures contained in Section 3.3. This soils information is compared with data assembled by Parametrix and the County Environmental Health Staff on existing housing densities, the population of a particular area, historical on-site wastewater disposal rates of repair and any known on-site problem or health concerns. Housing and population densities in unincorporated Grays Harbor County are low, usually less than 200 buildings per section (640 acres). Only two areas within unincorporated Grays Harbor County have densities at or above 300 buildings per section (640 acres). These areas are Moclips/Pacific Beach and Central Park.

The evaluation of wastewater treatment facilities was completed by subconsultant Camp Dresser and McKee, Inc. Each municipally operated treatment plant was analyzed for organic and hydraulic capacities as summarized in Table 1.2.

Table 1.2 - Sewage Treatment Capacities

Description	Capacity In Population Equivalents		1990 Service Area Population	Remaining Capacity in %	
	Organic	Hydraulic		Organic	Hydraulic
Aberdeen	29,600	20,100	19,500	34%	3%
Elma	4,000	2,700	1,800	55%	33%
Hoquiam	13,300	9,000	9,000	32%	0%
McCleary	2,100	1,300	1,500	28%	-15%
Montesano	4,520	12,500	4,200	7%	66%

Table 1.2 - Sewage Treatment Capacities					
Description	Capacity In Population Equivalents		1990 Service Area Population	Remaining Capacity in %	
Ocean Shores	3,300	50,200	1,900	42%	96%(1)
Pacific Beach	500	2,800	500	0%	82%
Westport	7,500	3,700	1,900	74%	48%

(1) Hydraulic capacity assumes primary treatment criteria.

As shown in Table 1.2, the wastewater treatment plants with the greatest ability to accept additional wastewater without modification or reconstruction are Elma, Ocean Shores and Westport assuming current NPDES permit limitations. This criteria assumes proper operation and maintenance of the treatment facility based on secondary treatment standards only. Conformance to the new surface water quality requirements may affect the actual facility capacity.

The evaluation of groundwater source by Richard Rongey included monitoring for nitrates as an indicator of aquifer contamination from on-site wastewater disposal. Of the 140 wells that had a nitrate analysis, none were found with levels at or above drinking water standards.

Problem Identification/Needs

Review of the soils information shows a significant portion of the County and study area consisted of Category 2 and Category 3 soils. These soil types either require alternative waste water disposal techniques or are unacceptable. These unfavorable soil types coincided with many of the urbanized areas such as McCleary, Elma, Malone, Satsop, Brady, Oakville, Montesano, portions of Central Park, portions of Cosmopolis, Aberdeen, Hoquiam, the westerly edge of North Beach from Ocean Shores to Moclips and the South Beach from Westport to Grayland. The more suitable soils were found in the low growth, nonurbanized areas, agricultural lands, and timber growing areas. It must be noted that the figures presented in this report are generalized and do not preclude that suitable soil may exist within areas shown as Category 2 or Category 3 soils. It does, however, give strong indications that substantial development within these areas may present future problems and concerns associated with on-site wastewater disposal systems.

Areas that were found to have potential public health problems based on the affects of soil conditions, existing population, housing density, known on-site problems and historic on-site repair rate are listed in order of priority:

1. Moclips/Pacific Beach Area

2. Oyhut/Illahee

3. Central Park

4. East Montesano

5. Grayland

A review of existing sewage treatment plant capacities identified limitations for some of the systems to accept additional sewage from the existing service area. This is particularly evident for Hoquiam, McCleary and Pacific Beach. There may be limitations in providing sewer service for future industrial customers with high water use, without adversely impacting existing plant capacity or requiring plant modifications.

Recommendations

Existing Health Concerns

The areas of Moclips/Pacific Beach, Oyhut, Illahee, Central Park, East Montesano and Grayland should be further investigated and be considered for future sewage collection and treatment.

Those areas that cannot be reasonably served by sewage collection and treatment should be considered for an on-site management district.

Economic Growth

Lands either zoned industrial or considered in the industrial lands study are non contiguous and are located from the City of Westport to the City of McCleary. These lands must rely on adjacent municipalities to provide sewage collection and treatment facilities for industry users with high volumes of waste discharge such as food processing. Obtaining sewer services may be difficult if the municipality does not wish to provide service outside their boundaries. The County should provide assistance for the development of large contiguous parcels of industrial zoned land that could be reasonably served by infrastructure. These contiguous industrial lands should be sited within a reasonable distance to wastewater treatment facilities, focusing the need for expansion to selected facilities. This simplifies the need for treatment plant capacity by allowing these selected facilities to serve the majority of industrial land in the County.

On-site wastewater disposal requirements and soil conditions along the North and South Beach could impact future tourism. Phase II should evaluate the expansion of sewer service in these areas.

Land Use

The comprehensive land-use plan and zoning requirements should be revised to direct low density growth that would rely on on-site wastewater disposal to occur in areas where the native soils are acceptable. Other safeguards should be put in place such as directing high density growth towards municipalities with established wastewater facilities.

1.4 STORM DRAINAGE

The Storm Drainage Section will serve as a guide to the County in providing for necessary public drainage facilities, upgrading existing stormwater facilities and assisting in the protection of water resources. This Section consists of the following four elements: Economic Development, Storm Drainage Facilities, Surface Water Resources, and Program Implementation. Each element contains objectives designed to: 1) identify and correct deficiencies, 2) provide for proper management, 3) protect surface water resources, and 4) plan for the expansion of existing systems to satisfy future demands. It was not the study's intent to address flooding impacts from high flow conditions in the Chehalis River.

Background

Each of the above four elements present the strategies and principles for achieving the goals of the section. The first element, Economic Development, outlines the need for the Utilities Comprehensive Plan to prepare for and accommodate new development and growth opportunities. This element also recognizes that existing economic opportunities must be protected and enhanced. The Storm Drainage Facilities and Surface Water Resources elements, describe the physical portions of the drainage systems. The Storm Drainage Facilities element describes the man-made portions while the Surface Water Resources element describes natural components and functions of the drainage systems. The Surface Water Resources element of the plan contains the goals, objectives and policies for wetlands. From these goals, objectives and policies, a wetland management plan can be developed. The Program Implementation element describes components of the administration support services, such as staffing, financial resources and policies that must be established to carry out the objectives of the other three program elements.

Recommendations describing the action plan and schedule for implementing goals, objectives and policies are described in Section 3.4. Four county-wide drainage priorities address the goal of the Storm Drainage Plan. The first priority is to reduce or resolve existing chronic drainage problems. The second priority establishes stormwater regulations, policies, and guidelines to protect the existing drainage system and guide new development, which will reduce public expenditures required for the repair and maintenance of drainage facilities and protect existing economic opportunities. The third priority is the establishment of long-term plans to monitor, maintain and improve existing drainage facilities and water resources, and the fourth priority is the development and implementation of basin plans in areas that are identified as growth areas. Each of these priorities can be achieved by implementing the Storm Drainage Comprehensive Plan.

In preparation of the Storm Drainage Comprehensive Plan in Phase I of this project, a series of issues are identified for inclusion in the scope of work for Phase II. Recommendations for proposed programs will be included in the Phase II Scope of Work. Issues to be addressed in the Phase II scope of work include identifying staffing requirements, developing a step-by-step implementation action plan, engineering analysis of special flood study areas, funding alternative analysis, and recommendation of various resource protection standards.

Problem Identification/Needs

The County has identified four specific areas which experience chronic flooding: Vance Creek near Elma, Ocean City and Copalis Beach in the North Beach, and the Community of Grayland on the South Beach. Each of these areas has unique flooding problems, yet have a common problem — the lack of a comprehensive surface water plan. Appendix D describes each area's flooding problems and existing conditions. A description of these existing flooding problems is outlined below:

- Vance Creek flooding problems affect the Elma elementary school and development along the Vance Creek drainage course. The flooding is a result of encroachments to the Vance Creek floodplain, changes in the runoff characteristics north of the Elma/Montesano Road caused by development and logging practices, and elimination of floodplain areas on lower Vance Creek caused by gravel mining operations for the Satsop nuclear plant.

- Ocean City flooding consists of backwater flooding from Conner Creek. This is a result of a lack of positive drainage due to existing ground elevation differential between the primary and secondary dunes. Road crossings may also be aggravating flooding along the Conner Creek drainage course.

- Copalis Beach flooding occurs during high tide and results in flooding of Grover Street. Periodic flooding is a direct result of an inadequate tide gate which causes a backwater condition during high tide events.

- Grayland flooding occurs as a result of localized low areas, wetlands, floodplains, and possibly an undersized drainage facility from Grayland to the point of discharge in Grays Harbor. Grayland has little or no positive drainage from the developed area of the community to the main drainage ditch east of SR 105.

Many industrial sites that are currently zoned for industrial use or have been included in the industrial lands study are either considered wetlands, are within the 100-year floodplain, or are subject to flooding. These conditions greatly affect development of these sites and in some cases are in direct conflict with the goals of the County for protection of public health and the environment.

Recommendation

The Storm Drainage Comprehensive Plan for Grays Harbor County has a number of objectives. The objectives have been prioritized and an implementation schedule has been developed in the form of an Action Plan. The proposed Action Plan lists activities needing to be undertaken to implement the Storm Drainage Plan over a 20-year period. The activities are grouped by priority as follows:

- Adopt, staff, and fund the Storm Drainage Program.
- Identify and resolve flooding problems, and develop and implement regulatory controls.
- Complete adoption and implementation of regulatory standards and begin developing resource management programs, including wetlands management.
- Secure adequate annual funding of the Storm Drainage Plan and continue enforcement of regulatory policies, operate and build new facilities, and coordinate with local agencies.

Funding for the Storm Drainage programs may, in part, be acquired through special districts.

Existing Flooding Concerns

Alternatives for specific flooding problems have been addressed in Appendix D for each of the identified problem areas, of Vance Creek, Ocean City, Copalis Beach and Grayland. A summary of alternatives for corrective action has been listed.

- Vance Creek — Provide positive drainage for the Elma elementary school, floodproof structures from backwater conditions caused by the Chehalis River and restore the natural floodplain on lower Vance Creek disturbed by gravel mining operations.
- Ocean City — Provide a positive outlet for Conner Creek, limit encroachment from development into the Conner Creek floodplain and naturally occurring low areas, and review sizing of storm facilities for all road crossings of Conner Creek.
- Copalis Beach — Replace the existing tide gates to prevent backwater during high tide events and elevate Grover Street above established flood levels.
- Grayland — Limit encroachment into low areas, wetlands, and floodplains. Preparation of a basin plan specific to the Grayland area and evaluation of improvements for localized drainage problems and improvements to the main drainage course east of SR 105.

Economic Growth

To support economic growth, industrial lands should be directed away from chronic flooding areas, wetlands or floodplains. This would retain the natural drainage characteristics within an area which provides water quality and water quantity protection.

Land Use

Future growth should be directed away from chronic flooding areas. Providing water and sewer service to areas that have potential flooding problems may aggravate the degree of flooding in these areas.

It would be advantageous to have all municipalities within Grays Harbor adopt the same goals, objectives and policies as outlined in the County plan. This would assure continuity between agencies so that the goals are accomplished.

1.5 SUMMARY RECOMMENDATIONS

Water, Wastewater, Storm Drainage

The Phase II document will contain an evaluation of the interaction between utilities. Development of one utility could directly effect another. For example, development of water and sewer service along the Beach areas could greatly impact the storm drainage problems associated with that portion of the County. Another example would be development of water service which could increase impacts to groundwater from on-site waste disposal. It will be very important that utilities are properly designed and managed to minimize negative impacts and provide positive benefits.

Service Area Designation

The Counties and Cities should establish and agree to area boundaries for utility service. The service area boundaries could coincide with urban growth boundaries and would establish responsibilities and commitments on the part of the County and the Cities.

Land Use Plan

With the establishment of service area or urban growth boundaries, the land use plan and zoning requirements should be modified as needed to reflect development objectives and compatibility within those areas.

CHAPTER 2
INTRODUCTION/BACKGROUND

2.1 COMPREHENSIVE PLANNING EFFORT

2.1.1 Purpose of the Phase I Document

The Grays Harbor Utilities Comprehensive Plan is being prepared in two separate documents. The first document includes individual planning elements for water, wastewater and storm drainage.

The first part of the document provides background information that is common to each of the planning elements. This information is needed to meet regulatory requirements for general planning or comprehensive planning. Each planning element will review existing conditions and the regulatory and policy issues which may affect that particular utility.

The Phase I document provides focus for the second document by providing a conceptual level of the planning effort needed for project prioritization and a discussion of alternatives available within areas of the County. The second document will incorporate a higher level of engineering detail to establish final project priorities and determine preferred alternatives.

2.1.2 Purpose of the Comprehensive Water, Wastewater and Drainage Plan

The Comprehensive Utilities Plan has three primary objectives: 1) to identify and prioritize problems within the County that are existing or can be anticipated for each planning element; water, wastewater, and storm drainage, as well as develop alternatives, resolve problems, and recommend the preferred alternative based upon engineering evaluation, environmental evaluation, and public impact; 2) to promote economic development and diversification, as it relates to water, wastewater, and stormwater; and 3) to promote and assist orderly land use planning.

It is the intent of Grays Harbor County to revise the Utilities Comprehensive Plan on a five-year schedule. This will allow the County to modify the Plan in light of new growth patterns and new areas of concern. It also helps the County stay current with the needs of economic growth and diversification.

2.1.3 Relationship to Other Plans and Studies

Because the objectives of the Comprehensive Utilities Plan (as outlined in Section 2.1.2) are related to the objectives of many other planning and development efforts in Grays Harbor County, the Utilities Plan must be coordinated with other planning and development efforts. Within the County, plans and programs that identify and guide objectives and programs for development are prepared by a variety entities, including Grays Harbor County, Grays Harbor

Regional Planning Commission, The Port of Grays Harbor, the Economic Development Council, the incorporated cities within the County, various departments within the local jurisdictions, and various state agencies. While there is coordination between these entities, the degree of consistency among their plans and programs vary.

Various plans and planning efforts are outlined but focus primarily on those that are related to the objectives of the Utilities Comprehensive Plan. Because one of the primary objectives of the Utilities Plan is to promote economic development, particular attention is paid to existing and proposed economic development problems, opportunities, and objectives. Also outlined are plans that have contributed to, or may help alleviate, existing utilities problems.

2.1.3.1 Grays Harbor County Comprehensive Planning

The purpose of the Comprehensive Plan is to articulate a community's vision of its future and describe how it will achieve that vision. It is not an ordinance, but a policy document. The Comprehensive Plan may include elements covering a variety of topics including land use, utilities, circulation, agriculture, recreation, and others. It is intended to provide the policy basis for developing regulations, programs and capital improvements. Local jurisdictions can derive their legal authority to plan from a variety of state constitutional and statutory provisions. As such, the contents of comprehensive plans vary widely among local jurisdictions.

Grays Harbor County's Comprehensive Plan is not a single document, but is comprised of several separate documents and maps. The various parts of the plan include a variety of required and optional elements which provide an extensive set of goals, objectives, and policies. However, the Comprehensive Plan, overall, is not widely used or circulated. Many of the elements are outdated, and without any significant development activity or pressure, there has not been an effort made to update and coordinate the various elements of the plan. Also, the plan does not have a current comprehensive statement of goals and objectives to use as a basis for promoting consistency and coordinating decisions regarding the development of ordinances, plans, and programs.

The Comprehensive Plan's "land use element," represented by the Generalized Comprehensive Land Use Plan Map, suggests the general location for a broad pattern of land uses (Appendix A). Other elements include the Agricultural Element, which was adopted in May 1981 and covers only the eastern part of the County. The Comprehensive Water and Sewer Plan was adopted in 1970 and will be replaced by the Utilities Comprehensive Plan currently being developed. Other recent efforts have been made to update elements of the Comprehensive Plan. For example, an Industrial Lands Study was conducted, in part, to develop an Industrial Lands Element for the County and for the two cities of Hoquiam and McCleary.

The Industrial Lands Study. Problems and opportunities for industrial development in the jurisdictions of Grays Harbor County and the cities of Hoquiam and McCleary are addressed in the Industrial Lands Study (Grays Harbor Regional Planning Commission et. al. 1989). The Study identified the following problems: (1) a lack of industrially zoned land available for

development in the County, and (2) out-of-date Comprehensive Plan industrial elements and industrial zoning districts for the County and the two cities.

To address these problems, the study developed the following three objectives:

(1) develop policies to guide the siting of industrial facilities in order to minimize conflict and increase the certainty of development;

(2) increase the amount of land zoned for industrial uses;

(3) modernize industrial district sections of the zoning code.

These objectives were intended to address the need for more employment, income and assessed valuation by providing locations for new industries and the expansion of existing industries. To address these objectives, the Industrial Lands Study developed the following: 1) draft of Industrial Lands Comprehensive Plan Elements; 2) draft ordinances to adopt new industrial zoning districts and regulations; and 3) proposed industrial zoning maps. These were prepared for each jurisdiction. Since this study was released, however, none of the proposed elements, ordinances or maps have been adopted by any of the jurisdictions. A number of the proposed sites are located in floodplains or contain potentially extensive wetlands or other critical areas that under current regulations would create substantial barriers to development. Still other sites pose substantial infrastructure provision problems. Further screening and environmental review is required to narrow the list of sites down to those that are most feasible.

The total acres of potential industrial land has been summarized in Table 2.1.1. This summary lists acres per census tract of industrial land as included in the industrial lands study.

TABLE 2.1.1

Census Division	Acres
McCleary	766
Elma	535
Wynochee	255
Malone	56
Aberdeen/Hoquiam	2,493
South Shore (South Beach)	677
North Beach	79
TOTAL	4,861

Grays Harbor County Comprehensive Zoning Ordinance. Grays Harbor County's Zoning Ordinance is the primary form of land use regulation in the County. The Zoning Ordinance is not policy, it is a law intended to promote the public health, safety and welfare. The purpose of the Zoning Ordinance is to "...facilitate the adoption and enforcement of the coordinated plans which are either developed or being designed to encourage the most appropriate use of land throughout Grays Harbor County..." (Grays Harbor County 1969).

Seventeen Primary Use Classifications and four Combining Use Classifications are established in the Zoning Ordinance and the location and boundaries of the zones are shown on the Zoning Map of Grays Harbor County. A copy of this map is in the Appendix. Permissible uses, conditional uses, prohibited uses, building height and bulk restrictions, yard requirements, density restrictions and other development standards are outlined in the Zoning Ordinance for each use classification district.

The primary relevance of the Zoning Ordinance to the Utilities Plan is that in designating land use classifications for specific geographic areas, the Zoning Ordinance is also specifying potential demand for utilities. Regardless of the zoning designation, utilities must be readily available in order for certain land uses to be feasible.

Grays Harbor County's Economic Development Role. Economic development is a long-term complex objective involving all jurisdictions, various agencies, the Port, special districts, councils, chambers of commerce and other organizations. Grays Harbor County's role in economic development is described below (Grays Harbor County Regional Planning Commission 1990):

> Maintain and improve, as necessary, the infrastructure that supports economic development including roads, streets, water systems, sewer systems and drainage problems.
>
> Provide key services that support economic development including police and fire protection, land development planning and administration, and public administration.
>
> Support other economic development factors both financially and through the expertise of their elected officials, appointed officials and staff.
>
> Plan and implement local economic developments and projects, including downtown redevelopment and waterfront redevelopment.
>
> Provide community leadership.
>
> Identify resources that may assist in project implementation.
>
> Write economic development grants.
>
> Assist in protecting and enhancing the area's natural resources.

Roles of other entities involved in economic development are outlined in the Overall Economic Development Program (OEDP) (Grays Harbor Regional Planning Commission 1990). Contents and functions of the OEDP are described below.

2.1.3.2 The Overall Economic Development Program for Grays Harbor County

In June 1990, Grays Harbor Regional Planning Commission released the fifth annual update of the sixth edition of the OEDP, a plan originally prepared in 1961-62. The report is a review of current economic conditions and an updated plan of action for achieving the objectives of the Area Redevelopment Act (Public Law 87-27, May 1961).

This document includes a report on the program's activities over the previous year; a description of the area and its economy; an analysis of economic needs, opportunities and problems; a description of the economic development strategy; and various other information.

Parts of the OEDP report are particularly relevant to the development of a new utilities comprehensive utilities plan. Much of the information in the OEDP regarding economic constraints and potentials, as well as a development strategy for the County, provides guidance in developing a utility plan to meet the objective of promoting economic development in the County. The most relevant information from the OEDP report is summarized below.

Overall Economic Needs. The OEDP identifies the following as overall economic needs for the County to address:

Increase employment, especially blue collar opportunities, or provide retraining;

Increase income;

Reduce seasonality of employment;

Protect and enhance natural resources (especially the forest, agricultural, fishery and scenic resources);

Increase forest products industry employment (which includes developing port facilities, increasing the use of wood fiber and value-added related manufacturing);

Diversify the economy to reduce reliance on forest products (includes marketing the region, supporting recruitment and location of diversified industry, and investing in new products or services);

Increase import substitution by producing consumer and basic sector goods locally, and converting local raw products into value-added products.

Increase exports/imports.

Potential for Increased Economic Activity. The opportunities available to the County to meet its economic needs are listed below. Their relevance to the Utilities Comprehensive Plan is in the contribution that utilities can make to help realize economic growth.

Deep Water Port Resources. This includes: (1) completing the deepening of the harbor channel, (2) improving the area's navigation capabilities to serve larger vessels, (3) providing adequate port facilities and infrastructure, (4) providing competitive industrial sites readily accessible to water transportation, (5) effectively organizing the port, and (6) ensuring conservation and enhancement of the natural productive capacity of the estuary.

Fishery and Seafood Resources. Possibilities include: (1) expanding domestic harvesting and processing of bottomfish, (2) encouraging and pursuing aquaculture industry, (3) increasing in-region processing of seafood and use of under-utilized species, and (4) increasing the use of the Westport Marina. Achieving these potentials will require marketing, diversification from salmon and razor clam resources, and maintenance of water quality.

Forestry Resources. Potentials include: (1) expanding western U.S. and Pacific Rim markets, (2) increasing processing of raw materials (3) opening new lines of forest products manufacture, (4) expanding pulp, paper, and by-product production, (5) intensifying forest management, (6) increasing export-import markets, (7) utilizing previously wasted materials, and (8) diversifying forest products. In pursuing these, it is important to protect forest resources, assist small operations, and maintain and improve transportation systems.

Recreational Resources. Potentials exist to increase the economic contribution of tourism. Destination tourism can be developed and waterfront sites are available for hotel-conference centers. Tourists are attracted to camping, beachcombing, fishing, hunting, hiking and birdwatching. Areas to be enhanced or developed include (1) other activities, in addition to fishing and razor clam digging (2) new visitors, such as the Japanese tourist market, (3) existing facilities, and (4) more year-round visitors.

Agricultural Resources. Potentials include: (1) producing specialized crops such as bulbs and heather, (2) increasing productivity, (3) developing more local processing, and (4) expanding local service industries. Close attention should be paid to protecting agricultural land use and increasing marketing strategies.

Other Resources. Other elements which contribute to industrial development potential in the County include (1) two major railroad lines (although sections have been abandoned), (2) electrical energy production, (3) a large labor force, and (4) a large supply of industrial water in the Aberdeen, Hoquiam and the Central Park urban area.

Inhibitors to Increased Economic Activity. The following conditions have been identified as preventing or inhibiting further economic development or activity in the County. Some of the information contained within the OEDP in regard to infrastructure status is in need of revision to reflect current conditions. Current status has been included at the end of each inhibiter listed.

Transportation Problems. The OEDP identifies problems in almost all modes of travel, as well as intermodal problems.

Navigation and Channel. The Deeper Draft project continues, but economic and environmentally sound dredge disposal sites are needed. The Deeper Draft project is anticipated to be completed in 1994.

Highway. Some identified highway/road problems include: beach highways (109 and 105) can become very congested; high volumes of traffic through urban areas may deter industrial expansion, tourism, and downtown rehabilitation efforts; no Washington Coastal Highway exists (although legislation passed in 1986 allows construction of a highway from Taholah to Queets); no harbor highway or vehicle ferry between Ocean Shores and Westport; and a lack of highway access inhibits the development of some industrial sites. Regional planning is currently assessing a potential 101 scenic highway study, including a supporting road system.

Airports. Improvements are needed at Bowerman, Elma and Westport airfields. Bowerman Basin has been sold to the Department of Interior, Fish and Wildlife Service for a wildlife sanctuary.

Railroad. Continued railroad abandonment could cause significant problems because tonnage on existing lines is down and the two carriers do not coordinate (State Legislature is studying ways to mitigate this problem).

Ferry Terminals. The lack of comprehensive passenger ferry service between urban areas and beach areas is a detriment to tourism potential.

Utility and Service Problems. Lack of efficient and/or effective utility services continues to hinder economic development efforts. In addition, the restricted financial capacity of local governments will make it very difficult to address public service utility problems.

Sanitation and Water. Point and nonpoint source pollution, drainage control and erosion are problems. Sewer and water system problems exist in Montesano, Hoquiam, Oakville and in some unincorporated areas. Water storage and capacity is a problem in Pacific Beach, Moclips, Cosmopolis, McCleary and Oakville.

Solid Waste. A new County solid waste site must be found. Wood waste, recycling, leachate, energy recovery, and hazardous waste all must be addressed. The County solid

waste management plan addressing these issues is scheduled for adoption by December 31, 1991.

Marinas. Lack of public water access is a problem, particularly in urban areas. Various marinas need major improvements (including Westport Marina). The Port of Grays Harbor is studying improvements to the Westport Marina.

Destination/Recreational Facilities. More tourists could be attracted and those which travel to the County do not lodge as much as desired. Water vistas have generally been ignored.

Marine Terminals. Certain marine facilities are lacking that which is both necessary to increase international trade and handle a variety of import and/or export commodities. The Port of Grays Harbor is improving its facilities to handle neobulk cargos.

Development Sites. Potential industrial sites are undeveloped and lack extension of water, sewer, street, power, and, in some cases, loading piers or docks. Many of these sites are in flood zones or shoreline areas, especially sites along the harbor. Expansion or new development of tourist facilities in the coastal area (outside Westport and Ocean Shores) is limited because sewer and water systems are lacking.

Planning and Development Problems.

Many downtown commercial areas are severely deteriorated, blighted and lack needed amenities or focus.

Development pressures in the coastal areas may result in conflict and create problems with cranberry cultivating and/or aquaculture.

The area lacks a fully coordinated and comprehensive marketing program.

Public and Community Service Problems.

Organized daycare services, required by many mothers who work, are somewhat limited and can be prohibitively expensive.

Adequate housing is not available for all groups of people. Many older units need replacement and/or rehabilitation.

Resource Management Problems.

Many fishery resources are depleted and better management and research are needed to avoid overuse of other stocks and to rebuild depleted stocks.

There is a very low survival rate of some fish species (e.g., coho salmon) in the Chehalis River basin.

Owners of smaller forests are not reforesting.

Other Problems. In addition to the problems mentioned above, the OEDP also identifies the following factors as inhibitors to economic development:

The economic structure of the region offers only limited employment opportunities for women.

Many areas are subject to flood and erosion hazards.

Development in many areas is limited by poor quality soils.

Environmental regulations and concerns may substantially increase costs of development and, in some cases, severely restrict development.

Financing higher risk business ventures may be difficult.

2.1.3.3 Grays Harbor 2000

The Grays Harbor County Board of Commissioners appointed a group of community leaders in early 1987 to form the Grays Harbor 2000 Committee. This committee was formed to study the future economy in Grays Harbor County and to provide recommendations to the Board of Commissioners. Working with a team of economic development consultants over a six-month period, the Grays Harbor 2000 Committee studied all aspects of the County's economy. The Committee's final report made recommendations for leadership, overall economic development strategy, selected projects, government and coordination/cooperation.

The complete findings, recommendations and analysis are in the Final Report and Recommendations of the Grays Harbor 2000 Citizens Committee (Barney and Worth, Inc. 1987). Their recommendations were adopted by the Overall Economic Development Committee as part of the regional economic development strategy. As such, they are incorporated in the summary of economic development projects and priorities in Section 2.3.2.

2.1.3.4 The Port of Grays Harbor

The Port's historic interest in expanding and diversifying its activities has been increased due to recent cutbacks in the timber industry. Port activities play a major role in the region's economy and have been severely impacted by lowered timber harvesting and exporting. In 1988, the Port shipped approximately 300 million board feet of timber. The projected total for 1991 is approximately 100 million board feet.

The main thrust of the Port is to attract marine commerce, which is not expected to have significant direct demands on utilities. However, potential Port or Port-related activities that are relevant to the Utilities Plan include:

1) New regulations regarding the handling of wastes, including sanitary waste, from ships may require disposal through the sanitary sewer system. The Port is currently analyzing the ramifications of these new regulations.

2) The Port owns 300 acres of land in Westport, between the Westhaven State Park and the Westport Lighthouse State Park, currently zoned to allow development of tourist-related/destination resort facilities. While there are no current proposals for this property, such development would have important implications for water, sewer and drainage utilities. It would likely consume much of the current excess capacity in Westport's treatment facility and water supply.

3) The southeast end of Westport Marina contains a vacant aquaculture (salmon) facility. The Port is actively seeking a proprietor to occupy this facility. Such facilities have significant demands for untreated freshwater for the salmon fry.

4) With approximately 50 to 60 percent vacancy at Westport Marina, the Port is attracting more Alaska catcher-processor vessels. This could lead to development of fish-product processing facilities (such as Surimi manufacturing). These facilities have substantial demands for freshwater, as well as waste water disposal.

2.1.3.5 Grays Harbor Public Utility District

A primary objective of the Grays Harbor Public Utility District (PUD) is to develop power resources in the County. This includes power generation and conservation. Currently, the PUD is involved in the following projects and programs:

- Industrial co-generation at existing mill sites
- Conservation projects at existing mill sites
- The proposed Satsop Gas Turbine project
- The Wynoochee Hydro project
- New transmission lines and expanded sub-station at Ocean Shores.

The PUD also coordinates with the Economic Development Council in an effort to attract and serve new or expanding industrial power users in the County. Further coordination between the County and the PUD on the provision of utilities is desired (Grays Harbor PUD 1991).

2.1.4 The Washington State Growth Management Act

The primary focus of the Growth Management Act (GMA) is to establish a planning framework for the fastest growing counties, and cities in those counties, to meet the challenges associated with rapid growth and economic prosperity. The GMA requires the following: inventory and protection of natural resource lands and critical areas, develop comprehensive and regional transportation plans, prepare plans for capital facilities and financing, assure concurrence, and coordinate and be consistent both within and between jurisdictions. It also authorizes mechanisms for funding public facilities and local capital improvements, and promises state assistance to cities and counties complying with the GMA.

Due to Grays Harbor County's existing population, the County and the cities in it are not required to comply with most of the requirements of the GMA. Also, the County has elected not to comply with all the GMA requirements. However, certain requirements in the GMA apply to all counties and cities.

2.1.4.1 GMA Provisions Affecting Grays Harbor

Provisions in the GMA that affect counties and cities that are not required to adopt, or have opted not to comply with the GMA, include inventory, consistency, subdivision and building permit review requirements. The specific requirements affecting Grays Harbor County are detailed in a memorandum from the Grays Harbor County Planning Director to the Board of Commissioners (Kimura 1991), which is in Appendix A of this report.

On or before September 1, 1991, the GMA requires each county and city to designate, where appropriate, agricultural lands, forest lands, mineral resource lands, and critical areas. Critical areas include wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas and geologically hazardous areas. Grays Harbor County's past planning efforts and programs may already satisfy these inventory requirements.

The GMA also requires that beginning July 1, 1992, the development regulations of each city and County that is not required to plan, or does not opt to plan, under the GMA shall not be inconsistent with the city's or County's Comprehensive Plan. This requirement does not mandate new local regulations, but if the Comprehensive Plan and existing regulations are inconsistent, the GMA does require amendments to either or both to achieve consistency. New regulations must be consistent with the Comprehensive Plan.

City, town, and County subdivision regulations are addressed in Section 51 and 52 of the GMA. The GMA mandates several new requirements for short plans and short subdivisions, and allows several optional issues to be considered in local subdivision regulations. It also allows greater authority for administrative review.

Also, the GMA requires that in all jurisdictions, each building permit application for a building necessitating potable water shall provide evidence of an adequate water supply for the intended

use. The County may not need new local regulations to implement this requirement, but compliance will add time and administrative costs to the application review process.

In addition, the County is voluntarily preparing the Comprehensive Utilities Plan. The County is not required to prepare a utilities plan consistent with the GMA, but because future amendments to the GMA may make such compliance mandatory, it may be advisable at this time to comply to the extent that it is practical. Although the most recent revisions to the GMA, passed in June 1991 by the state legislature and signed by the Governor in July 1991, have not directly affected the County, the GMA will continue to be an issue in subsequent legislative sessions. The County is advised to continue monitoring developments in the GMA to assure compliance.

2.1.4.2 Utilities Requirements in the GMA

The GMA includes several specific requirements related directly to utilities, and additional requirements related indirectly to utilities. For Grays Harbor County, which is not required to adopt and has not opted to plan under the GMA, none of the utilities requirements are applicable. However, the County has expressed an intention to voluntarily prepare the Utilities Comprehensive Plan so that it will generally be consistent with the requirements of the GMA. Some of the GMA's utilities-related requirements are summarized below:

> Public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards;
>
> Where applicable, the land use element shall review drainage, flooding and stormwater run-off in the area and nearby jurisdictions and provide guidance for corrective actions to mitigate or cleanse those discharges that pollute waters of the state;
>
> A Comprehensive Plan shall be adopted that includes a capital facilities plan, including a capital facilities financing plan;
>
> Urban growth areas, adequate to permit the urban growth projected to occur for the succeeding 20 years, shall be designated. Urban government services (such as water and sanitary sewer service) should not be provided outside these urban growth areas;
>
> Each special district (for sanitary sewer, potable water and others) shall adopt or amend a capital facilities plan for its facilities that is consistent with the Comprehensive Plan and indicates the existing and projected growth for the area that is served by the special district;
>
> The sewer and/or water general plan must incorporate the provisions of existing comprehensive plans;

> The sewer district commissioners, before ordering improvements or submitting to vote on any proposition for incurring indebtedness, shall adopt a general comprehensive plan for a system of sewers for the district. The plan shall provide for treatment and collection facilities and provide the method of distributing costs and expenses of the sewer system suitable and adequate for the present and reasonably foreseeable future needs;
>
> The water district commissioners, before ordering improvements or submitting to vote on any proposition for incurring any indebtedness, shall adopt a general comprehensive plan of water supply for the district. They shall determine the present and reasonable foreseeable future needs, they shall select water supplies, and determine a water supply acquisition, retention, storage, and conveyance system or plan suitable and adequate for present and reasonably foreseeable future needs. They shall determine the method of distributing the cost and expense of certain conveyance facilities.

As previously mentioned, Grays Harbor County is not subject to these GMA requirements. However, the County indicates they generally wish to comply with the GMA, and should, therefore, consider these requirements in developing a comprehensive utilities plan. The County may also consider other GMA requirements that could have indirect ramifications for utilities planning. These include numerous requirements for comprehensive planning, consistency and coordination.

2.1.4.3 Encourage Economic Growth

Included in growth management under the GMA are measures intended to encourage economic growth state-wide. Contained in Part V of the GMA, these measures are intended to more effectively manage growth in the Puget Sound region and assist rural areas in building to capacity to accommodate additional economic activity in their communities. It advocates that, where possible, rural economies and low-income areas should be linked with prosperous urban economies to share economic growth. However, the GMA does not specifically provide funds for local jurisdictions to encourage economic growth.

2.1.5 Public Participation

Grays Harbor County Public Works Department chose to request input into their planning process prior to initiating the first phase of the project. Input was solicited from elected officials and staff members from the various cities and towns, special utility districts, Chambers of Commerce, The Port of Grays Harbor, Grays Harbor Regional Planning Commission, The Economic Development Council and private citizens. Meeting dates and attendance are listed:

DATE/TIME	LOCATION	ATTENDANTS
• March 22, 1991 9:00 a.m.	Pearsall Building, Aberdeen	Municipalities and special districts
• March 22, 1991 1:00 p.m.	Economic Development Council (EDC), Aberdeen	Regional Planning, County Planning, Chamber of Commerce, Port of Grays Harbor, EDC, etc.
• April 1, 1991 7:00 p.m.	Lions Club Hall, Grayland	Public participation
• April 2, 1991 7:00 p.m.	Courthouse Administration Building, Montesano	Public participation
• April 3, 1991 7:00 p.m.	North Beach High School, Oyhut	Public participation
• April 4, 1991 7:00 p.m.	Pearsall Building, Aberdeen	Public participation

The presentation to the participants covered a discussion of the goals and objectives of the comprehensive planning effort. It also covered each planning element (water, wastewater and drainage) and discussed information contained in Phase I. Once the presentation was completed, the meeting was opened to discussion. An example of the presentation packet has been included in Appendix A. The comments and concerns voiced by attendees at the public meetings have also been included in Appendix A.

The comments received at the public meeting assisted the consulting team and the public works staff to define problem areas within the County. These comments also provided focus to determine the utility or utilities that were in need of improvement. Selected members of the presentation team reviewed problem areas in conjunction with the public presentations.

In addition to the presentation material, the municipalities and special districts were requested to provide information regarding their infrastructure improvements. This information was utilized to generate the text contained within the Specific Planning Element section of this document.

Information requested is listed as follows:

WATER

- Source of supply
- Treatment requirements
- Storage
- Transmission

WASTEWATER

- Wastewater treatment facilities capacity
- Transmission capacity
- Wet/dry weather flows
- Areas failing on-site systems

STORM DRAINAGE

- Policies, requirements
- Problem areas
- Natural drainage characteristics

CITY POLICIES REGARDING

- Outside use of City infrastructure improvements
- Number of existing outside connections
- Annexation requirements

2.2 OVERVIEW OF GRAYS HARBOR COUNTY

2.2.1 Population

Since 1960, Grays Harbor's population has grown more slowly than the state as a whole. From 1960 to 1980 the total population of Grays Harbor County grew 21.8 percent (averaging 1.1 percent per year), or about half the growth rate for the state. From 1980 to 1990, Grays Harbor's population decreased by 4.1 percent, while the state's population increased by 12.9 percent.

The County's overall growth trend belies the dynamics of certain parts of the County. From 1960 to 1980, the unincorporated areas of the County experienced very rapid growth, and from 1980 to 1990, were static on average, while the total County population declined. In fact, many of the unincorporated areas have shown significant growth over the past ten years.

Increasing by more than 25 percent in the past ten years, the County's most rapidly growing population was in the eastern unincorporated areas surrounding Elma, Malone-Porter, and Oakville. Growing at more than 15 percent during the past decade were the districts of North

River and Quinault Reservation. While most incorporated areas declined or experienced very slow growth, Ocean Shores grew by 24.37 percent. The most rapid population decline during the last decade occurred in the unincorporated areas of Lake Quinault (-30.6 percent) and the area surrounding Aberdeen/Hoquiam (-14.17 percent). Table 2.3.6 shows a tabulation of percent change in population over this time period.

Within the 1980 Grays Harbor County population, the median age was 30.8 compared to 29.8 for the state in the same year. Labor force figures show significant out-migration of working age persons has occurred since 1990 (OEDP). The County has proportionally more residents over age 65 than does the state. Males and females composed nearly equal portions of the population in 1980, with the male population (49.9 percent) slightly lower than the female population (50.1 percent). Ethnic minorities comprised just 4.8 percent of the 1980 population. Native Americans comprised 72 percent of the minority population in the County, the remainder being Asian, black, or other.

2.2.2 Housing

Housing information is provided by the United States Department of Commerce on overall housing characteristics within the County. These numbers are from a preliminary publication from the 1990 census.

HOUSEHOLDS BY TYPE	
Total households	25,514
Family households (families)	17,423
Married-couple families	14,001
Percent of total households	54.9
Other family, male householder	911
Other family, female householder	2,511
Non-family households	8,091
Percent of total households	31.7
Householder living alone	6,837
Householder 65 years and over	3,034
Persons living in households	63,309
Persons per household	2.48
Total housing units	29,932
OCCUPANCY AND TENURE	
Occupied housing units	25,514
Owner occupied	17,088
Percent owner occupied	67.0
Renter occupied	8,426

Vacant housing units	4,418
For seasonal, recreational, or occasional use	2,249
Homeowner vacancy rate (percent)	1.7
Rental vacancy rate (percent)	8.3
Persons per owner-occupied unit	2.55
Persons per renter-occupied unit	2.34
Units with over 1 person per room	831
UNITS IN STRUCTURE	
1-unit, detached	20,267
1-unit, attached	408
2 to 4 units	2,008
5 to 9 units	1,050
10 or more units	1,540
Mobile home, trailer, other	4,659

2.2.3 Economy

The economy of Grays Harbor County is based heavily on the County's natural resources. The basic components are forestry and forest products, fisheries, tourism and agriculture. During the early 1980s, construction employment played a large role, but that has plummeted with the termination and mothballing of the Satsop Nuclear Power Project.

As is common in areas dependent largely upon the extraction of natural resources, Grays Harbor County's economy has been very cyclical. Strong during the 1960s and 1970s, the timber industry faltered during the early 1980s with high interest rates and a severe drop in building activity. Timber companies retooled, mechanized and eliminated workers from manufacturing jobs. Unemployment rates were the highest ever recorded in the County at 18.8 percent in April 1982. The timber industry has since improved, but unemployment remains relatively high.

Fishery declines, fishing curtailments and other problems hurt the fishing industry in the mid-1980s. However, it has been recovering.

The tourism sector, reported to be the second largest fishing industry in the harbor, has grown over the past decade; it includes use of the ocean beaches, fishing, camping and other outdoor activities.

2.2.4 Climate

A generalized description of the climatic conditions along the Washington coast line is included in the soil survey of Grays Harbor County Area, Pacific County and Wahkiakum County, Washington as prepared by the United States Department of Agriculture.

"The climate of the survey area is influenced by the prevailing direction of the wind, the surface temperature of the Pacific Ocean, the Coast and Cascade Ranges, and the position and intensity of the large high- and low-pressure centers over the ocean. The summers are cool and comparatively dry and the winters are mild, wet, and cloudy. The air is moist, and the annual range in temperature is narrow. The ocean current near the coast reverses directions between summer and winter; in summer the California Current moves southward, and in the winter the Davidson Current moves northward. The temperature of the water along the coast ranges from 48 degrees F in February and March to 58 degrees in August.

In spring and summer, a large high-pressure area covers most of the northeastern Pacific Ocean. The prevailing flow of air into Washington is from the northwest. In midsummer, the average air temperature over the ocean ranges from 55 to 60 degrees F. As the air moves inland, it becomes warmer and drier. This flow of air results in a dry season that begins late in spring and reaches its peak in midsummer.

In fall and winter, a low-pressure center near the Aleutian Islands intensifies and spreads southward. At the same time, the high-pressure center over the northeastern Pacific Ocean becomes smaller and also moves southward. This causes the prevailing flow of warm, moist air to shift from the west to the southwest. Fog banks frequently form offshore and move inland at night, but the beaches are clear by the following noon.

In winter, weather disturbances crossing the North Pacific allow a more southerly course, and the number of storms striking the Washington coast increase. Wind velocity normally ranges from 50 to 70 miles per hour as intensive storms move inland, but the velocity has been recorded at 113 miles per hour at North Head and at 100 miles per hour on peaks of the Willapa Hills. In spring, the ocean becomes calmer and the frequency of storms decreases. The high-pressure area spreads northward, and the prevailing direction of the wind gradually shifts from southwest to west.

In winter, the average temperature is 41 to 42 degrees F and the average daily minimum temperature is 33 to 36 degrees. Colder periods occur, usually when cold, dry northeasterly or easterly winds from east of the Cascade Range reach the coast. The sky is frequently clear under these conditions and additional heat is lost by radiation at night. The lowest temperature on record, which occurred at Elma and at Grays River on December 8, 1972, is 2 degrees. The colder weather seldom continues for more than a few days before the warmer, moist air from the ocean moves inland. In summer, the average temperature is 60 to 62 degrees and the average daily maximum temperature is 71 degrees. The highest recorded temperature, which occurred at Elma on July 20, 1956, is 105 degrees.

In beach areas some distance from the hills, the annual precipitation generally ranges from 65 to 75 inches. Near the foothills, annual precipitation ranges from 80 to 90 inches. It increases to 100 inches in the Willapa Hills and ranges from 125 to 150 inches or more in the rain forest along the windward slopes of the Olympic Mountains. The total precipitation is 84 inches at Aberdeen, 68 inches at Elma, 114 inches at Grays River and 87 inches at Willapa Harbor. Of

this, 20 percent usually falls in April through September. The growing season for most crops is within this period. The heaviest 1-day rainfall during the period of record was 6.1 inches at Grays River on December 2, 1977. Thunderstorms occur on about 5 or 6 days of each year, and most occur in summer.

Snowfall is light in the beach areas, and the snow frequently melts as it falls. Snowfall increases in the foothills, and the higher elevations of the Olympic Mountains are covered with snow from early in winter until late in spring. The average seasonal snowfall is 9 inches at Aberdeen, 10 inches at Elma, 9 inches at Grays River, and 6 inches at Willapa Harbor. The greatest snow depth at any one time during the period of record was 19 inches at Elma. On an average of 1 or 2 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 65 to 70 percent. Humidity is higher at night, and the average at dawn is about 90 percent. In midsummer, easterly winds that are hot cross the Cascade Range and reach the coast. This sometimes causes the relative humidity to drop to 30 percent. The sun shines 45 percent of the time in summer and 20 percent in winter. The prevailing winds are from the south-southwest. Average wind speed is highest, 8 or 9 miles per hour, in winter".

2.2.5 Geography

2.2.5.1 Soils Characterization

The geological history of Grays Harbor County has had a profound effect on soil conditions. The northern half of the County contained both continental and alpine glaciers. The larger continental glaciers filled Puget Sound and extended southward to the Tenino area. During periods of warming, their melt waters containing gravels, sands and silts filled stream channels. As the glaciers receded, drainage patterns to the north were blocked, forcing water and sediment into the Chehalis River valley where large terraces formed. Changes in sea level caused erosion of the terraces, forming new flood plains. Where water velocities were high, sediments were scoured, suspended and transported downstream. In the quieter waters near the ocean, sediments were deposited. These alluvial deposits formed aquifers which are the major sources of groundwater in the County.

Some of the alluvial deposits settled in Grays Harbor, while others were swept out to sea where offshore currents formed long sand spits.

The process of erosion on terraces and uplands is still occurring today much the same way it did during the last 4,000 to 5,000 years. The changing elevation of the sea and sedimentation have created oxbow lakes and marshy areas. Some of the lakes are filled with peat. (Eddy 1966).

The parent material of County soils is very diverse. It ranges from sands deposited yesterday to old sandstone and basalt in the mountainous regions. In-between are soils derived from

terrace materials laid down by the melt waters of glaciers, recent silt, clay and peat deposits adjacent to Grays Harbor. Soils range from excessively well-drained gravels to dense poorly drained clays with high seasonal water tables.

The Soil Conservation Service (SCS) (Pringle et. al. 1986) has produced a general soil map which includes the study area, with the exception of the Lake Quinault area. A quick overview of the different soils can be seen in Figure 2.2.1. There are 12 general soil areas depicted on the SCS map which correspond to the narrative below.

Soils on flood plains, terraces, dunes, and fans

Ocosta — These are very deep, poorly drained, nearly level soils found on flood plains and deltas protected from tidal overflow. They have seasonal water that can be close to the surface.

Grehalem — Rennie Association contains very deep, well-drained and poorly drained soils on gently sloping flood plains.

Chehalis — Skamo — Spanaway-Complex soils form in glacial outwash material. The texture ranges from silt to gravel. Slopes are gentle. This complex is found along the Chehalis River from Montesano eastward.

Yaquina — Netarts — Dune Lands-Complex soils form in sands. It ranges from recent sand dunes to somewhat poorly drained stabilized sand dunes.

Soils on glacial uplands

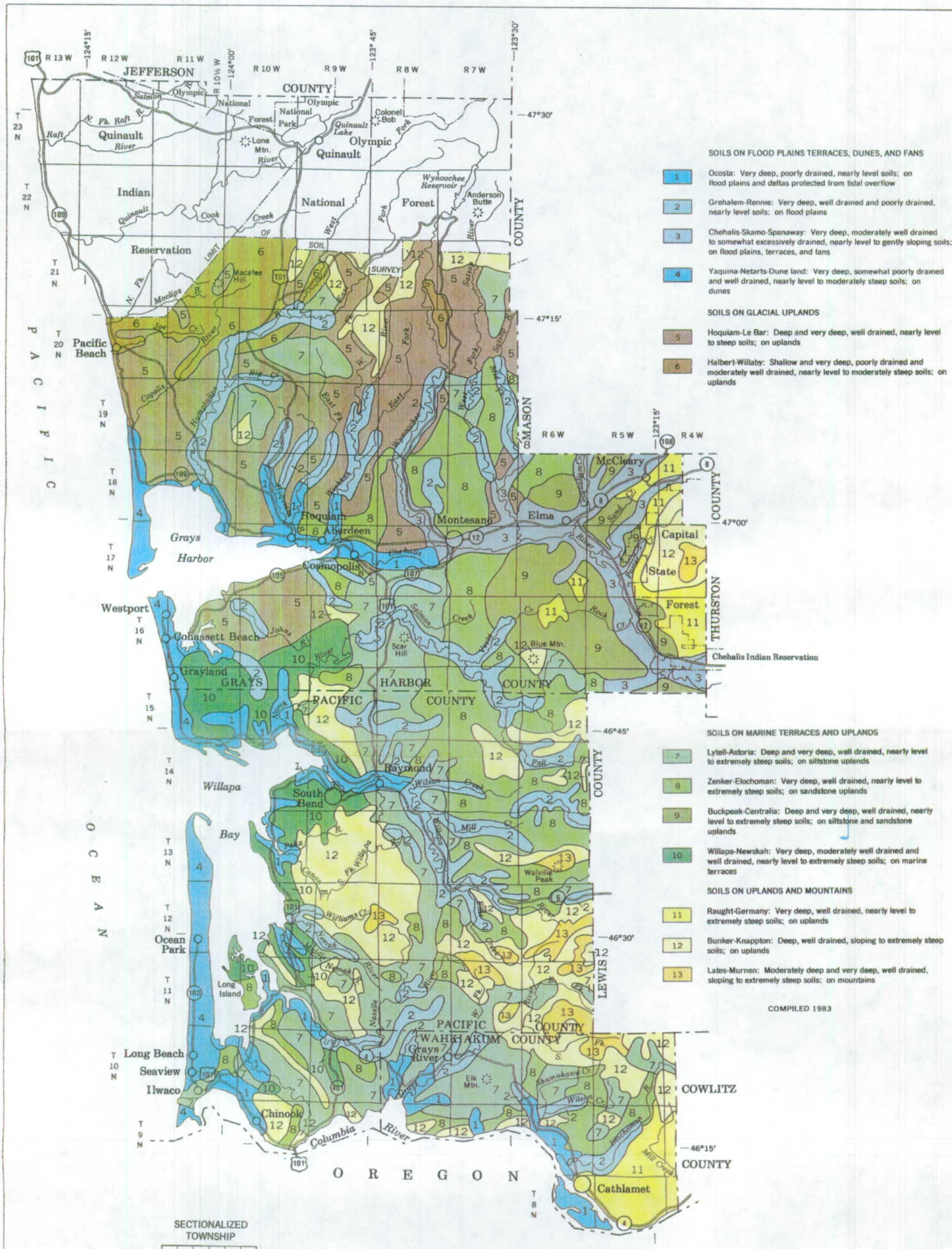
Hoquiam — LeBar Association contains deep and very deep well-drained soils on slopes that range from 0-60 percent. This unit is the most common in uplands.

Halbert — Willaby Association contains contrasting soils. Shallow and deep soils in this unit range from moderately well drained to poorly drained.

Soils on marine terraces and uplands

Lytell — Astoria Association is found on siltstone bedrock. It contains deep, well-drained soils on slopes that range from 0-60+ percent in the northwest part of the County.

Zenker — Elochman Association contains soils derived from sandstone. They are deep, well-drained soils on slopes that range from 0-60+ percent, generally north and south of Montesano and around Aberdeen.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
WASHINGTON STATE UNIVERSITY,
AGRICULTURAL RESEARCH CENTER

Figure 2.2.1 **GENERAL SOIL MAP**

GRAYS HARBOR COUNTY AREA, PACIFIC AND WAHKIAKUM COUNTIES WASHINGTON

Scale 1:506,880

2 0 2 4 6 8 Miles

2 0 4 8 12 16 Km

Buckpeak — Centralia Association refers to areas where the bedrock is a complex of siltstone and sandstone. It is well-drained, deep, and occurs on slopes of 0-60+ percent in the eastern side of the County.

Willapa — Newskah Association is found on marine terraces in the Grayland area. It contains soils which are moderately to well-drained.

Soils on mountainous slopes

Raught — Germany Association is found at elevations between 100 and 1,500 feet, over areas of basalt. This unit includes mostly very deep well-drained soils.

Bunker — Knappton Association is found at higher elevations. This unit contains deep, well-drained soils on steep slopes.

The SCS soil survey has cross sections of these soil types, should the reader wish to have a clearer idea of where these soils occur. It also contains detailed soil maps and soil profile descriptions which are very useful in depicting areas suitable for disposal of domestic waste.

2.2.5.2 Hydrogeologic Characteristic

As a portion of this first phase study, hydrogeologist Richard Rongey of Rongey/Associates conducted an investigation and prepared a report which located approximately 10 percent of the total number of wells the Department of Ecology has on record in Grays Harbor County. From the number of located wells, 60 were sampled. The purpose of the report was to ascertain general water quantity and water quality characteristics in given areas of the County. The entire report is presented in Appendix A and will be referred to in the planning elements and planning area portions of this document and is summarized in Table 3.2.6.

2.2.6 Surface Water

Grays Harbor has an abundance of surface water sources ranging from the Pacific Ocean to a number of major river systems and lakes. Grays Harbor County Tuhas two saltwater bodies, the Pacific Ocean, and Grays Harbor. The Pacific Ocean along the County's west shores provides a number of recreational activities, including beachcombing, clam digging, fishing and sightseeing.

Grays Harbor begins at the north and south jetty at Ocean Shores and Westport, respectively, and is approximately 16 miles long from east to west. The Harbor terminates at the City of Aberdeen at the mouth of the Chehalis River. Grays Harbor provides shelter for ocean-going vessels entering the harbor to load wood and other raw products at the Port of Grays Harbor.

Grays Harbor also provides habitat for a variety of aquatic species and contains a Federal wildlife refuge in the vicinity of Bowerman Field directly west of the City of Hoquiam.

There are a number of major rivers that lie within the County boundaries. These include the Quinault River, Humptulips River, Hoquiam River, Wishkah River, Chehalis River, Wynoochee River, Satsop River, North River and Johns River. These major river systems provide a variety of recreational and municipal uses for citizens and visitors in Grays Harbor County. All the rivers are habitats for wildlife and provide fishermen and hunters with recreational opportunities.

The major river systems also provide receiving waters for municipal discharges. These discharges may originate from wastewater treatment facilities or storm drainage systems.

Bypasses or discharges of untreated waste has occurred along the Chehalis River. This discharge has prompted temporary closures of oyster harvesting activity downstream. Some of the river flows in the Grays Harbor Area are monitored by gauging stations operated by the U.S. Department of the Interior. Where gauging stations have been present for over a 10-year period, statistical information is available for 10-year, 7-day low-flow values. This data is provided in Table 2.2.1. The 10-year, 7-day low-flow information is considered a critical element by the Department of Ecology for determining dilution zone compliance for wastewater treatment facilities.

TABLE 2.2.1

10-YEAR, 7-DAY RIVER LOW-FLOW OCCURRENCE

Location	10-Year, 7-Day Low Flow in CFS
Chehalis River Near Doty	21.4
Chehalis River at Porter	198.3
Satsop River Near Satsop	204.0
Wynoochee River Above Black Creek	6.3
North Fork Quinault River Near Amanda Park	123.6

The rivers listed are the only surface water bodies with sufficient data to generate statistical analysis for low flow values. These values are listed in the Stream Flow Statistics and Drainage-Basin Characteristics for the Southwestern and Eastern Regions, Washington, Volume I, Southwestern Washington, as prepared by the U.S. Department of the Interior in cooperation with the State of Washington Department of Ecology.

2.3 FUTURE CONDITIONS

2.3.1 Population Projections

Grays Harbor County's population is impacted by a number of different influences. Furthermore, one part of the County may or may not be influenced as another portion of the County would. Some of the influences that affect different sectors of the County are listed:

- East County residential population is affected by prices and availability of affordable housing along the Interstate 5 corridor. People are purchasing homes in east County and commuting to the Olympia, Tumwater and Lacey area. East County is also influenced by agriculture.

- Central County is impacted by the economic conditions of the harbor itself. Industries that serve this area are the timber industry, shipping at the Port of Grays Harbor, wood processing, fishing and the tourist industry.

- North and South Beach in the west portion of the County are greatly influenced by the tourist industry wishing to enjoy the Pacific Ocean and the associated activities.

- All areas within the County rely partially or solely on the timber industry.

The diversity of influences that affect Grays Harbor's population requires that individual sectors be reviewed for population trends rather than the County as a whole. Census tract information as provided by the U.S. Census Bureau was utilized to provide a more detailed study of population movements within the County.

Knowledge of population movements allow prioritization of infrastructure needs and land use planning on a proactive, rather than a reactive basis.

The population growth rate is projected to increase for the County as a whole for the next five, ten, and twenty-year horizons. This includes continued rapid growth (averaging more than 2 percent per year) in the eastern County, specifically in the unincorporated areas of Elma, Malone, and Oakville, as well as renewed rapid growth in the McCleary Area. Also projected for rapid growth (averaging approximately 2 percent per year) is the area of Quinault Reservation. Less rapid growth (averaging approximately 1.5 percent per year) is projected for the unincorporated areas of South Beach and Aberdeen/Hoquiam. The remaining unincorporated areas are projected to grow slowly or decline. Table 2.3.1 shows the projected population numbers from 1995 to the year 2010 in five-year increments for all of the County's Census tracts based on most likely population trends. Figure 2.3.1 shows all the census tracts and boundaries for Grays Harbor County. Tables 2.3.2, 2.3.3 and 2.3.4 show population projections using 10-, 20-, and 30-year past trends, respectively.

TABLE 2.3.1
ESTIMATE OF FUTURE POPULATION WITHIN UNINCORPORATED GRAYS HARBOR COUNTY USING MOST LIKELY TRENDS

Census Division:	Population Estimate(4)			
	1995	2000	2005	2010
McCleary (1)	1,630	1,813	1,997	2,181
Elma (2)	4,092	4,639	5,187	5,734
Malone (2)	1,542	1,714	1,886	2,058
Oakville (2)	1,189	1,338	1,488	1,637
Wynoochee (1)	3,067	3,180	3,294	3,408
North River (1)	626	638	651	663
South Shore (1)	2,381	2,558	2,734	2,911
Aberdeen/Hoquiam (3)	4,744	5,079	5,414	5,749
Wishkah (2)	1,569	1,596	1,624	1,652
Humptulips (1)	1,272	1,242	1,213	1,184
Lake Quinault (1)	656	606	557	507
Quinault Reservation (1)	1,517	1,712	1,908	2,103
North Beach (1)	2,349	2,568	2,787	3,007
TOTAL COUNTY	**26,634**	**28,683**	**30,740**	**32,794**

(1) Most-likely value figured from average of 1980-1990 and 1960-1990 values.

(2) Most-likely value figured from 1980-1990 value.

(3) Most-likely value figured from 1960-1990 County value.

(4) Population estimates include unincorporated Grays Harbor County only.

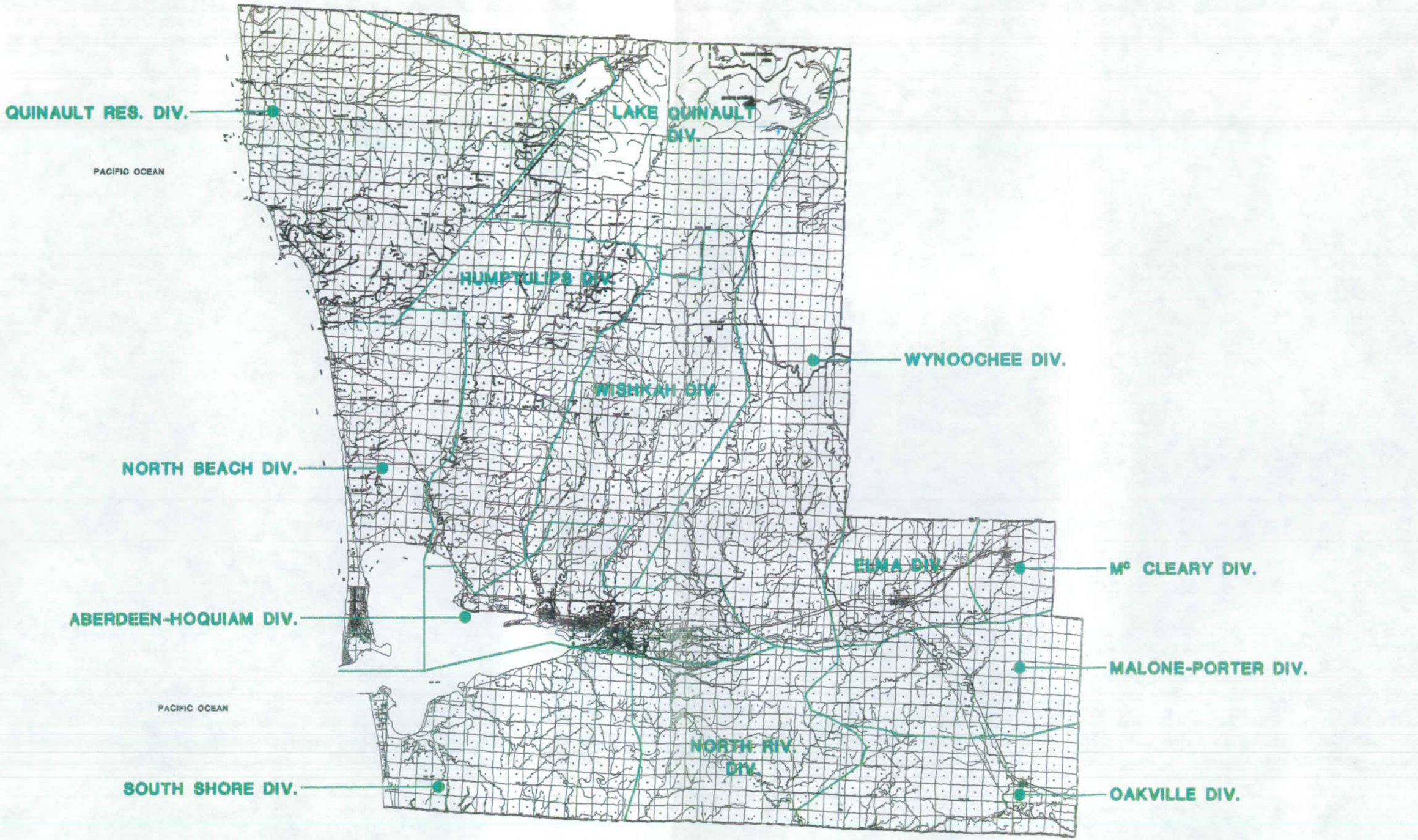


Figure 2.3.1: Census Division Boundaries

TABLE 2.3.2
ESTIMATE OF FUTURE POPULATION WITHIN UNINCORPORATED GRAYS HARBOR COUNTY USING 10 YEAR PAST TRENDS

	Population Estimate[1]			
Census Division:	1995	2000	2005	2010
McCleary	1,470	1,495	1,519	1,543
Elma	4,091	4,638	5,185	5,732
Malone	1,542	1,714	1,886	2,058
Oakville	1,189	1,339	1,488	1,637
Wynoochee	2,927	2,901	2,875	2,849
North River	660	706	753	800
South Shore	2,123	2,040	1,958	1,876
Aberdeen/Hoquiam	4,097	3,784	3,472	3,159
Wishkah	1,568	1,596	1,623	1,651
Humptulips	1,261	1,221	1,181	1,141
Lake Quinault	598	490	382	274
Quinault Reservation	1,442	1,564	1,685	1,806
North Beach	2,145	2,160	2,175	2,190
TOTAL COUNTY	**25,113**	**25,648**	**26,182**	**26,716**

(1) Population estimates include unincorporated Grays Harbor County only.

TABLE 2.3.3
ESTIMATE OF FUTURE POPULATION WITHIN UNINCORPORATED GRAYS HARBOR COUNTY USING 20 YEAR PAST TRENDS

	Population Estimate[1]			
Census Division:	1995	2000	2005	2010
McCleary	1,920	2,393	2,867	3,340
Elma	5,012	6,480	7,947	9,415
Malone	1,346	1,322	1,298	1,274
Oakville	1,136	1,232	1,327	1,423
Wynoochee	3,129	3,305	3,482	3,658
North River	567	521	475	429
South Shore	2,417	2,629	2,840	3,052
Aberdeen/Hoquiam	14,252	24,096	33,939	43,782
Wishkah	1,446	1,351	1,256	1,161
Humptulips	1,250	1,199	1,147	1,096
Lake Quinault	667	628	589	550
Quinault Reservation	1,580	1,840	2,099	2,358
North Beach	2,287	2,445	2,602	2,760
TOTAL COUNTY	**34,009**	**49,441**	**61,868**	**74,298**

(1) Population estimates include unincorporated Grays Harbor County only.

TABLE 2.3.4
ESTIMATE OF FUTURE POPULATION WITHIN UNINCORPORATED GRAYS HARBOR COUNTY USING 30 YEAR PAST TRENDS

	Population Estimate[1]			
Census Division:	**1995**	**2000**	**2005**	**2010**
McCleary	1,788	2,130	2,471	2,813
Elma	5,226	6,908	8,591	10,273
Malone	1,318	1,266	1,214	1,162
Oakville	1,125	1,209	1,294	1,378
Wynoochee	3,205	3,457	3,709	3,961
North River	592	570	549	527
South Shore	2,641	3,076	3,512	3,947
Aberdeen/Hoquiam	11,244	18,079	24,914	31,749
Wishkah	1,483	1,425	1,367	1,309
Humptulips	1,282	1,263	1,244	1,225
Lake Quinault	714	723	731	740
Quinault Reservation	1,590	1,860	2,129	2,399
North Beach	2,415	2,700	2,985	3,271
TOTAL COUNTY	**34,663**	**44,666**	**54,710**	**64,754**

(1) Population estimates include unincorporated Grays Harbor County only.

The methodology used for forecasting population data was based on historic trends. Population forecasts were prepared by projecting 1990 census values for each population division. Table 2.3.5, prepared by Grays Harbor Regional Planning, shows population estimates generated for the cities and unincorporated Grays Harbor County.

The historic trends selected as the basis of the population projections are assumed to be relatively conservative. These values do not include impacts on County-wide population trends because of issues such as spotted owl habitat conservation and declining timber markets. It is the intent of this document to be prepared for growth given positive historic trends. If changing political or economic issues greatly impact the population trends in Grays Harbor County, then the population projections can be revised in the next five-year study.

Census data from 1960 to 1990 are shown in Table 2.3.6 for unincorporated Grays Harbor County. From these numbers a straight percent change was calculated for the periods of 1960 to 1990, 1970 to 1990, and 1980 to 1990. For each of these periods, a percent change per year was calculated from the total percent change for the time period. The census data used for this table can be found in Appendix A along with housing information.

From these calculated percent-change-per-year values, a most likely value for each census division was assigned. The results of these projections from the most-likely trends will be used for the plan. The criteria for assigning these most-likely values was decided by the use of evaluative assessments and professional judgements. These judgements took into consideration what has occurred in each division over the past decades, the reasons for those past trends and what is likely to occur in each division in the future.

The most-likely-percent-change values were then used to forecast forward population numbers for each census division from the current 1990 census numbers. Future populations were forecasted for five, ten, fifteen, and twenty years using a straight line extrapolation method.

The most-likely-percent-change values assigned for each of the census divisions within the County were determined as follows:

(1) The average of the 1980 to 1990 and the 1960 to 1990 percent-change values; These census divisions had a growth spurt during the 1970s which has ended and is not likely to occur again in the forecasted future. The growth in the 1970s was likely due to growth in the timber industry.

This evaluation was assigned to the McCleary, Wynoochee, North River, South Beach, Humptulips, Lake Quinault, Quinault Reservation, and North Beach census divisions.

TABLE 2.3.5

HISTORIC AND PROJECTED POPULATION GRAYS HARBOR COUNTY[1]

	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Aberdeen	18,741	19,000	18,489	18,067	18,739	17,250	17,050	16,794	16,542	16,294	16,050
Cosmopolis	1,312	1,325	1,599	1,600	1,575	1,570	1,545	1,591	1,639	1,688	1,739
Elma	1,811	2,067	2,227	2,470	2,720	2,460	2,420	2,548	2,683	2,825	2,975
Hoquiam	10,762	10,800	10,466	10,054	9,719	9,240	9,020	8,758	8,504	8,257	8,018
McCleary	1,115	1,102	1,265	1,275	1,419	1,420	1,515	1,597	1,683	1,774	1,870
Montesano	2,486	2,641	2,847	2,790	3,247	3,160	3,270	3,430	3,598	3,774	3,959
Oakville	377	385	460	503	537	540	580	624	671	722	777
Ocean Shores				1,021	1,777	2,130	2,262	3,017	4,025	5,369	7,162
Westport	976	1,100	1,364	1,382	1,954	1,850	1,935	2,188	2,475	2,799	3,166
Unincorporated	16,885		20,836	21,038	24,627	24,280	24,603	25,710	26,867	28,076	29,339
Incorporated	37,580	38,420	38,717	39,162	41,687	39,620	39,597	40,547	41,820	43,502	45,716
TOTAL COUNTY	54,465		59,553	60,200	66,314	63,900	64,200	66,257	68,687	71,578	75,055

(1) Information provided by Grays Harbor County Regional Planning Commission.

TABLE 2.3.6
ESTIMATE OF FUTURE POPULATION: UNINCORPORATED GRAYS HARBOR COUNTY

Division:	Population[1]				% Change	% Change	% Change	% Change	% Change	% Change	Most
	1960	1970	1980	1990	1960-'90	per year	1970-'90	per year	1980-'90	per year	Likely
Mc Cleary[2]	598	626	1,399	1,446	141.81	4.73	130.99	6.55	3.36	0.34	2.54
Elma[3]	921	1,334	2,708	3,544	284.80	9.49	165.67	8.28	30.87	3.09	3.09
Malone[3]	1,773	1,473	1,095	1,370	-22.73	-0.76	-6.99	-0.35	25.11	2.51	2.51
Oakville[3]	699	760	808	1,040	48.78	1.63	36.84	1.84	28.71	2.87	2.87
Wynoochee[2]	1,953	2,384	3,006	2,953	51.20	1.71	23.87	1.19	-1.76	-0.18	0.77
North River[2]	776	876	532	613	-21.01	-0.70	-30.02	-1.50	15.23	1.52	0.41
South Shore[2]	1,009	1,593	2,383	2,205	118.53	3.95	38.42	1.92	-7.47	-0.75	1.60
Aberdeen/Hoquiam[4]	428	444	5,137	4,409	930.14	31.00	893.02	44.65	-14.17	-1.42	1.52
Wishkah[3]	1,991	2,045	1,488	1,541	-22.60	-0.75	-24.65	-1.23	3.56	0.36	0.36
Humptulips[2]	1,426	1,544	1,386	1,301	-8.77	-0.29	-15.74	-0.79	-6.13	-0.61	-0.45
Lake Quinault[2]	659	907	1,017	706	7.13	0.24	-22.16	-1.11	-30.58	-3.06	-1.41
Quinault[2]	594	740	1,116	1,321	122.39	4.08	78.51	3.93	18.37	1.84	2.96
North Beach[2]	2,436	3,390	2,552[5]	2,129[5]	80.25	2.68	29.53	1.48	1.43	0.143	2.06
TOTAL COUNTY	15,263	18,116	24,627	24,578	61.03	2.03	35.67	1.78	-0.20	-0.02	

(1) Information provided by United States Census.

(2) Most-likely value figured from average of 1980-1990 and 1960-1990 values.

(3) Most-likely value figured from 1980-1990 value.

(4) Most-likely value figured from 1960-1990 County value.

(5) Population of the City of Ocean Shores was added to this figure when calculating % change only. Ocean Shores was annexed in 1975. Total North Beach population, including Ocean Shores, is 4,329 in 1980 and 4,391 in 1990.

(2) The average from 1980 to 1990 percent-change value; It is assumed that the percent change which occurred in the population in the last decade will continue to occur for the next 20 years. The trends before 1980 were not used because these census divisions were affected by population increases from transient populations, such as Satsop construction crews, or redefinition of census boundaries in 1975. More current trends over the last decade are assumed to be more representative of future forecasts.

This evaluation was assigned to Elma, Malone, Oakville, and Wishkah. Since the divisions lines near Wishkah and Aberdeen/Hoquiam have changed from 1960 to 1970, the more current census numbers will be representative of the trends for this area than numbers which extend further into the past.

(3) The total County-wide average from 1960 to 1990; This value was obtained from total County census data supplied by the County. This evaluation assumes that the division will only continue to grow at the same rate as the rest of the County. This evaluation was assigned to the Aberdeen/Hoquiam census division only.

The information provided in the preceding section does not account for transient and tourist population. After exhaustive research it became apparent that a statistical analysis of tourist populations or part-time residents is not available at this time.

In order to estimate the part-time or transient population, it is recommended that water usage be monitored over a 4th of July weekend, from areas that will be impacted by part time residents or tourist populations. It is recommended that those areas reviewed include Grayland Water District Number One, the Pacific Beach Water System, Ocean Shores, and the City of Westport. These water production rates, which should be recorded on a daily basis, can be compared with wastewater flows generated at the treatment plants at the City of Westport, the City of Ocean Shores, and the County-owned facility at Pacific Beach. It also recommended that other holiday periods during the summer months be monitored in the same manner. By applying population- and consumer-use statistics, estimates of transient populations can be derived.

2.3.2 Economic Projections and Goals

The Grays Harbor Regional Planning Commission, with responsibility for maintaining and updating the Overall Economic Development Plan, has a primary role in developing plans, programs, and goals for promoting economic development in the area. A summary of some key findings of the Commission's 1990 report (Grays Harbor Regional Planning Commission 1990) is provided in Section 2.1.3.2. The specific projects and priorities, intended to address the identified needs and objectives, are listed below:

Job Development Project Priorities

Improve the Public Terminal to allow for cargoes other than logs and lumber.

Redevelop the Westport Marina.

Improve the South Montesano Industrial Area infrastructure (water service, as well as sewer, stormwater, and access improvements.

Improve McCleary Industrial Site (extensive infrastructure improvements).

Complete the Westport Marina Bulkhead rehabilitation and bankline reconstruction projects.

Construct infrastructure for Industrial Development District No. 1.

Pursue and complete the Tall Ships project.

Provide infrastructure for the Elma Marion Road Industrial Area.

Extend water and sewer services to the South Aberdeen/Highway 105 Industrial District.

Provide site and infrastructure improvements at the Hoquiam Rail Yard Industrial District (Union Pacific rail yard).

Modernize and improve Bowerman Field Airport.

Improve Port Industrial Road intersections for safety and efficiency.

Complete the Aberdeen/Hoquiam Industrial Highway to provide adequate access to adjacent industrial sites.

Complete strategy and improvements for Westport destination tourism facilities.

Explore options for an independently operating railroad.

Pursue and continue rehabilitation of town centers throughout the County. Develop Woodlawn access bridge.

Construct Terminal Two, Berth B to increase the commerce and shipping capacity of forest products.

Improve Ocean Shores water system to accommodate growth.

Infrastructure Project Priorities

Continue navigation improvements for Grays Harbor.

Pursue development of the South Aberdeen Dike to prevent flooding.

Remodel or construct a new ferry terminal in Ocean Shores.

Pursue the orderly development of a regional airport system, including improvements to existing airports.

Support the Mayr Brothers Fish Hatchery development.

Pursue development of the Wynoochee Dam Hydro Project and Fish Hatchery.

Improve transportation in Ocean Shores to eliminate a dangerous traffic circulation problem.

REFERENCES

Barney and Worth, Inc., 1987.

Eddy P.A., "Geology and Groundwater Resources of the Lower Chehalis River Valley and Adjacent Areas, Grays Harbor County, Washington." Washington Division Water Resources Water Supply Bull 30, 1966.

Eddy P.A., "Geohydrology of the Chehalis River Valley, Elma to Oakville, Grays Harbor County, Washington." Washington Department of Ecology, GH #3, 1973.

Grays Harbor County, Grays Harbor County Zoning Code, Title 13, Montesano, Washington, 1969.

Grays Harbor Public Utility District, Personal communication with Steve Romjue, Grays Harbor PUD Director. June 14, 1991. Aberdeen, Washington, 1991.

Grays Harbor Regional Planning Commission, Grays Harbor County, City of Hoquiam, City of McCleary. Industrial Lands Study, May, 1989. Grays Harbor, Washington, 1989.

Grays Harbor Regional Planning Commission. Overall Economic Development Report. Grays Harbor, Washington, 1990.

Kimura, Ken, Memorandum from Ken Kimura, Grays Harbor County Planning Director, to the County Board of Commissioners, regarding the Growth Management Act requirements for Grays Harbor County. June 13, 1991. Montesano, Washington, 1991.

Port of Grays Harbor. Personal communications with Stan Lattin. May 28, 1991. Grays Harbor, Washington, 1991.

Pringle, R.F. et al., "Soil Survey of Grays Harbor Area, Pacific County, and Wahkiakum County, Washington." USDA -SOS U.S. Government Printing Office, 1986.

CHAPTER 3
PLANNING ELEMENTS

3.1 STUDY AREA

To perform an adequate analysis of the County's needs and goals, study areas were developed by considering the location of the County's residents as well as their current and projected needs. Boundaries were established, and in some cases, areas shaded to represent less significant sections within the study area boundary. The boundaries and areas developed are shown in Figure 3.1.1. The boundaries and areas defined for this study are: (1) an Overall Study Area Boundary, (2) Census Tract Boundaries, (3) Intermediate Study Area Boundaries, and (4) Less Significant Sections.

Each boundary was determined using various criteria specific to one or more elements of the Utility Comprehensive Plan. All boundaries are used to aid in an effective analysis of the County's current and projected needs for water, wastewater and storm drainage.

The Overall Study Area Boundary was established to define the extent of the entire Comprehensive Plan. All studies for water, wastewater and storm drainage are performed within this boundary. To develop this boundary, a broad overview of the larger population centers within the County was considered. Areas having the larger population centers and larger population densities would be in greater need of this utilities plan.

The Census Tract Boundaries were those boundaries defined by the Federal Census Bureau. They define specific areas within the County and are used to help enumerate the population centers. Analysis of census tract data is helpful in assessing the needs of various areas within the County.

To focus more closely on the County's population centers within the Overall Study Area Boundary, Intermediate Study Area Boundaries were developed. These boundaries were fashioned largely by the Census Tract Boundaries, but consideration was also given to known population centers which were of interest for the study. This allowed areas to be developed which were contained within both the Overall Study Area Boundary and the Census Tract Boundary while providing some separation for the population centers which were of interest. This benefits the study since areas of interest are in workable portions, and the United States Census numbers can still be of use for population projections.

Within the Overall Study Area, less significant sections were identified, reviewed by County personnel and removed from the study. These were areas of very small or non-existent population, originally identified as those sections in which there were no County or improved roads.

Estimates of the number of people in a census division's population actually living within the study area were made. Percentages for each census division living in the study area were assigned using the best professional judgement, and consultation with county personnel. These percentages were applied to the 1990 census values and the 2010 population estimates for the respective divisions. Table 3.1.1 shows the percentages for each division and the calculated population estimate for the number of people within the study area boundary.

TABLE 3.1.1
ESTIMATE OF POPULATION WITHIN STUDY AREAS FOR GRAYS HARBOR COUNTY

Census Division	% in Study Area	Total Population 1990 Unincorporated Grays Harbor	Estimated Population in Study Area 1990	Total[1] Population 2010 Unincorporated	Estimated Population[1] in Study Area 2010 Unincorporated Grays Harbor
McCleary	95	1,446	1,374	2,181	2,072
Elma	95	3,544	3,367	5,734	5,447
Malone	85	1,370	1,165	2,058	1,749
Oakville	95	1,040	988	1,637	1,555
Wynoochee	50	2,953	1,477	3,408	1,704
North River	10	613	61	663	66
South Shore	95	2,205	2,095	2,911	2,765
Aberdeen/Hoquiam	100	4,409	4,409	5,749	5,749
Wishkah	90	1,541	1,387	1,652	1,487
Humptulips	90	1,301	1,171	1,184	1,066
Lake Quinault	95	706	671	507	482
Quinault Reservation	0	1,321	0	2,103	0
North Beach	95	2,129	2,023	1,686	1,602
TOTAL		**24,578**	**20,188**	**31,473**	**25,744**

[1]Using "most likely" trends

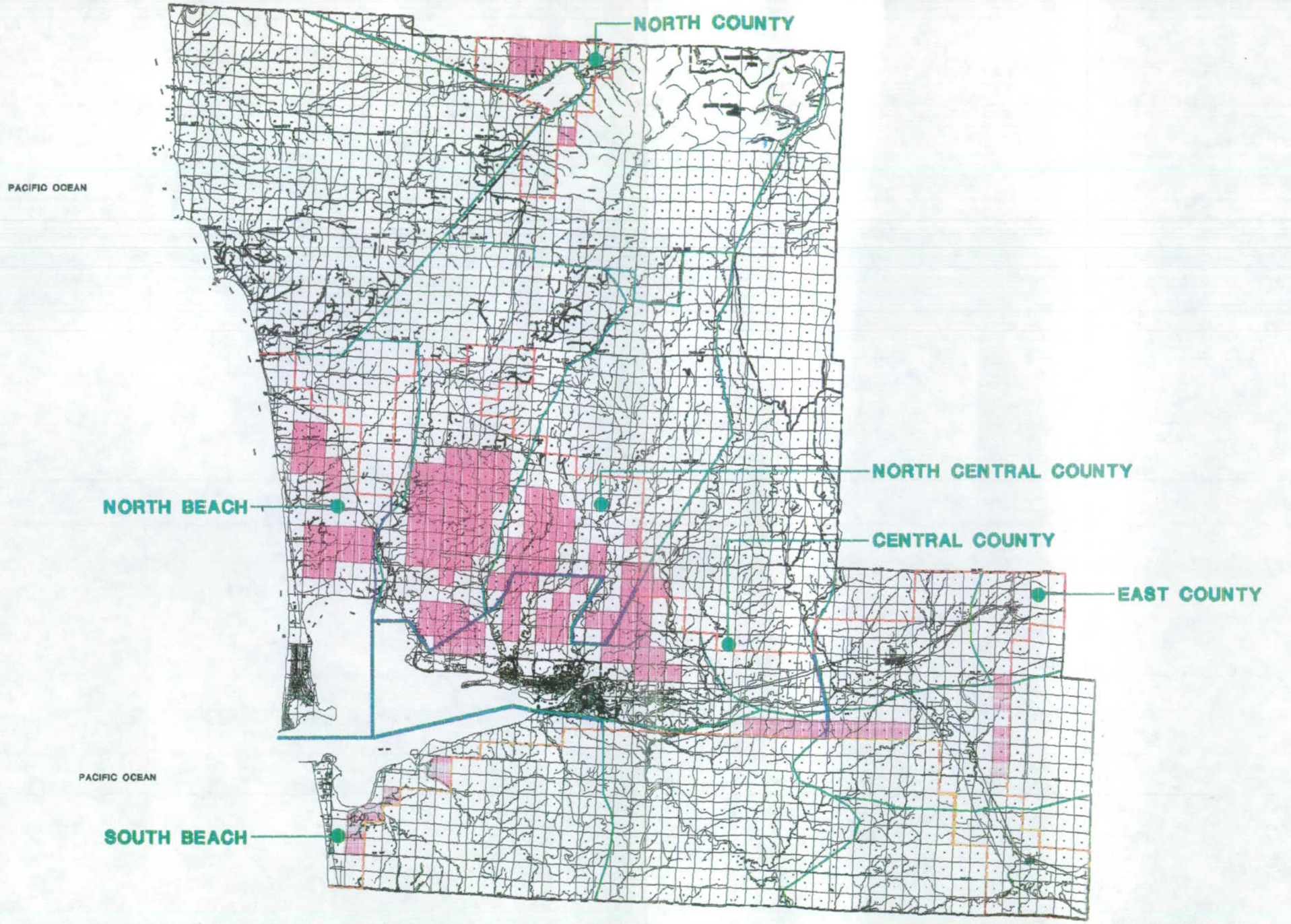


Figure 3.1.1: Study Area Map

3.2 WATER

3.2.1 Goals and Objectives

This section focuses upon water resource and management issues for existing and future municipal and industrial customers within the study area of Grays Harbor County between 1991 and the year 2000. Of specific interest to the study is the quality and quantity of water resources available to support proposed industrial development, as described in the County's Industrial Lands Study. Recent economic changes within the County emphasize the need to stimulate economic diversity. Suitable water quantities and quality for varying industries are evaluated within this report.

In addition, existing water system problems within the study area have been evaluated. The majority of these problems relate to inadequate, unreliable and poorly managed water systems. State legislation now specifies that water utilities that chronically do not meet public health or management criteria of the Department of Health (DOH) may be placed into the receivership of County government. This added responsibility on local government emphasizes the need to establish and promote well-managed water systems.

This study evaluates the suitability of current water resources to meet present and projected potable usage by the year 2000, along with a conservative range of ultimate industrial demands.

3.2.2 Existing Conditions

Information on existing water systems and usage patterns within the study area was obtained from a variety of sources. A series of four workshops were conducted throughout the County with participation by various water utilities. Questionnaires were sent to all Class 1 and Class 2 water systems to obtain information regarding their existing facilities, capacities and usage patterns. Water facility inventory (WFI) forms, obtained from DOH, were used where data on the questionnaires proved to be inadequate. Although the reliability of WFI information is subject to the reporting accuracy and scrutiny of water utility managers, in many cases it was the only available information. Finally, interviews were conducted with representatives from the Grays Harbor County Health Department (GHCHD) and Public Works Department to evaluate areas or systems with chronic problems.

Based on a review of the information, there are 13 Class 1, 36 Class 2, 78 Class 3, and 104 Class 4 water systems reported within the study area. Figures 3.2.1 through 3.2.6 identify the approximate service areas of all Class 1 water systems. In addition, these figures also identify by section within each sub-area the number of reported Class 2, 3, and 4 public water utilities. No attempt has been made to identify existing industrial sources of supply nor their location. Some of the cities provide service outside their city limits into unincorporated areas. At present, there are no formal agreements between City and County governments regarding the extent or location of these current or future service areas.

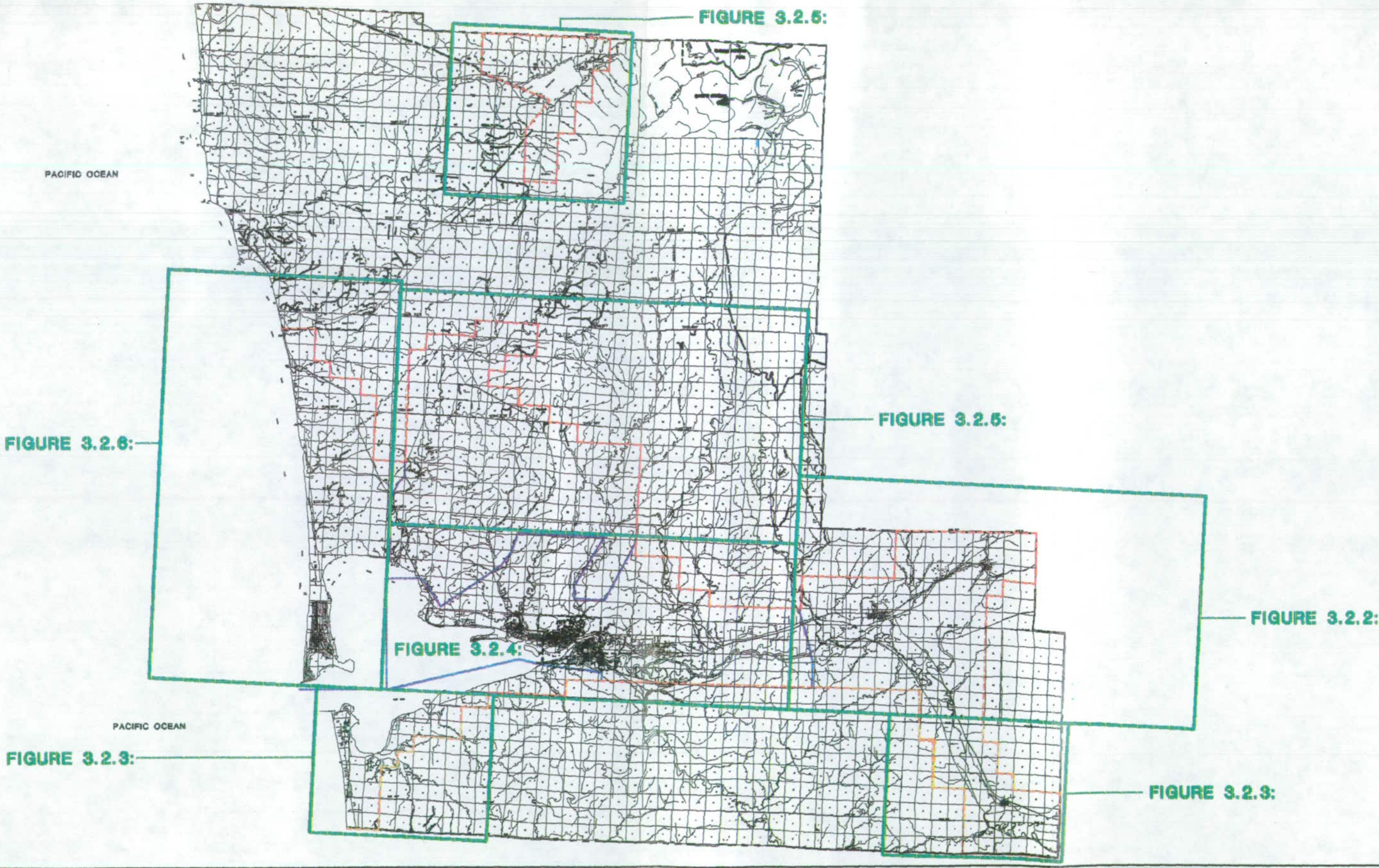
The responsibility for regulating public water systems and establishing procedures for new developments, as well as the creation of new water systems is shared by the Grays Harbor County Health Department and Washington State Department of Health.

The supply capability of the Class 1 water utilities is anticipated to provide the greatest opportunity for meeting future demands within the study area. With the exception of Aberdeen and Hoquiam, all other Class 1 utilities use groundwater as their source of supply. The majority of Hoquiam's water comes from a water treatment plant using raw water from the Hoquiam River. After complete filtration and disinfection, water is provided to City customers. The City of Aberdeen has a separate potable and industrial supply source. The potable supply comes from the Wishkah River. Water from the Wishkah River is disinfected and flows by gravity into the City where it is used by residents, as well as its commercial and industrial customers. Quantities of water from the supply are generally limited to a maximum of 11 MGD due to constraints in the transmission piping system. Aberdeen also has a separate industrial supply system, which brings untreated water from the Wynoochee River. Contracted users of the industrial water include: ITT Rayonier in Hoquiam; Weyerhauser in Cosmopolis; the Washington Public Power Supply System; and the Washington Department of Game fish hatchery.

3.2.3 Water Demands

A comparison of existing and future demands with the installed capacity of existing Class 1 and Class 2 water utilities was conducted to evaluate the existing ability to meet future potable and industrial demands within the study area. Population estimates for the study area have already been summarized in Section 3.1. The water system plan redistributed those population figures based upon census records, the utility questionnaire and WFI records. For each sub-area, the historical population and projections to the year 2010 are presented in Table 3.2.1 for all Class 1 systems as well as "other unincorporated" areas of the sub-area. Figure 3.2.1 to Figure 3.2.6 illustrate the service area of Class 1 systems and the number of Class 2, 3, and 4 systems by section throughout the study area.

Table 3.2.2 compares the installed capacities with projected demands for potable water supply within each sub-area. Current average daily per capita consumption rates are identified on this table based upon input from the utility questionnaires or the WFI data. Where information was lacking, per capita rates were assumed based upon consumption values established for similarly sized and located utilities. The consumption rates range from 129 gallons per capita per day (gpcd) to a high of approximately 325 gpcd in the Cities of Aberdeen and Westport where larger commercial, industrial and recreational activities occur. These values are based on production records and therefore include system losses in the calculation. Average daily per capita consumption rates were used in conjunction with projected population figures in Table 3.2.1 to forecast average daily demands in the year 2000 and 2010. Peak day consumption was estimated using a peaking factor of either 1.5, 2.5 or 3.0. A peaking factor of 1.5 was assumed for the Cities of Aberdeen and Hoquiam. Montesano, Elma, McCleary, and Oakville were assigned peaking factors of 2.5. All other systems were assumed to have a higher fluctuation in seasonal and residential consumption patterns and used a 3.0 peaking factor. It should be noted that demands identified for "other unincorporated" include unincorporated areas of the County which are served by smaller public water systems as well as individual wells.



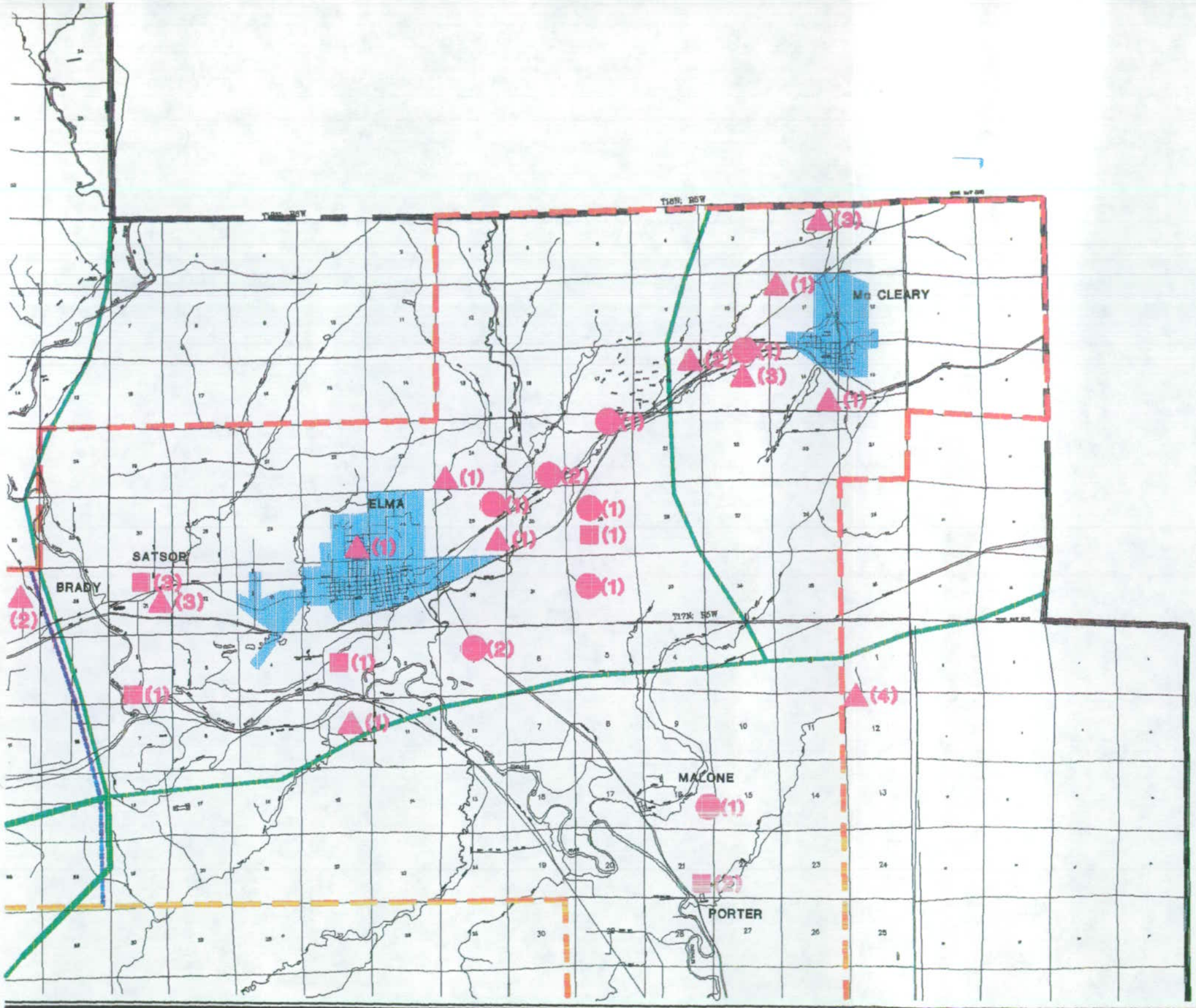
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Legend

- STUDY AREA BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY
- PAGE BORDERS

Figure 3.2.1: Index for Water Service Maps



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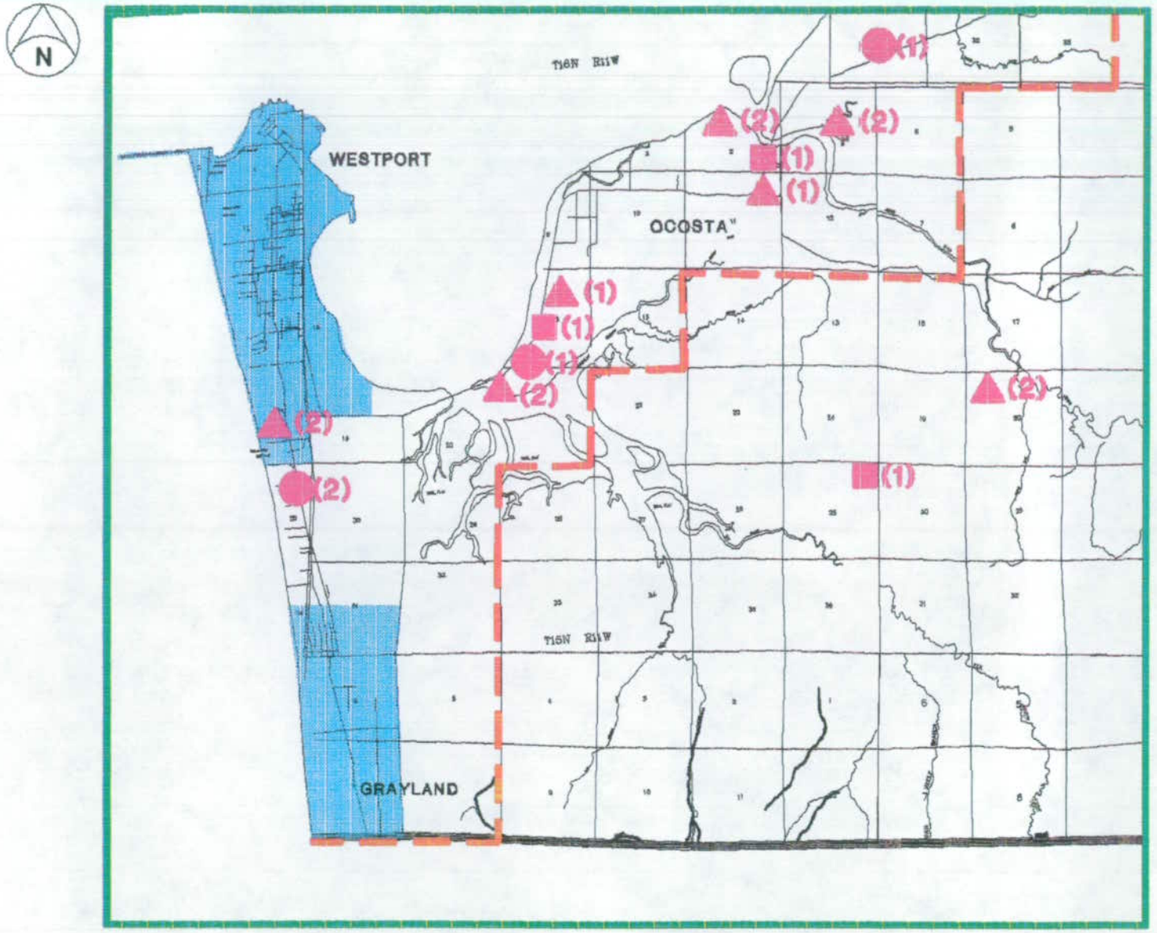
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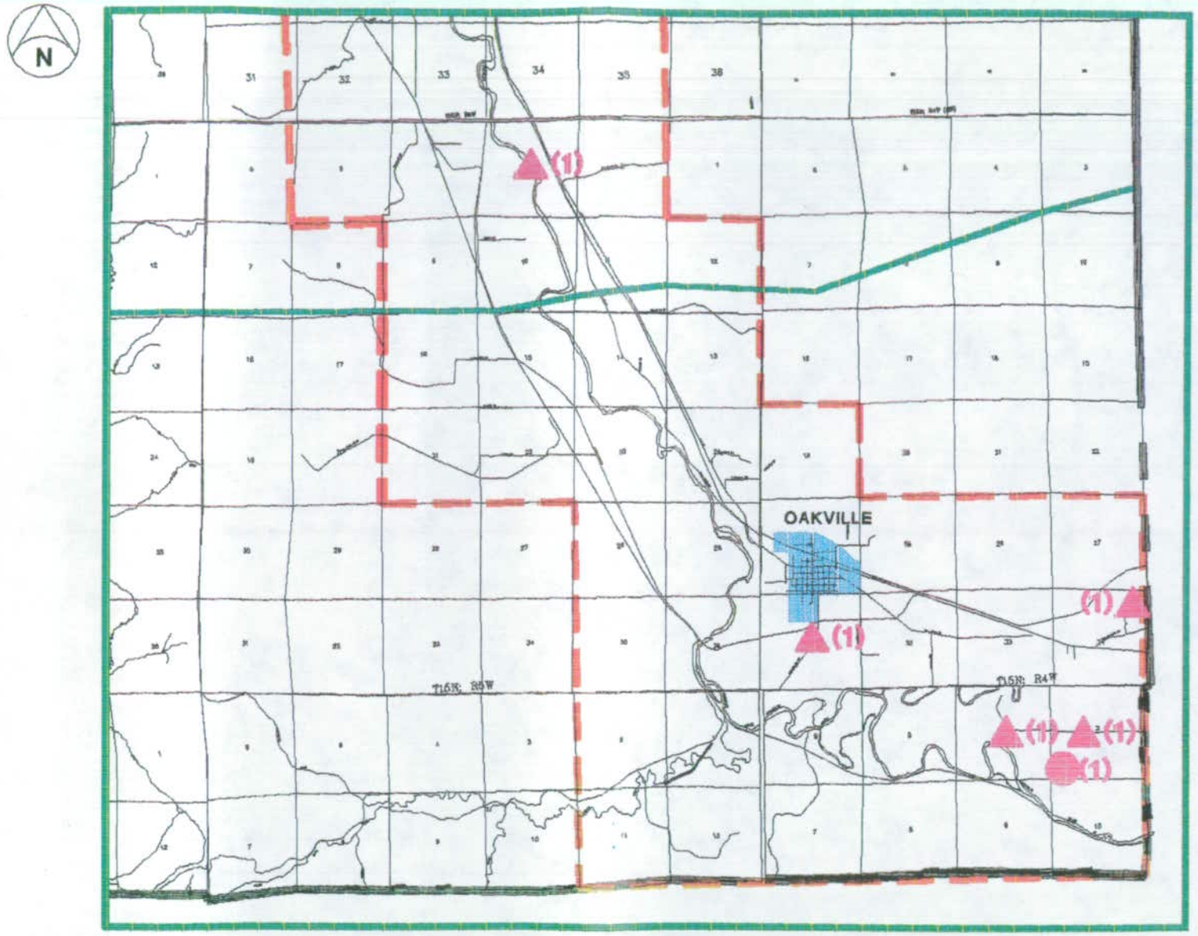
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- STUDY AREA BOUNDARY
- CLASS I
- (0) CLASS II
- (0) CLASS III
- (0) CLASS IV
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDT AREA BOUNDARY

Figure 3.2.2: Water Service Map East County Sub-Area



SOUTH BEACH



EAST COUNTY

FILE: 323 JOB: 11-1558-02

Legend

- STUDY AREA BOUNDARY
- CLASS I
- (0) CLASS II
- (0) CLASS III
- (0) CLASS IV
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

0 4500 9000
SCALE IN FEET

Figure 3.2.3: Water Service Map East County and South Beach Sub-Areas

NORTH CENTRAL COUNTY

CENTRAL COUNTY

SOUTH BEACH

T16N R11W

HOQUIAM

ABERDEEN

COSMOPOLIS

CENTRAL PARK

MONTESANO

(1)

(2)

(3)

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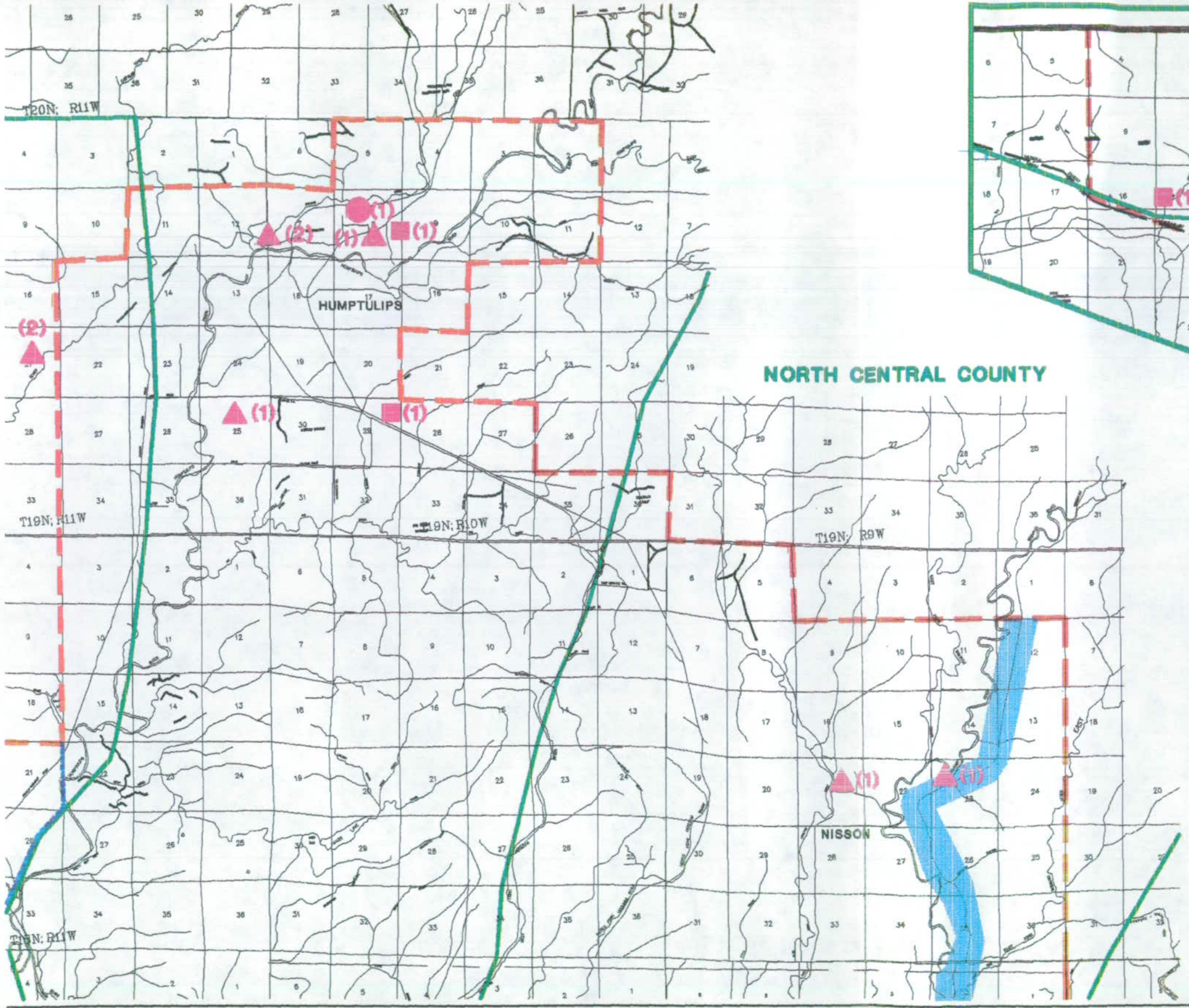
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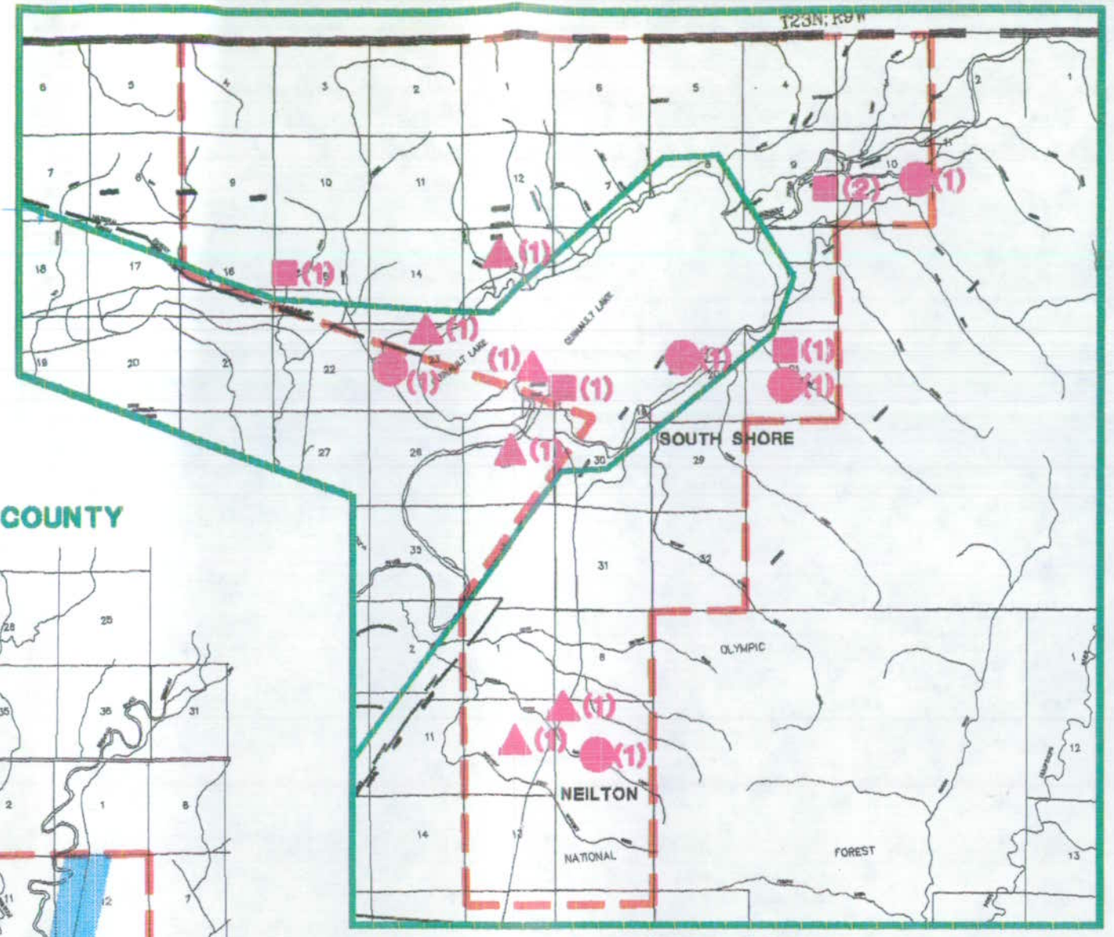
Legend

- STUDY AREA BOUNDARY
- CLASS I
- (0) CLASS II
- (0) CLASS III
- (0) CLASS IV
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

Figure 3.2.4: Water Service Map North Central County, Central County and South Beach Sub-Areas

NORTH CENTRAL COUNTY





NORTH COUNTY

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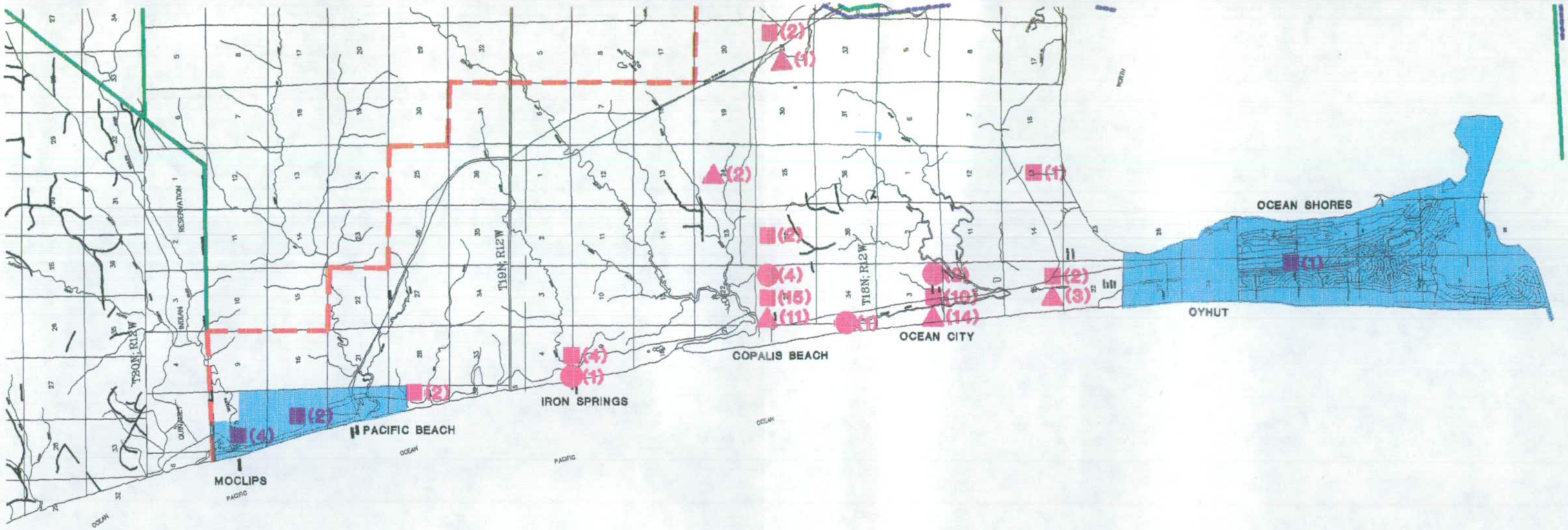
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0 4500 9000
SCALE IN FEET

Legend

- STUDY AREA BOUNDARY
- CLASS I
- (0) CLASS II
- (0) CLASS III
- (0) CLASS IV
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

Figure 3.2.5: Water Service Map North Central County and North County Sub-Areas



FILE: 326 JOB: 11-1558-02

N

0 4500 9000
SCALE IN FEET

Legend

- STUDY AREA BOUNDARY
- CLASS I
- (0) CLASS II
- (0) CLASS III
- (0) CLASS IV
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

Figure 3.2.6: Water Service Map North Beach Sub-Area

TABLE 3.2.1

GRAYS HARBOR COMPREHENSIVE WATER PLAN
POPULATION PROJECTIONS 1960 - 2010[1]

	1960	1970	1980	1990	2000	2010
CENTRAL						
Aberdeen	18,741	18,489	18,739	17,050	16,542	16,050
Cosmopolis	1,312	1,599	1,575	1,545	1,639	1,739
Hoquiam	10,762	10,466	9,719	9,020	8,504	8,018
Montesano	2,486	2,847	3,247	3,270	3,598	3,959
Grays Harbor W D #2[3]				3,600	4,075	4,554
Other Unincorporated[2]	1,482	1,724	6,693	2,345	2,657	2,965
TOTAL	34,783	35,125	39,973	36,830	37,015	37,285
EAST COUNTY						
Elma	1,811	2,227	2,720	2,420	2,683	2,975
McCleary	1,115	1,265	1,419	1,515	1,683	1,870
Oakville	377	460	537	580	671	777
Other Unincorporated[2]	3,614	3,836	5,600	6,893	8,857	10,531
TOTAL	6,917	7,788	10,276	11,408	13,894	16,153
NORTH BEACH						
Illahee - Oyehut[3]				320	386	452
Ocean Shores			1,777	2,262	4,025	7,162
Grays Harbor W D #7[3]				999	1,204	1,411
Other Unincorporated[2]	2,314	3,221	2,424	703	848	993
TOTAL				4,284	6,463	10,018
SOUTH BEACH						
Westport	976	1,364	1,954	1,935	2,475	3,166
Grays Harbor W D #1[3]				1,500	1,740	1,980
Other Unincorporated[2]	959	1,513	2,264	595	690	785
TOTAL				4,030	4,905	5,931
NORTH CENTRAL						
Other Unincorporated[2]	3,075	3,230	2,587	2,558	2,554	2,552
NORTH						
Other Unincorporated[2]	626	862	966	671	576	482

Footnotes:

(1) Population for the unincorporated cities from "Historic and Projected Population Grays Harbor County" by Grays Harbor Regional Planning

(2) Utilizing census tract data assuming percentage of tracts that lie within study area boundaries

Census Tract	% in Study Area
McCleary	95%
Elma	95%
Malone	85%
Oakville	95%
Wynoochee	50%
North River	10%
South Beach	95%
Aberdeen/Hoquiam	100%
Wishkah	90%
Humptulips	90%
Lake Quinault	95%
Quinault	0%
North Beach	95%

Also GHWD #1, #2, #7, and Illahee populations have been subtracted out.

(3) 1990 population from Water Facilities Inventory, DOH and projections 2000 and 2010 at growth rate of unincorporatrated areas.

TABLE 3.2.2
GRAYS HARBOR COMPREHENSIVE WATER PLAN
POTABLE WATER SOURCE/DEMAND COMPARISON

	DEMAND							SOURCE		STORAGE		
	Per Capita (1) (gpcd)	1990 Ave (2) (mgd)	1990 Peak Day (3) (mgd)	2000 Ave (4) (mgd)	2000 Peak Day (3) (mgd)	2010 Ave (4) (mgd)	2010 Peak Day (3) (mgd)	Installed Capacity (5) (mgd)	2000 Peak Day Exc/Def (mgd)	1990 Capacity (7) (mg)	2000 Required (8) (mg)	2000 Excess/ Defic. (mg)
CENTRAL												
Aberdeen[6]	323	5.50	13.75	5.34	13.34	5.18	12.94	11.09	(9)	25.85	16.30	9.55
Cosmopolis	129	0.20	0.60	0.21	0.63	0.22	0.67	0.00	-0.63	**	0.85	-0.85
Hoquiam	195	1.76	4.40	1.66	4.15	1.56	3.91	8.06	3.91	15.71	5.73	9.98
Montesano	129	0.42	1.05	0.46	1.16	0.51	1.28	3.20	2.04	1.50	1.45	0.05
Grays Harbor W.D. #2	129	0.46	1.39	0.52	1.57	0.59	1.76	4.46	2.89	0.35	1.99	-1.58
Other Unincorporated	129	0.30	0.91	0.34	1.03	0.38	1.15	0.04	-0.99	**	1.30	-1.30
TOTAL		8.65	22.10	8.54	21.88	8.45	21.71	26.85	7.21	43.41	27.57	15.84
EAST COUNTY												
Elma	142	0.34	0.86	0.38	0.95	0.42	1.06	3.82	2.87	1.5	1.22	0.28
McCleary	142	0.22	0.54	0.24	0.60	0.27	0.66	1.30	0.70	0.65	0.81	-0.16
Oakville	142	0.08	0.21	0.10	0.24	0.11	0.28	0.43	0.19	0.15	0.39	-0.24
Other Unincorporated	129	0.89	2.67	1.14	3.43	1.36	4.08	0.16	-3.27	**	4.06	-4.06
TOTAL		1.53	4.27	1.86	5.22	2.16	6.07	5.71	0.50	2.30	6.48	-4.18
NORTH BEACH												
Hoh Indian - Oyehut	129	0.04	0.12	0.05	0.15	0.06	0.17	0.00	-0.15	**	0.29	-0.29
Ocean Shores	129	0.29	0.88	0.52	1.56	0.92	2.77	1.60	0.04	**	1.91	-1.91
Grays Harbor W.D. #7	129	0.13	0.39	0.16	0.47	0.18	0.55	0.92	0.45	0.04	0.66	-0.62
Other Unincorporated	129	0.09	0.27	0.11	0.33	0.13	0.38	0.12	-0.21	**	0.50	-0.50
TOTAL		0.55	1.66	0.83	2.50	1.29	3.88	2.64	0.14	0.04	3.36	-3.32
SOUTH BEACH												
Westport	328	0.64	1.91	0.81	2.44	1.04	3.12	2.30	(9)	2.10	2.92	-0.82
Grays Harbor W.D. #1	129	0.19	0.58	0.22	0.67	0.26	0.77	0.60	-0.07	**	0.89	-0.89
Other Unincorporated	129	0.08	0.23	0.09	0.27	0.10	0.30	0.03	-0.23	**	0.43	-0.43
TOTAL		0.91	2.72	1.13	3.38	1.40	4.19	2.93	-0.31	2.10	4.24	-2.14
NORTH CENTRAL												
Other Unincorporated	129	0.33	0.99	0.33	0.99	0.33	0.99	0.02	-0.97	**	3.53	-3.53
NORTH												
Other Unincorporated	129	0.09	0.26	0.07	0.22	0.06	0.19	0.04	-0.18	**	0.89	-0.89

Footnotes:

(1) Per capita demand for Aberdeen, Hoquiam, GHWD #2, McCleary, and Westport calculated with 1990 demands supplied by the utility and population from Table 3.2.1.
Per capita demands for Elma and Oakville assumed to be similar to McCleary.
All other systems per capita demand assumed to be 129 gallons per capita per day (gpcd).

(2) Average Day 1990 demands for Aberdeen, Hoquiam, GHWD #7, McCleary, and Westport as reported by the utility.
For the other systems, per capita demand and population data (Table 3.2.1) were used to estimate the average day 1990 demand.

(3) Peak to average day usage factors are assumed to be:
2.5 Aberdeen, Hoquiam, Montesano, Elma, McCleary, and Oakville; 3.0 for all others

(4) Demands for 2000 and 2010 based on population projections (Table 3.2.1) and respective per capita demand.

(5) Source capacities were reported by Aberdeen, Hoquiam, GHWD #7, McCleary, Elma, and Westport. Zero represents purchased water. Other purveyors are noted as reported in the WFI by DOH. Installed source capacity for "other unincorporated" equals the 1990 peak day usage estimate but does not imply adequate reliability of all Class II, III, IV, or private wells.

(6) Aberdeen source capacity:
Wishkah for Municipal & Industrial - 11 mgd (transmission limiting factor)
Wynoochee for Industrial only - (see water rights report)

(7) Storage capacity 1990 supplied by the purveyor.

** not available

(8) Storage required 2000 is [peak day + (0.15 * peak day + fire flow)]. Fire flow assumed to be 4,000 gpm for 4 hours in Hoquiam and Aberdeen and 1,000 gpm for 2 hours for other purveyors.

(9) Peak Day demands in excess of installed capacity can be met from distribution storage.

The installed source capacities of the Class 1 utilities and "other unincorporated" areas are compared on Table 3.2.2 with the year 2000 peak day demands. The table indicates whether existing source capacity exceeds or is deficit for peak day requirements in the year 2000. It should be noted that the source capacity listed for "other unincorporated areas" is assumed to equal current peak day demands. The study has not been able to establish the reliability of these existing sources or their additional unused capacity beyond 1990 established demands. Only the South Beach planning area shows an overall deficit by the year 2000. However, it should be noted that this deficit may be mitigated by the availability of water from other Class 2 or smaller systems, or from individual wells. A summary of Class II system capacities through the study area is summarized in Table 3.2.3.

Table 3.2.2 also provides a comparison of existing installed distribution storage capacity with demands anticipated in the year 2000. These storage demands are based upon a projected peak day, plus equalizing requirements, plus fire-flow storage requirements. The table also identifies by system and planning area whether excess or deficient storage capacities exist in the year 2000. Under this comparison it appears that all sub-areas, except for the central, will be deficient in storage by the year 2000. This may be mitigated for systems meeting the DOH criteria for reliable power supplies coupled with multiple wells. Under these circumstances, the combined pumping capacity of all but the largest well may be considered as supplemental storage.

A projection of industrial lands was provided from the industrial land study conducted throughout the County. Total acreage is shown on Table 3.2.4 for the proposed sites. Sites for potential industrial development are limited to the East County, Central and South Beach areas. A projection of potential water demands was made based upon water usage patterns in two industrial park areas within the State of Washington. A range of 1,000 to 3,000 gallons per acre, per day was used to project industrial demands. Total potential industrial usage was projected from this range of demands. No attempt was made to estimate when these industrial demands would occur. The industrial lands study identified individual parcels of land with the potential for industrial classification and use. If the industrial lands study recommendations were implemented, actual land use may vary from an actual "industrial park" use.

A summary of the source requirements in the year 2000 and 2010 for both potable and industrial demands, as projected in Tables 3.2.2 and 3.2.4, was compared to existing installed capacities on Table 3.2.5. All three sub-areas anticipating industrial expansion indicate a deficit of supply by the year 2000 ranging from 0.89 MGD to 3.35 MGD. These figures indicate that additional supply capabilities will need to be developed if industrial development occurs to its maximum potential.

The accuracy of the supply deficiencies shown in Table 3.2.5 are heavily influenced by various assumptions made in the projections as well as the following issues affecting industrial development. The actual implementation of the Industrial Lands Study both in terms of schedule and industrial sites will greatly influence the supply requirements. Phased industrial development will postpone demands. The type of industrial user and encouragement of "dry

TABLE 3.2.3
GRAYS HARBOR COMPREHENSIVE WATER PLAN
CLASS II SYSTEM CAPACITIES[1]

	Capacity	
	(GPM)	(MGD)
CENTRAL		
Country Estates	81	0.016
Crawford Trailer Park	25	0.005
Monte View Water Co.	80	0.015
TOTAL	186	0.036
EAST COUNTY		
Chehalis Tribal Housing	73	0.014
Malone Water Dept.		0.000
Evergreen Village	50	0.010
Greenwood Mobile Home Park	90	0.017
Pit Water Co.	102	0.020
Forrest View Mobile Home Park	264	0.051
Whites Water System		0.000
Meadowood Development	190	0.037
R L 's Water System #1	45	0.009
Viking West Mobile Home		0.000
Oak Ridge Golf Course	20	0.004
TOTAL	834	0.161
NORTH BEACH		
Ocean City Water Works		0.000
Phelps Water System	25	0.005
Iron Springs Park	150	0.029
Paradise Water Assn	30	0.006
Lindberg, M Water		0.000
Aloha Heights Water	100	0.019
Haven by the Sea	75	0.014
Sea View Estates	250	0.048
TOTAL	630	0.121
SOUTH BEACH		
Wildwood Village		0.000
Bay City Prop Water Assn	80	0.015
Surfside Resort		0.000
Wind Sand Estates	10	0.002
Harbor Homes	60	0.012
Rustemeyer Mobile Home Park	20	0.004
TOTAL	170	0.033
NORTH CENTRAL		
Potter, Joyce	82	0.016
NORTH		
Neilton Cooperative Water Co.		0.000
Quinault Norwood	27	0.005
Quinault Water Company	190	0.037
Falls View Trailer Court		0.000
Olympic Trailer Park		0.000
TOTAL	217	0.042

Footnote:
[1] Reported in Department of Health Water Facilities Inventory (WFI) form.

TABLE 3.2.4 GRAYS HARBOR COMPREHENSIVE WATER PLAN ZONED INDUSTRIAL DEMANDS			
	Industrial (1) (acres)	Low Demand (2) 1,000 g/acd (mgd)	High Demand (2) 3,000 g/acd (mgd)
EAST COUNTY	1,297	1.30	3.89
CENTRAL	4,048	4.05	12.14
SOUTH BEACH	667	0.67	2.00

Footnotes:
(1) Acreage data is from the Industrial Lands Study, May 1989
(2) Demand values estimated on studies conducted for industrial activities.
g/acd = gallons per acre per day

process" industries will lessen supply requirements. The current study identifies parcels of land scattered through the study area rather than "industrial parks". Wide dispersement of industrial sites may make it less likely to take advantage of a common supply system. For the Central planning area, the supply capacity of the City of Aberdeen's separate Wynoochee River industrial transmission line has not been included. This is a significant source of water which already has a water right and may adequately address the needs of developing industries. This supply may provide a cost effective solution if "industrial park" settings are pursued and if industry water quality requirements for potable and industrial use can be met.

3.2.4 Problem Identification

The analysis conducted by the water system plan has focused upon three major issues: water quantity, water quality, and utility management.

Water Quantity. A more detailed comparison of supply alternatives is presented in Section 3.2.5. In general the South Beach sub-area experiences the most problems and uncertainty with adequate water supplies. A better understanding of the existing aquifer and its characterization are needed in the South Beach area. Currently, a study is being initiated by the City of Westport, with assistance from the County, to identify and understand the aquifer systems within that South Beach area. This may lead to a well head protection program and defined management procedures for the aquifer systems within this area.

Water Quality. There are sporadic water quality problems throughout the County, however, most of these pertain to non-health-related issues. Specifically iron and magnesium concentrations within the groundwater are prevalent in many locations. There do not appear to

TABLE 3.2.5
GRAYS HARBOR COMPREHENSIVE WATER PLAN
SOURCE REQUIREMENT SUMMARY

	2000	2010
CENTRAL		
Potable Demand[1]	14.87	14.95
Industrial Demand[2]	12.14	12.14
Subtotal	27.01	27.09
Total Source[3]	23.66	23.66
Excess/Defic	-3.35	-3.43
EAST COUNTY		
Potable Demand[1]	5.22	6.07
Industrial Demand[2]	3.89	3.89
Subtotal	9.11	9.96
Total Source[3]	8.22	8.22
Excess/Defic	-0.89	-0.89
NORTH BEACH		
Potable Demand[1]	2.50	3.88
Industrial Demand[2]	0.00	0.00
Subtotal	2.50	3.88
Total Source[3]	2.79	2.79
Excess/Defic	-0.29	-0.29
SOUTH BEACH		
Potable Demand[1]	3.38	4.19
Industrial Demand[2]	2.00	2.00
Subtotal	5.38	6.19
Total Source[3]	3.13	3.13
Excess/Defic	-2.25	-2.25
NORTH CENTRAL		
Potable Demand[1]	0.99	0.99
Industrial Demand[2]	0.00	0.00
Subtotal	0.99	0.99
Total Source[3]	0.99	0.99
Excess/Defic	0.00	0.00
NORTH		
Potable Demand[1]	0.22	0.19
Industrial Demand[2]	0.00	0.00
Subtotal	0.22	0.19
Total Source[3]	0.26	0.26
Excess/Defic	0.04	0.07

Footnotes:
(1) Based on Table 3.2.2 Peak Day Demands
(2) Based on 3,000 gal/acre/day (g/acd) demand in Table 4
(3) Based on Table 3.2.2 Installed Source Capacity

be areas with trends of significantly elevated nitrates or saltwater intrusion. The North Beach area has water quality concerns that are significant. Growth within the North Beach area has resulted in utilization of many shallow aquifer systems. These systems are subject to iron and magnesium contamination, as well as potential contamination from on-site waste disposal and other land use activities which are transmitted rapidly to the shallow water table aquifers.

Recent revisions to the Federal Safe Drinking Water Act (SDWA) require filtration of unprotected surface water supplies which do not meet specific finished water criteria. This legislation is especially significant to many of the smaller water utilities using stream/spring or surface water without proper filtration and treatment. The City of Aberdeen is currently evaluating its supply system to establish conformance with the SDWA. Surface water treatment costs must be anticipated for the development of any new potable surface water supplies. Industrial water quality requirements will be site-specific and, with the exception of potable usage, may have lower quality requirements.

Utility Management. Management of small water utilities has been a particular problem within the North and South Beach area of Grays Harbor County. Due to the lack of proper training and certification there is a preponderance of small, poorly managed systems. This has resulted in concerns both for public health and system reliability. This causes particular concern regarding likelihood of a sustained level of satisfactory service. Past practices frequently allowed the approval of entire developments before the water system was installed. The number of building permits, however, was limited to the approved capacity of the water system. This frequently resulted in phased construction of water systems whose ownership was transferred to the landowners. The developer occasionally would not finance and install the total number of facilities needed for ultimate buildout of the development. This created incomplete, unfunded, non-municipally owned water systems. Non-municipally owned water systems typically are not eligible for loans, grants, and bond programs needed to make capital improvements. The financial viability of these systems usually lacks adequate planning, budgeting or reserve funds for emergency conditions.

3.2.5 Alternatives

3.2.5.1 Supply Alternatives

In order to formulate supply alternatives for each of the planning areas, a hydrogeologist reviewed groundwater supplies throughout the County. A copy of the hydrogeologic summary report is included as Appendix A. In this analysis, generalizations of aquifer characteristics in regard to quantity, quality and location are made based upon a review of approximately 2,500 well logs and drilling reports as well as personal inspections of approximately 280 wells. Table 3.2.6, coupled with Figures 3.2.7 through 3.2.12, summarizes the current understanding of aquifer systems within the planning area. These figures show the major water-bearing areas, illustrate specific local aquifer locations if known and outline bedrock areas with hatched symbols. The areas shown in these figures as undefined aquifers are those locations where it is understood that groundwater is present. There is currently, however, no information

concerning the quantity and quality of water in these areas. Table 3.2.6 evaluates each major hydrogeologic area within the planning sub-areas. A description is provided of the probable depths at which aquifers will be encountered, a range of potential well yield, a generalized statement of the water quality within each area, an estimate of the risk of drilling a well which would not yield production within the estimated well yield, an indication that aquifer withdrawals would not establish a long-term decline in static water level, and an assessment of the probability of obtaining additional water rights within these areas.

In the East planning area, peripheral bedrock areas outside the Chehalis River Valley are generally poorly suited for large capacity wells. Large producing wells within the Chehalis River Valley area are available with generally good water quality. Exceptions may occur along bedrock areas where iron and manganese may be encountered. Within the McCleary area, additional studies are necessary to establish specific aquifer yields; however, water quality appears to be good except for iron encountered occasionally in shallow wells. Potential water rights conflicts exist throughout the Chehalis River Valley area for the development of new groundwater supplies where groundwater/surface water continuity occurs. As explained in Section 3.2.5.3, prior surface water rights are protected from interference caused by subsequent groundwater development. The Department of Ecology (Ecology) has already established "base flow" regulations for the Chehalis River. Currently, however, Ecology's criteria to establish continuity and enforce denial of groundwater development applications is unclear.

For the Central area the same conditions exist for peripheral bedrock as shown on the attached figures. The Montesano-Central Park area has moderate yields with fair water quality. The Chehalis and Wynoochee Valleys, along with the North Bay Uplands, have potential for significant well yields. Water quality is generally good except where iron and manganese are encountered along the valley edges and in bedrock. The proximity of well development to the Chehalis and Wynoochee River is again questionable due to groundwater/surface water continuity.

Additional information is needed for the Grayland-Westport area regarding availability of groundwater. The ongoing study by Westport will add to limited aquifer characterization information. It appears that upper and lower aquifers of significance exist. Water quality is generally fair, with iron and manganese concentrations again being the problem most frequently encountered.

In the North Beach area, upper and lower aquifers generally exist from Ocean Shores to Pacific Beach. Iron and manganese are prevalent throughout both aquifer systems with additional color generally encountered in the shallower aquifer. Well yields from both the upper and lower aquifer are significant. Wells developed from the lower aquifer systems have ranged up to 1,500 gallons per minute with sustained production. The City of Ocean Shores has developed large producing wells in the lower aquifer system which have been used for some time with no indication of saltwater intrusion.

The North Central area yields are generally small but adequate for projected use. Iron is encountered near peripheral bedrock and in shallow depths in the stream valleys.

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TABLE 3.2.6

GRAYS HARBOR COUNTY GROUNDWATER SUPPLIES[1]

Hydrogeologic Area	Well Depths	Well Yield	Water Quality(4)	Drilling Risk[2]	Aquifer Safe Yield[3]	Water Rights
EAST COUNTY						
McCleary	50 - 175'	50 - 150 gpm	Good Fe - shallow wells	<10%	Study required	Generally good Wildcat Creek - continuity
Chehalis Valley	50 - 175'	100 - 1,000+ gpm	Good Fe - along valley bedrock	Low	Significant	Limited - due to continuity
Peripheral Bedrock		2 - 20 gpm	Poor Fe & Mn	High	Limited	Good
CENTRAL						
Montesano - Central Park	30 - 100'	2 - 200 gpm	Fair	25% for > 25 gpm	Good	Good
Chehalis Valley	75 - 200'	100 - 1,000+ gpm	Good - Satsop to east Good - Satsop to west Poor - Fe & Mn along valley edge	Low	Significant	Limited - due to continuity
Wynoochee Valley	30 - 75'	50 - 200 gpm	Good - Valley alluvium Poor - Fe & Mn in bedrock	<10% - Valley >50% - Valley edge	Significant	Limited - due to continuity
North Bay Uplands	100 - 400'	50 - 500+ gpm	Good Fe & Mn - occasionally	<10%	Good	Good
Peripheral Bedrock		2 - 20 gpm	Poor Fe & Mn	High	Limited	Good
SOUTH BEACH						
Cosmopolis	50 - 300'	25 - 200 gpm	Fair - Good Fe - occasionally	<10%	Good	Good
Grayland	Upper 40 - 100' Lower 100 - 300+	25 - 150 gpm 25 - 300+ gpm	Good - occasionally	Low 50%	Good Study required	Good Good

TABLE 3.2.6

GRAYS HARBOR COUNTY GROUNDWATER SUPPLIES[1]

Hydrogeologic Area	Well Depths	Well Yield	Water Quality(4)	Drilling Risk[2]	Aquifer Safe Yield[3]	Water Rights
NORTH BEACH						
Ocean Shores	Upper 80 - 90' Lower 520'+	200 - 300 gpm 500 - 1,500 gpm	Poor - Fe & color Poor - Fe & Mn	Low Low	Good Good	Good Good
Hogan's Corner (Moclips)	Upper 40 - 100' Lower 75 - 400'	50 - 100 gpm 20 - 300+ gpm	Poor - Fe, Mn, color Poor - Fe, Mn	Low <20%	Good Good	Good Good
NORTH CENTRAL						
Humptulips Floodplain	50 - 100'	50 - 200+ gpm	Good	Low	Significant	Limited - due to continuity
Chenois Creek Uplands	100 - 300'	25 - 200+ gpm	Good Fe - near perimeter and shallow depths in stream valley	<10% for less than 50 gpm	Study required	Good
Peripheral Bedrock		2 - 20 gpm	Poor Fe & Mn	High	Limited	Good
NORTH						
Upper Valley	30 - 100'	50 - 300+ gpm	Poor - Fe & Mn	Low	Study required	Limited - due to continuity
North Lake	50 - 250'	20 - 100+ gpm	Good Fe & Mn - near bedrock	Low	Study required	Fair
South Lake & 101 Corridor	40 - 200'	50 - 200+ gpm	Good Fe & Mn - near bedrock	Low	Study required	Fair
Peripheral Bedrock		2 - 20 gpm	Poor	High	Limited	Good

Footnotes:

(1) Source - Richard Rongez, hydrogeologist. Review of approximately 2,500 well logs and drilling reports and field inspections of approximately 280 wells in Grays Harbor County.

(2) Risk of new well being less than that specified for range of well yields.

(3) Annual withdrawals can be conducted within range of well yields without a long-term trend in static water level decline.

(4) Fe = Iron; Mn = Manganese

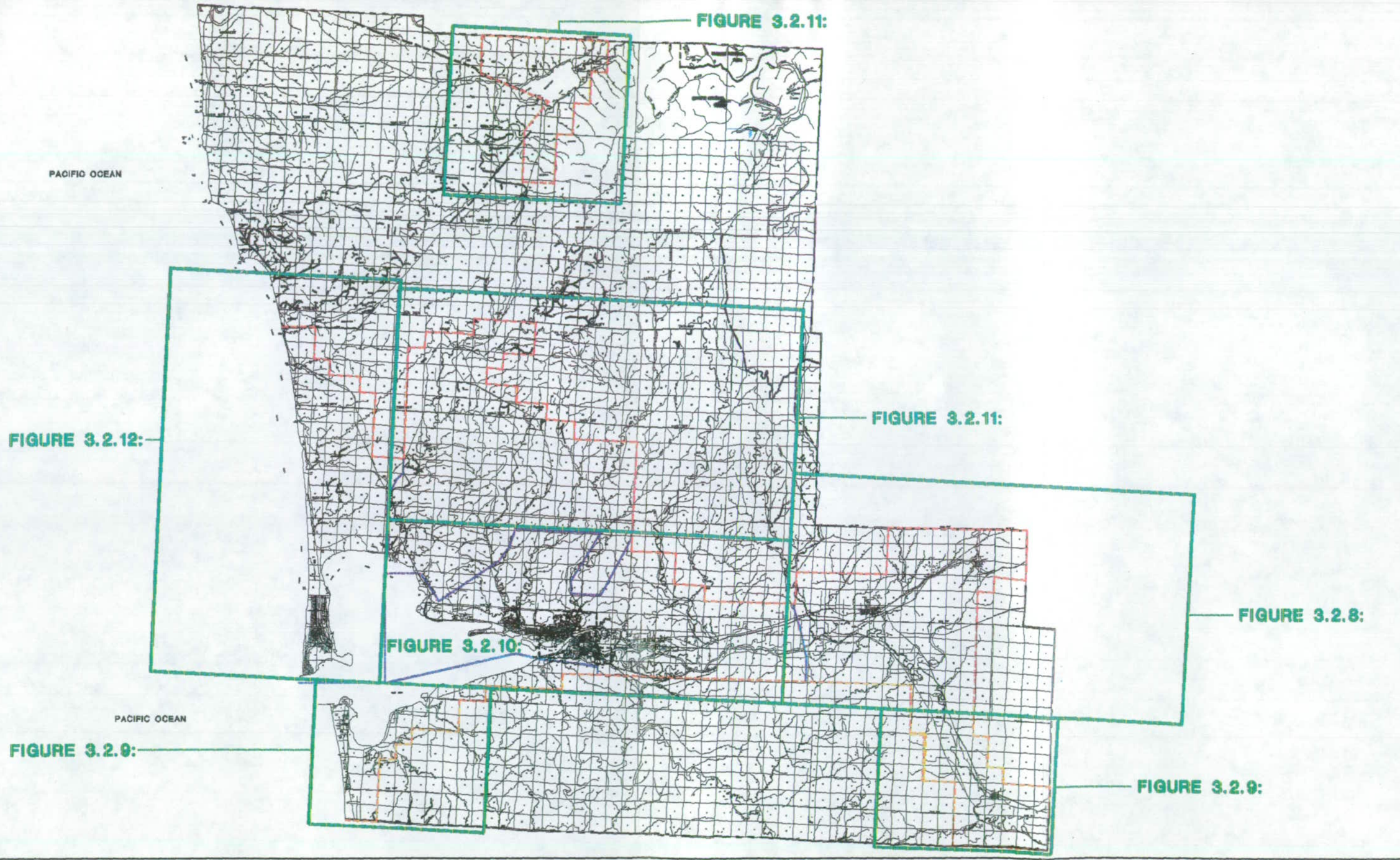
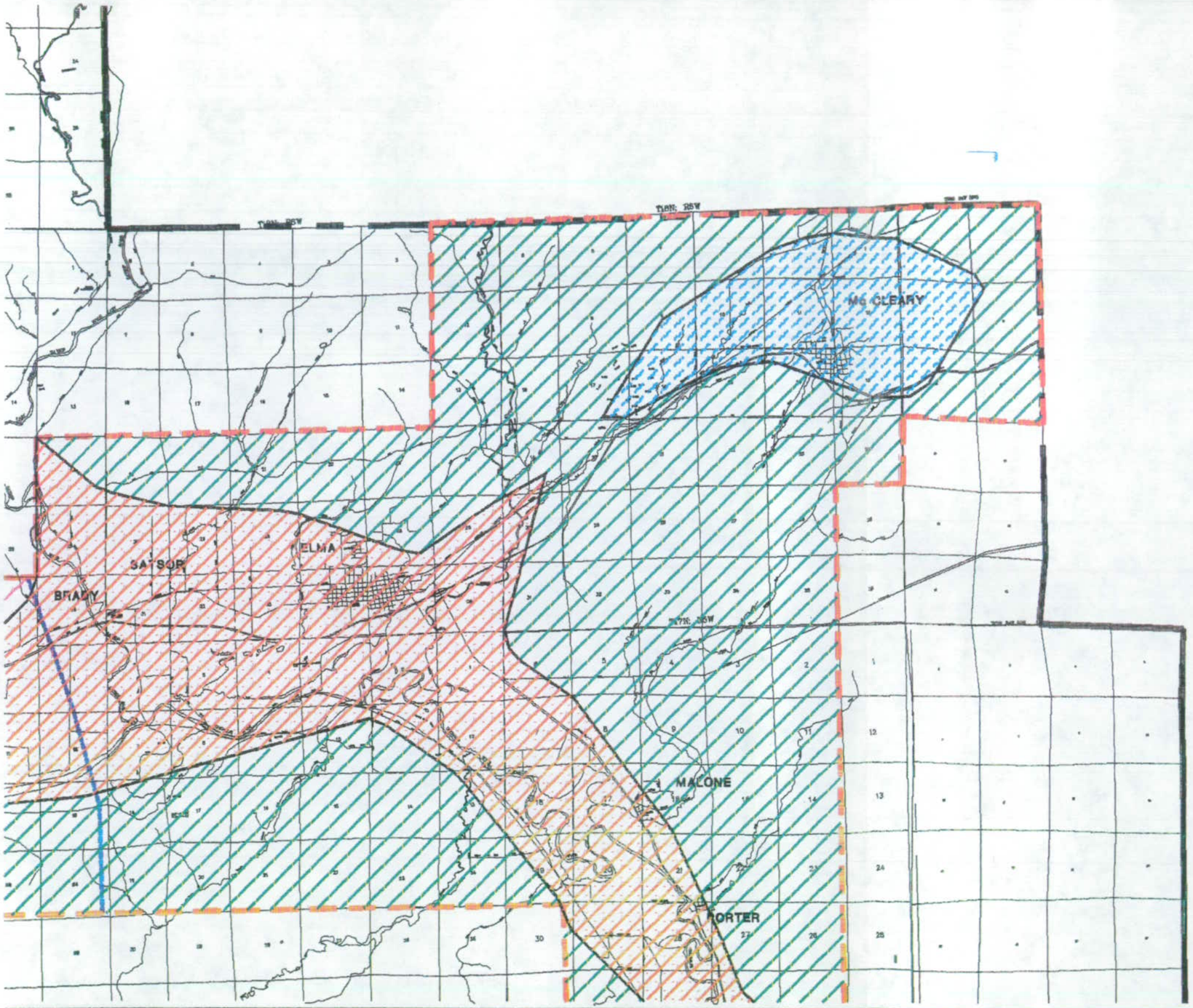


Figure 3.2.7: Index for Groundwater Availability Maps



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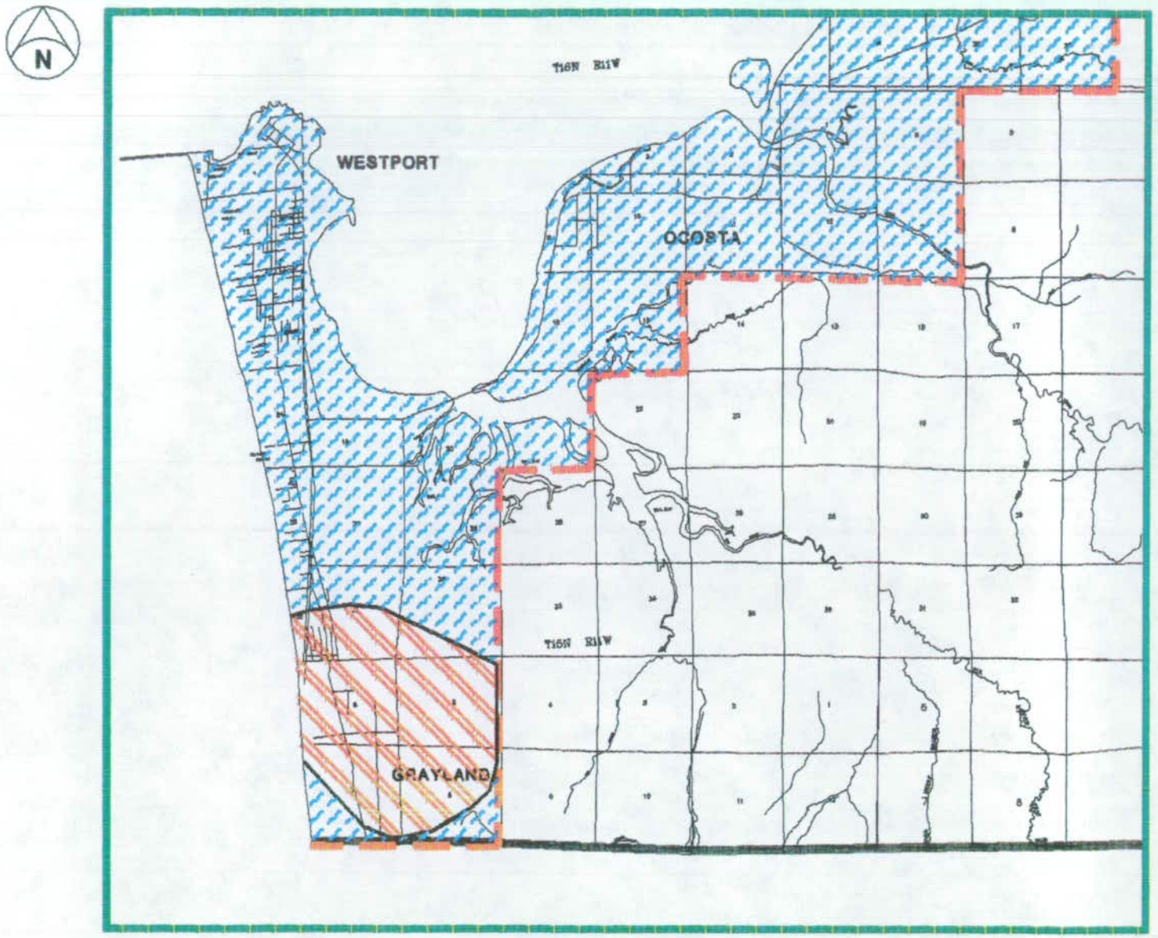
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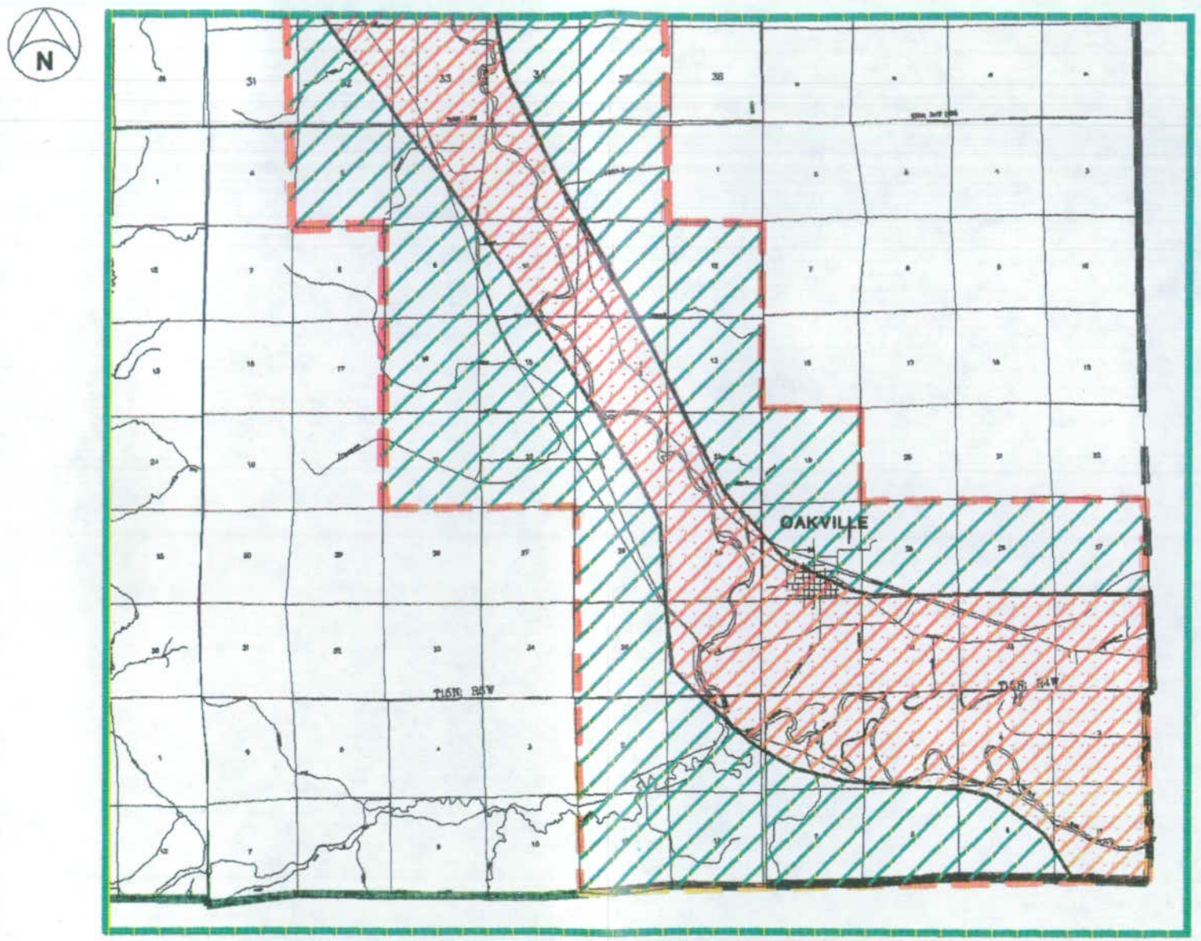
Legend

- STUDY AREA BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY
- PERIPHERAL BEDROCK
- CHEHALIS AQUIFER
- UNDEFINED AQUIFER

Figure 3.2.8: Groundwater Availability Map East County Sub-Area



SOUTH BEACH



EAST COUNTY

FILE: 329 JOB: 11-1558-02

Legend

- STUDY AREA BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY
- PERIPHERAL BEDROCK
- GRAYLAND AQUUFER LOCATION
- CHEHALIS AQUIFER
- UNDEFINED AQUIFER

0 4500 9000
SCALE IN FEET

Figure 3.2.9: Groundwater Availability Map East County and South Beach Sub-Areas

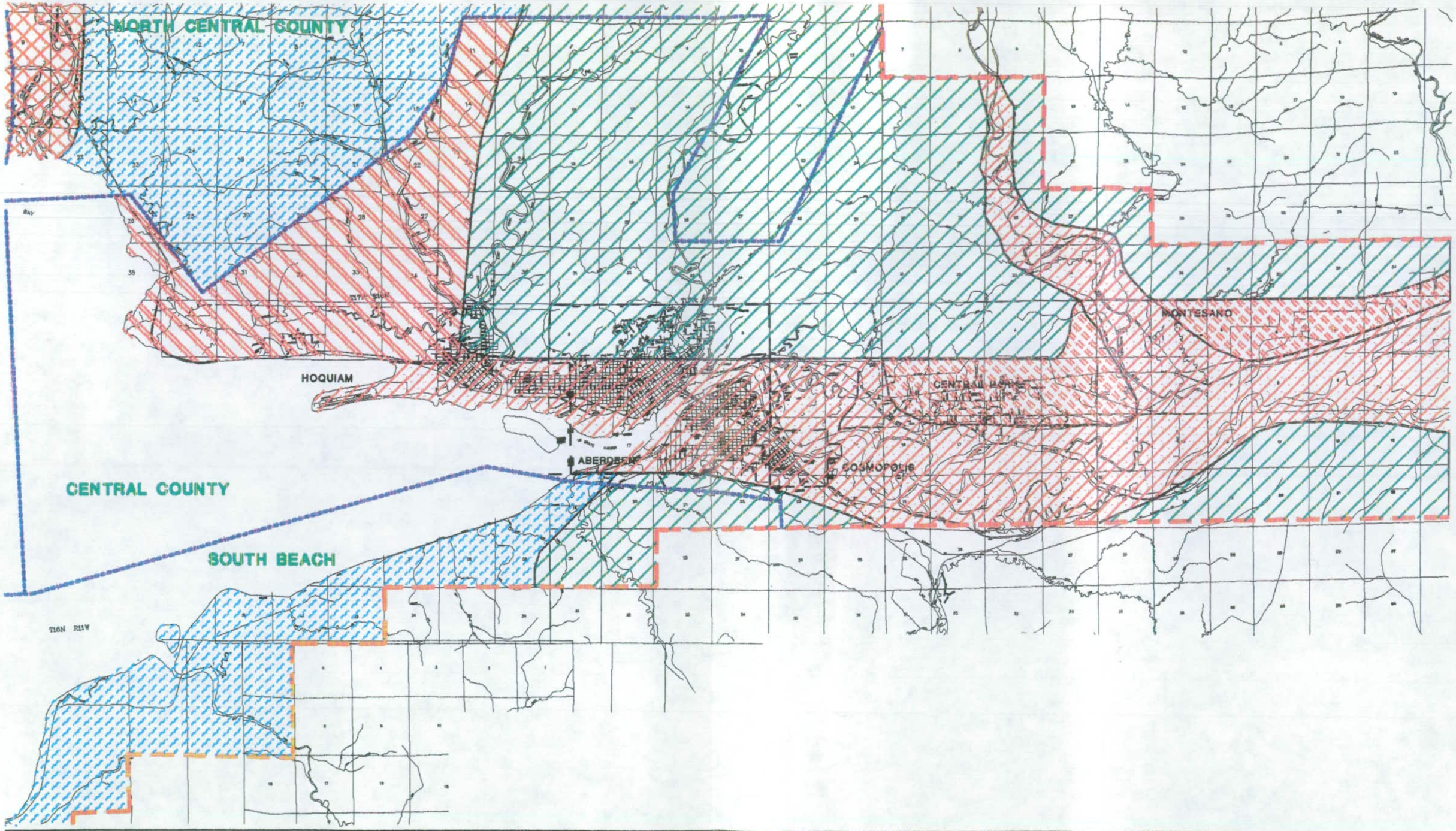
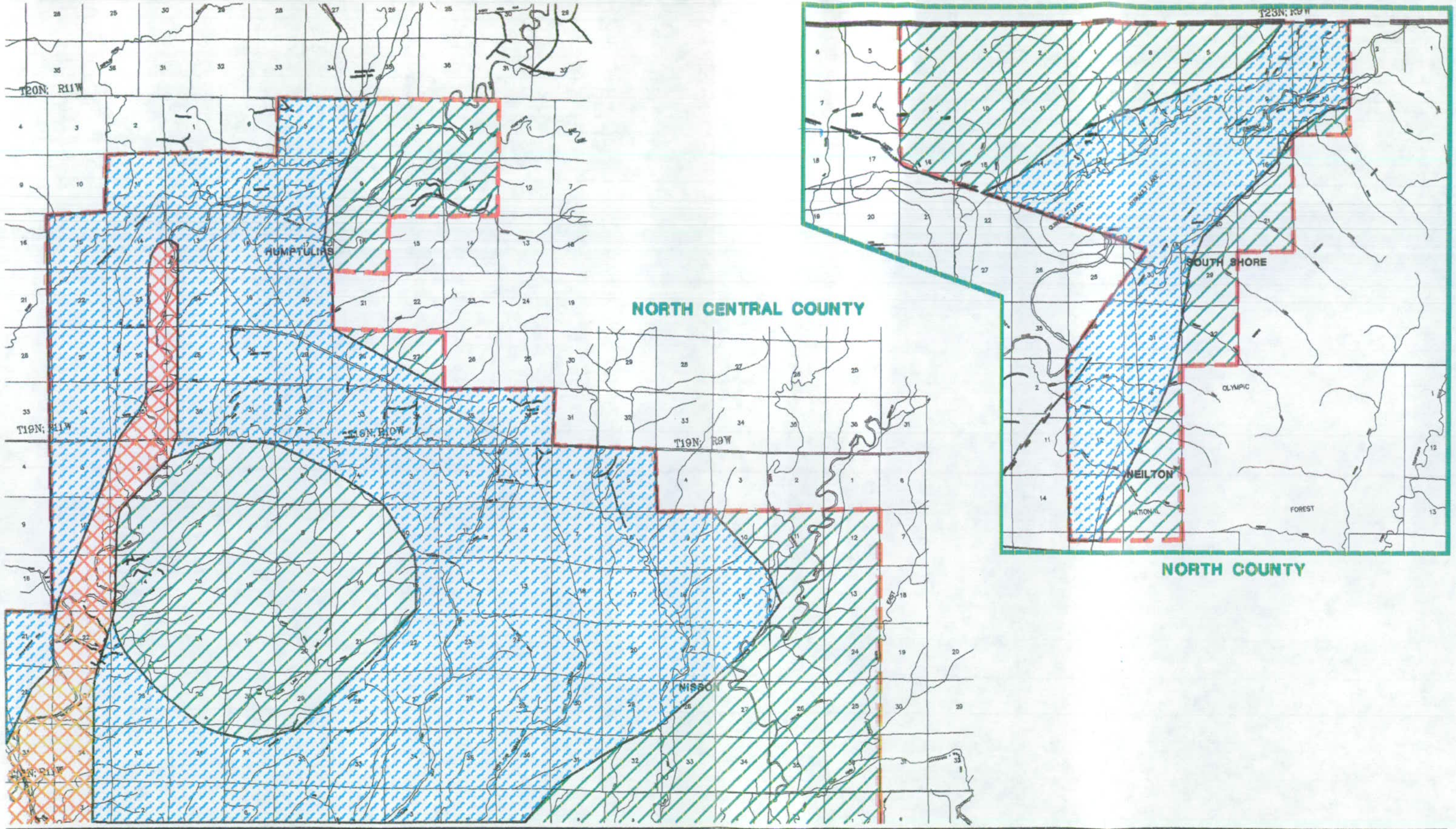
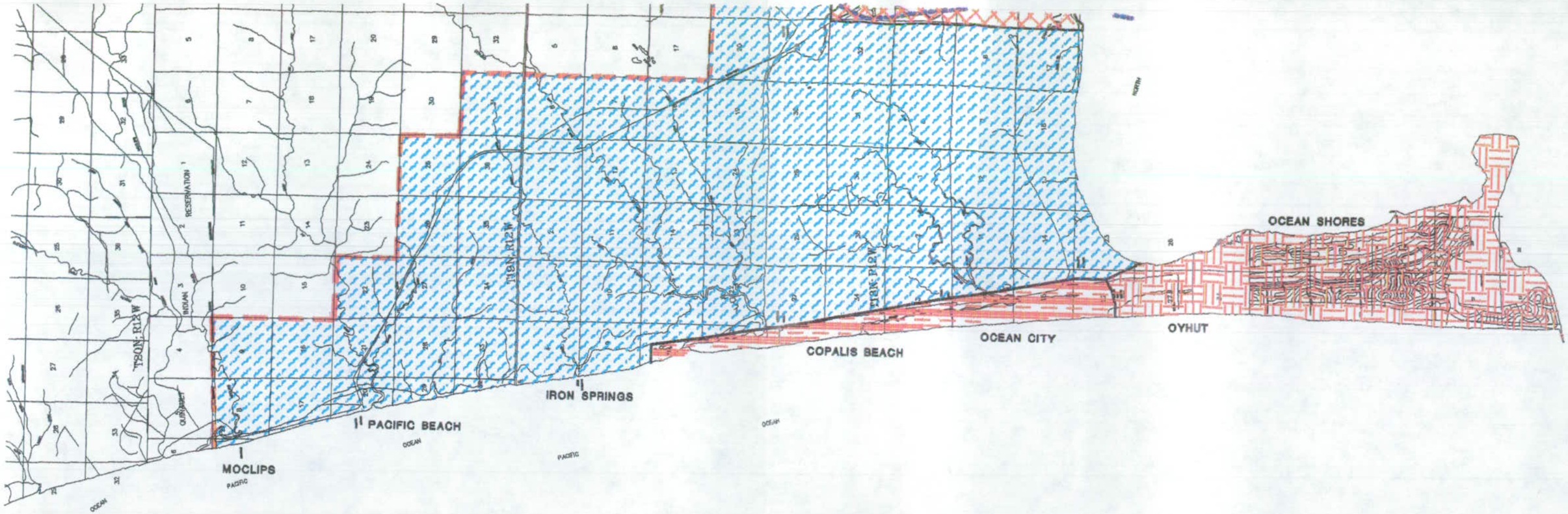


Figure 3.2.10: Groundwater Availability Map North Central County, Central County and South Beach Sub-Areas



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Figure 3.2.11: Groundwater Availability Map North Central and North County Sub-Areas



FILE: 3212 JOB: 11-1558-02

N

0 4500 9000
SCALE IN FEET

Legend

- STUDY AREA BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY
- HUMPTULIPS FLOOD PLAIN
- HOGANS CORNER AQUIFER
- OCEAN SHORES AQUIFER
- UNDEFINED AQUIFER

Figure 3.2.12: Groundwater Availability Map North Beach Sub-Area

In the North area, three areas of well production were identified. Water quality throughout this area is generally affected by iron and manganese concentrations with poor yields and water quality in bedrock areas.

Major alternatives available to offset future supply requirements have been evaluated for each sub-area. Generally, throughout all sub-areas the alternatives include groundwater, surface water, interties, conservation, and desalinization. Each of these alternatives are described in more detail below with specific recommendations provided in Chapter 5.

Figure 3.2.13 provides a matrix of source options which have been evaluated for each of the planning sub-areas. This matrix subjectively compares source options and assigns either a high, moderate, or low favorability for the various issues influencing their potential source development for the differing alternatives. The evaluation of groundwater alternatives is based upon information presented in Table 3.2.6. The likelihood of developing surface water supplies is primarily contingent upon the ability to obtain additional water rights, requirements for treatment of surface water supplies and the potentially significant environmental impacts associated with building impoundments and transmission piping. A physical piping intertie with nearby utilities is listed and appears to have the least complication for construction and implementation. A more detailed review of the demands to be met by the intertie, the available source, the length and the cost of constructing the intertie will be needed for each proposed activity. Conservation is an important element of future resource management strategies. However, it may serve more as a supplement to existing supplies rather than as a substitute for the development of new resources as needed. Desalinization is also listed as an alternative. Technically, desalinization is used in various locations throughout the world. The capital and operating costs for desalinization generally render this a nonviable alternative.

Based upon the information presented throughout this report and specifically in Table 3.2.6 and Figure 3.2.13, various quantity and quality alternatives have been evaluated. Management alternatives have also been addressed and are discussed in Section 4.0 and 5.0.

The criteria used to compare these source options is subjectively based upon issues related to supply potential, regional benefits and other regulatory and non-regulatory issues. Two of the major regulatory issues influencing this comparison are the requirements of the SDWA and current state water resource and water right policies. Selection between these options is based upon requirements of the recently adopted Safe Drinking Water Act Amendments. A summary of the major provisions of the Safe Drinking Water Act and Washington State Water Resource Development policies follows.

3.2.5.2 Safe Drinking Water Act Summary

On June 29, 1989, the EPA promulgated the Surface Water Treatment Rule (SWTR), which sets forth primary drinking water regulations requiring treatment of surface water supplies or groundwater supplies under the direct influence of surface water.

FIGURE 3.2.13

GRAYS HARBOR COUNTY SOURCE OPTIONS MATRIX

Planning Area	Firm Yield	Regional Benefits	Meets Needs 2000	Meets Needs 2010	Meets Needs Industry	Water Right Issues	Water Quality	Environmental Impacts	Implementable
EAST COUNTY									
Groundwater	○	◐	○	○	○	◐	○	◐	◐
Chehalis River	○	○	○	○	○	●	●	●	●
Intertie	◐	◐	○	○	○	◐	○	○	○
Conservation	●	●	●	●	●	○	○	○	◐
CENTRAL									
Groundwater	○	◐	○	○	○	◐	○	◐	◐
Chehalis River	○	○	○	○	○	●	●	●	●
Wynoochee River	○	○	○	○	○	●	●	◐	◐
Wishkah River	◐	○	○	○	○	●	◐	◐	◐
Hoquiam River	◐	○	◐	◐	●	●	●	●	◐
Intertie	◐	◐	○	○	○	◐	○	○	○
Desalination	○	○	○	○	○	○	●	○	●
Conservation	●	●	●	●	●	○	○	○	◐
SOUTH BEACH									
Groundwater - upper	◐	◐	○	○	○	◐	◐	○	○
Groundwater - lower	○	◐	○	○	○	○	○	○	○
Elk River	●	○	◐	◐	◐	◐	●	●	●
Intertie	○	◐	○	○	○	◐	○	○	○
Desalination	○	○	○	○	○	○	●	○	●
Conservation	●	●	◐	◐	●	○	○	○	◐

FIGURE 3.2.13

GRAYS HARBOR COUNTY SOURCE OPTIONS MATRIX

Planning Area	Firm Yield	Regional Benefits	Meets Needs 2000	Meets Needs 2010	Meets Needs Industry	Water Right Issues	Water Quality	Environmental Impacts	Implementable
NORTH BEACH									
Groundwater - upper	⊖	⊖	⊖	⊖	⊖	⊖	●	⊖	○
Groundwater - lower	○	⊖	○	○	○	○	●	⊖	○
Humptulips River	○	○	○	○	○	●	●	●	⊖
Intertie	⊖	⊖	○	○	○	⊖	○	○	○
Desalination	○	○	○	○	○	○	●	○	●
Conservation	●	●	●	●	●	○	○	○	⊖
NORTH CENTRAL									
Groundwater	○	⊖	○	○	○	●	●	⊖	○
Humptulips River	○	○	○	○	○	●	●	●	●
Intertie	⊖	⊖	○	○	○	⊖	○	○	○
Conservation	●	●	●	●	●	○	○	○	⊖
NORTH									
Groundwater	⊖	⊖	○	○	○	⊖	⊖	⊖	○
Lake Quinault	○	○	○	○	○	●	●	●	●
Intertie	○	○	○	○	○	⊖	○	○	○
Conservation	●	●	⊖	⊖	●	○	○	○	⊖

NOTES:

○ Highly Favorable
⊖ Moderately Favorable
● Least Favorable

These regulations require a specific treatment technique--filtration and/or disinfection--in lieu of establishing maximum contaminant levels (MCL's) for turbidity, *Giardia lamblia*, viruses, *Legionella*, and heterotrophic bacteria, as well as many other pathogenic organisms that are removed by these treatment techniques. The regulations also establish a maximum contaminant level goal (MCLG) of zero for *Giardia lamblia*, viruses, and *Legionella*. No MCLG is established for heterotrophic plate count or turbidity.

The pre-existing MCL for turbidity will continue to apply until December 30, 1991 for unfiltered systems, until June 29, 1993 for filtered systems, and until June 29, 1993 or until filtration is installed (whichever is later) for unfiltered systems which the state has determined must install filtration.

In this rule, the EPA defines surface waters as "all water open to the atmosphere and subject to surface runoff," A new term, "groundwater under the direct influence of surface water," has been established by the EPA; it is defined as "any water beneath the surface of the ground with (1) significant occurrence of insects or other microorganisms, algae, or large-diameter pathogens such as *Giardia lamblia*, or (2) significant and relatively rapid shifts in water characteristics, such as turbidity, temperature, conductivity, or pH, which closely correlate to climatological or surface water conditions."

The regulations include criteria under which filtration (including coagulation and sedimentation, as appropriate) is required and procedures by which the states are to determine which systems must install filtration. Further, the regulations establish disinfection requirements.

States having primacy enforcement responsibility must adopt any necessary regulations to implement the rule by December 29, 1990.

When the state revises its drinking water regulations to adopt this filtration rule, the revisions must also include a program for determining which systems using groundwater as a source are "under the direct influence of surface water."

An unfiltered groundwater system must be monitored within 6 months following the state's determination that it is under the direct influence of surface water.

Treatment Requirements

Under this rule, all community and non-community public water systems using any surface water source or groundwater source directly under the influence of surface water must provide filtration and/or disinfection of the water supply to achieve at least 99.9 percent (3 log) removal and/or inactivation of *Giardia lamblia*, and at least 99.99 percent (4 log) removal and/or inactivation of viruses.

Criteria To Be Met To Avoid Filtration

Under this rule a public water supply derived from surface water or groundwater under the direct influence of surface water must meet the following criteria to avoid having to meet the filtration requirement.

Source Water Criteria:

Coliform Limits--The fecal coliform concentration in the water prior to disinfection must not exceed 20/100 ml, or the total coliform concentration must not exceed 100/200 ml in more than 10 percent of the samples analyzed in the previous six months.

Turbidity Limits--The turbidity of the water prior to disinfection cannot exceed 5 NTU based on grab samples collected every four hours or by continuous monitoring.

Site-Specification Conditions:

Disinfection--Disinfection must achieve at least 99.9 and 99.99 percent inactivation of *Giardia* cysts and viruses, respectively.

Other Conditions:

Water systems must maintain a watershed control program to minimize the potential of water contamination by viruses and *Giardia lamblia.*

The system must not have been identified as a source of a waterborne disease outbreak.

The system must comply with the MCL for total coliforms.

The system must be in compliance with the MCL for trihalomethanes (THMs).

Criteria for Filtered Systems:

Treatment by conventional or direct filtration must achieve a turbidity level of less than 5 NTU at all times.

Turbidity measurements must be performed on representative samples of the system's filtered water every four hours or by continuous monitoring.

Disinfectant Residuals:

Both unfiltered and filtered systems must provide a continuous disinfectant residual of at least 0.2 mg/L at the entrance to the distribution system.

CT Values for Determination of Effective Disinfection:

The purpose of the SWTR is to ensure that *Giardia lamblia*, *Legionella* and other pathogenic organisms are removed and/or inactivated.

For unfiltered systems treating surface water, the treatment required for disinfection is totally dependent upon the application of the disinfectant. The efficiency of the disinfectant is measured by the time in minutes of disinfectant contact in the water "T" at peak hourly flow, and the concentration of the disinfectant residual "C" in mg/L measured at the end of the contact time. The product of these two parameters "CT" provides a measure of the degree of inactivation of specific pathogenic organisms. The required CT values are dependent upon the organism in question, the pH and temperature, which affect the activity of certain disinfectants.

3.2.5.3 Water Right Laws, Regulations and Procedures

In order to evaluate the potential of existing and new source development to satisfy future water needs, it is important to have a general understanding of water rights and related laws and regulations that govern the management of the water resources in Grays Harbor County. A brief background summary follows:

(a) Water Rights Laws

Rights to use water in the State of Washington are established under a rather complex set of water right laws and regulations that are administered by Department of Ecology (Ecology). Where the laws or regulations are not specific or clear on an issue, Ecology renders a decision based on its interpretation of the law, court decisions, past policy positions, or standard operating procedures. Ecology decisions on water right matters are subject to appeal to a separate State agency, the Pollutions Control Hearings Board, and through the court system.

The basic water right procedures are broken into three categories: (1) prior appropriation, (2) surface water code, and (3) groundwater code. A brief description of each follows.

(1) Prior Appropriation

The 1891 State Legislature put in place a process recognizing "first in time is first in right." Initially, anyone desiring to appropriate public water for beneficial use had to post a notice at the proposed point of diversion and record a copy of that notice with the local County Auditor. Construction of the diversion and putting the water to beneficial use, with due diligence, perfected the right in the amount of the beneficial use. Until such rights are confirmed by a court's general adjudication of water rights, they are generally referred to as "claims to vested right." In order to keep such a claimed right active, the claim had to be filed and registered with Ecology, or its predecessor, the Department of Water Resources,

during the period from July 1, 1969 through June 30, 1974, pursuant to the claim registration requirements of Chapter 90.14 RCW. The provisions of this law generally apply to groundwater rights established prior to June 7, 1945, and all small wells, i.e. less than 5,000 gallons a day, that were put in use prior to July 1, 1974.

(2) Surface Water Code (Chapter 90.03 RCW)

Laws were enacted in 1917 that: recognized and protected pre-existing rights, provided an exclusive process for establishing rights to surface waters after that date, and set up a three-step procedure for acquiring water rights. The procedure includes:

a. Application

A filing must be submitted to the State, now Ecology, requesting permission to appropriate water for beneficial use. Following a process of publication of legal notice, evaluation of protest, field examination, and consulting other agencies, Ecology either approves, approves with modification, or rejects the application. To approve an application, Ecology must find:

- The proposal is a "beneficial use" as defined in the Code;
- Water is available for appropriation in the amount requested;
- The proposed use will not impair existing rights; and,
- The proposed use will not be detrimental to the public interest, having due regard to the highest feasible development of the use of the waters belonging to the public.

b. Permit

Assuming approval of the application, a permit is issued. This permit is authorization to proceed with construction of facilities and use water consistent with the time schedule and other provisions of the permit.

c. Certificate

Once a project is completed and water is fully utilized, the Certificate of Water Rights is issued. This document is recorded with the local County Auditor and in Ecology's records. The right embodied in a Certificate is perpetual, and not subject to extensions, but may be modified through adjudication or lost through non-use in certain cases.

(3) Groundwater Code (Chapter 90.44 RCW)

Laws were enacted in 1945 which extended the provisions of the 1917 Surface Water Code to the appropriation and use of groundwater. There were, however, two key differences. First, withdrawals of less than 5,000 gpd were exempt from the permit requirement. Second, a 5-year period was allowed for "declaring" rights to groundwater existing prior to 1945. An application-certificate process was provided during this period. The application essentially constituted a claim of right which, if verified by the State, was confirmed through the issuance of a "declaration" certificate.

The application/permit/certificate procedure, discussed above for surface water, is essentially the same for groundwater. There is, however, an additional criterion Ecology must consider in acting on new applications for groundwater permits. RCW 90.44.070 provides in part that "No permit shall be granted for the development or withdrawal of public groundwaters beyond the capacity of the underground bed or formation in the given basin, district, or locality to yield such water within a reasonable or feasible pumping lift in case of pumping developments, or within a reasonable or feasible reduction of pressure in the case of artesian developments..."

Once a right is established in either of the above three categories, it is fixed in source, priority, quantity, purpose of use, period of use, point of diversion, place of use and point of diversion/withdrawal. It can be changed, but to make such changes an application must be filed with Ecology and a Certificate of Change granted.

(b) Other Relevant Statutes

Several statutes are relevant and provide guidance to Ecology in its groundwater and surface water right and management determinations. They include, among others, RCW 75.20.050 (Review of Permit Applications...-Water Flow Policy); Chapter 90.22 RCW (Minimum Water Flows and Levels); Chapter 90.54 RCW (Water Resources Act of 1971); and Chapter 43.21C RCW (State Environmental Policy Act of 1971); and Chapter 18.104 RCW (Water Well Construction). Because of the interrelationships of these laws and their overall complexity, they are not described in full. However, their relationship to future water development is summarized.

The hydraulic continuity between surface water and groundwater was recognized when the Groundwater Code was enacted in 1945. Prior surface water rights were protected from interference caused by subsequent rights to groundwater, according to RCW 90.44.030. This was emphasized in the Water Resources Act of 1971, RCW 90.54.020(8), which reads in part: "Full recognition shall be given in the administration of water allocation and use programs to the natural interrelationships of surface and groundwaters." Therefore, an understanding of the status of surface waters is a necessity in the planning for new groundwater development.

In addition to those water rights established under the Surface Water Code, protection for the fishery and other instream resources has been provided by three statutes. The oldest, RCW 75.20.050, was first enacted in 1949. It enunciated the policy "that a flow of water sufficient to support game fish and food fish populations be maintained at all times in the streams of this state...". The policy was carried out by conditioning or rejecting applications for new water rights based on recommendations from the Directors of Fisheries or Game (now Wildlife).

The two other statutes are the Minimum Water Flows and Levels Acts and the Water Resources Act referenced above. Both statutes establish a State policy that sufficient flows are to be retained in perennial rivers and streams to protect fish, game, wildlife and other resources and values. Chapter 90.22 RCW refers to "minimum flows" and Chapter 90.54 RCW to "base flows." Ecology has overcome the definition problem by establishing "instream flows" through the process of adoption of State regulations. Once instream flows are established, all new permits are issued subservient to these flows. As a matter of law, a new appropriation cannot be exercised when instream flows, established by rule, are not being met. Water rights established prior to the establishment of instream flows are not affected. Additionally, lake levels can be established under Chapter 90.22 RCW. Further, Chapter 90.54 RCW provides that "Lakes and ponds shall be retained substantially in their natural condition." The protection provided by the above statutes is not absolute. There is a provision to withdraw waters in conflict with protected surface water levels "...where it is clear that overriding considerations of the public interest will be served."

There are two other provisions of relevance in the State Surface Water Code. RCW 90.03.247 provides that "Whenever an application for a permit to make beneficial use of public waters is approved relating to a stream or other water body for which minimum flows or levels have been adopted and are in effect at the time of approval, the permit shall be

conditioned to protect the levels of flows...." This clause highlights that surface water/groundwater continuity may be unacceptable if groundwater withdrawals deplete protected surface water. RCW 90.03.345 also states "The establishment of reservations of water for agriculture, hydroelectric energy, municipal, industrial, and other beneficial uses under RCW 90.54.050(1) or minimum flows or levels under RCW 90.22.010 or 90.54.040 shall constitute appropriations within the meaning of this chapter with priority dates as of the effective dates of their establishments...." This provision set priority dates for establishing water right sensitivity.

In addition to instream resource protection, the Water Resource Act of 1971 carries some important fundamental guidance for groundwater and surface water management. The purpose of the Act, as stated in RCW 90.54.010, is "... to ensure that waters of the State are protected and fully utilized for the greatest benefit to the people of the State...." RCW 90.54.020(2) indicates "Allocation of waters among potential uses and users shall be based generally on the securing of the maximum net benefits for the people of the State. Maximum net benefits shall constitute total benefits less cost including opportunities lost."

(c) Regulations

The most significant constraints against new source development in Grays Harbor County arise from Chapter 173-522 WAC, Water Resources Program in the Chehalis River Basin, WRIA-22 and 23 filed by Ecology on March 10, 1976. A copy of this regulation is included as Appendix B. Through this regulation, "base flows" have been established on, among others, the Chehalis, Wynoochee, Wishkah, Hoquiam and Humptulips Rivers. Additionally, the Wynoochee River is closed to new appropriations from May 1 to October 31 of each year.

The first impact of these regulations is that any new appropriations of surface water would be subject to the conditions that the diversion or use be regulated, from reduction to total cessation, at any time the stream flow did not exceed the established base flows. For example, in the case of the Humptulips River, the "base flow" for August of 170 cfs is, according to the U.S. Geological Survey records, available in the stream from 50 to 80 percent of the time. This means that some regulation of a new water right could be expected 20 to 50 percent of the time. This type of a water right would not offer a reliable supply.

The second impact presents considerable uncertainty at this time because it involves the issue of groundwater/surface water continuity. Under the

law it is clear that new appropriations of groundwater should not be allowed if the withdrawal adversely affects previously established "base flows" or "minimum flows." Ecology, however, does not have clearly established rules concerning this question. Consequently, the occurrence of groundwater in large quantities, does not in itself, mean that the groundwater is available for new appropriations. Without further policy clarification from Ecology, development of further groundwater in this study is assumed to be preferable at sites having at least a one mile or greater separation distance from surface water.

(d) Existing Water Rights

Tables 3.2.7, 3.2.8, and 3.2.9 summarize the existing water rights in the six designated planning areas within Grays Harbor County. The data used to develop these tables was taken from a water right printout dated May 30, 1991 provided by the Department of Ecology through its Water Right Information System (WRIS).

With the exception of two claims to vested right, see City of Aberdeen entries on Table 3.2.8, all other water rights information involves water rights perfected under the groundwater and surface water permit systems. In order to avoid double accounting, some adjustments were made in preparation of Table 3.2.7. Where there was a water right for multiple use purposes without a breakdown of the instantaneous quantity into component parts for each purpose, the entire quantity was identified with the primary use. For example, if there was a water right for 1,000 gpm to irrigate 120 acres and to provide individual domestic supply, the entire right would be categorized as irrigation. In looking at all the rights, it appears that the quantity relationships between different uses are still substantially representative.

Amounts of water for the WPPSS Satsop Nuclear Plants are not included in the water right tables. They were excluded because these are not standard water rights. They were authorized by the Energy Facility Site Evaluation Council under the authorities of Chapter 80.50 RCW, not under Chapters 90.03 and 90.44 RCW. It is unique and would not be transferable to other uses. It should be noted that the withdrawal location for these rights is in close proximity to the Chehalis River and likely influences the base flow requirements for any additional groundwater development found to be in continuity with the Chehalis River.

TABLE 3.2.7

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SUMMARY OF WATER RIGHT INFORMATION[1]

Areas	East	Central	North Central	North	North Beach	South Beach	Totals
Public Water Supply[2]							
gpm	5,344	200,639[6]	8,261	1,293	15,955	3,483[7]	234,975
mgd	7.70	288.94	11.90	1.86	22.98	5.01	338.39
Other uses							
Domestic/Stock[3]							
gpm	533	398	266	157	17	82	1,453
mgd	0.77	0.57	0.38	0.23	0.02	0.12	2.09
Irrigation[4]							
gpm	46,860	12,844	3,013	134	8,752	12,957	84,560
mgd	67.48	18.50	4.34	0.19	12.60	18.66	121.77
Commercial/Industrial[5]							
gpm	2,695	29,639	6,832	-	1,010	200	40,376
mgd	3.88	42.68	9.84	-	1.45	0.29	58.14
Fish Propagation							
gpm	152	638	26,200	197	1,737	-	28,924
mgd	0.22	0.92	37.73	0.28	2.50	-	41.65
Power							
gpm	929	-	2,244	1,809	-	-	4,982
mgd	1.34	-	3.23	2.60	-	-	7.17
Totals							
gpm	56,513	244,158	46,816	3,590	27,471	16,722	395,270
mgd	81.39	351.61	67.42	5.16	39.55	24.08	569.21

Footnotes:

(1) Includes both groundwater rights and surface water rights (converted from cfs to gpm and mgd).
(2) Public water supply includes all water rights reported as municipal and domestic multiple in Ecology water right printout.
(3) Domestic/stock includes single domestic supply and stock watering rights.
(4) Irrigation period of use should generally be considered to be 6 months or less.
(5) Water for WPPSS Satsop Nuclear Plants in amounts of 1,007 gpm (East) and 35,909 gpm (Central have not been included in C&I totals.
(6) Includes two claims to vested right by City of Aberdeen (63.9 cfs or 28,678 gpm).
(7) Includes two rights of Grays Harbor W.D. #1 with source in Pacific County (625 gpm).

TABLE 3.2.8

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SUMMARY OF WATER RIGHTS FOR CLASS 1 SYSTEMS[1]

Area and Entity	Water Rights			Footnotes
	gpm	mgd	AF/YR[5]	
CENTRAL				
Aberdeen	165,575	238.44	255,798	[2]
Cosmopolis				[3]
Hoquiam	7,719	11.11	12	
Montesano	4,400	6.34	1,960	
Grays Harbor W.D. #2	1,250	1.80	672	
Subtotal	178,944	257.69	258,442	[4]
EAST COUNTY				
Elma	2,010	2.89	1,232	
McCleary	1,100	1.59	673	
Oakville	800	1.15	90	
Subtotal	3,910	5.63	1,995	
NORTH BEACH				
Illahee-Oyhut				[3]
Ocean Shores	11,576	16.68	1,440	
Grays Harbor W.D. #7	1,330	1.91	140	
Subtotal	12,906	18.59	1,580	
SOUTH BEACH				
Westport	2,400	3.46	1,523	
Grays Harbor W.D. #1	625	0.90	504	
Subtotal	3,025	4.36	2,027	
TOTAL	198,785	286.27	264,044	

Footnotes:
(1) Class 1 systems for the purposes of this table have more than 100 services.
(2) City of Aberdeen totals include two claims to vested right amounting to 63.9 cfs (28,678 gpm).
(3) Department of Health Water Facility Inventory indicates all water purchased.
(4) Annual quantity only includes specific water right allocations. As a general rule, annual amounts were not identified on many early surface water rights.
(5) Acre Feet/Year.

TABLE 3.2.9

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

CENTRAL AREA

Aberdeen

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Stewart Creek	17N 09W 04C	Claim #002922	3,994 (8.9 cfs)	5.75	6,450	
Wishkah River	21N 08W 33F&M	Claim #002299	24,684 (55 cfs)	35.55	40,000	
Wishkah River	21N 08W 28	R2*02280C			48	
"C" Creek	21N 08W 33M	S2*02762C	13 (0.03 cfs)	0.02		a.
Wynoochee River	22N 07W 20E	R2-00905C			70,000	
Wynoochee River	22N 07W 20C	S2-25765P	(1,400 cfs)			b.
Wynoochee River	18N 08W 28	S2*01972C	49,368 (110 cfs)	71.09		a.
Wynoochee River	18N 08W 28	S2-00140C	20,196 (45 cfs)	29.08	32,850	
Wynoochee River	18N 08W 28	S2-00141P	65,076 (145 cfs)	93.72	105,850	
Elliott Slough	17N 09W 01	R2*02078C			600	
Van Winkle Creek	18N 09W 36	S2*01968C	2,244 (5.0 cfs)	3.23		a.
TOTALS			165,575	238.44	255,798	

a. Annual allocations not identified on water right.

b. This permit is for generation of power and not included in totals.

Cosmopolis

All water purchased from Aberdeen

Hoquiam

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Davis Creek	18N 10W 04K	R2*19593C			12	
Davis Creek	18N 10W 04L	S2*01121C	6,732 (15 cfs)	9.69		
West Fork Hoquiam River	18N 10W 04J	S2*12423C	987 (2.2 cfs)	1.42		
TOTALS			7,719	11.11	12	

Montesano

TABLE 3.2.9

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

Source	Location[1]	Water Right				Comments
		Control No.[2]	gpm (cfs)	mgd	AF/YR(s)[3]	
Well	17N 07W 09	G2-23838P	2,000	2.88	1,120	
Well	17N 08W 12L	G2*07743C	500	0.72	800	
Well	17N 08W 12F	G2-20479C	900	1.30	1,120(s)	
Well	17N 08W 14A&H	G2-27410C	1,000	1.44	40 1,120(s)	
TOTALS			4,400	6.34	1,960	

Grays Harbor W.D. #2

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well	17N 08W 14G	G2-24153P	900	1.30	426	
Well	17N 08W 14G	G2-25929C	350	0.50	246 314(s)	
TOTALS			1,250	1.80	672	

EAST COUNTY

Elma

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well #1	17N 06W 04D	G2*00029S	260	0.37	422	
Well #3	18N 06W 27P	G2*05829C	750	1.08	138 422(s)	
Well #4	18N 06W 33J	G2-24632C	1,000	1.44	672	
TOTALS			2,010	2.89	1,232	

McCleary

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well	18N 05W 11A	G2*02136C	200	0.29	320	
Well	18N 05W 11A&B	G2*02598C	400	0.58	352 288(s)	
Well	18N 05W 11B	G2*06087C	500	0.72	1 672(s)	
TOTALS			1,100	1.59	673	

TABLE 3.2.9

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

Oakville

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well	15N 05W 30	G2-20572C	500	0.72	90(s)	
Well	16N 04W 31C	G2*04197C	300	0.43	90	
TOTALS			800	1.15	90	

NORTH BEACH

Illahee-Oyhut

All water purchased from Ocean Shores

Ocean Shores

Source	Location[1]	Water Right				Comments
		Control No.[2]	gpm (cfs)	mgd	AF/YR(s)[3]	
Well	17N 12W 02N	G2-26101C	700	1.01	565(s)	
Well	17N 12W 03R	G2*07862C	400	0.58	575(s)	a.
Well	17N 12W 03	G2*09232C	1,500	2.16	784(s)	a.
Humptulips R.	18N 11W 04	S2*16160PBL	8,976 (20.0 cfs)	12.93	1,440	b.
	19N 11W 33N	S2*16160PAL	-			b.
TOTALS			11,576	16.68	1,440	

a. These are carried in the name of Grays Harbor W.D. #3.

b. This water right is in permit status with time for beginning of construction to expire on 8/1/92; the permit is conditioned to maintain a 100 cfs flow in the Humptulips River.

Grays Harbor W.D. #7

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well #1	20N 12W 08L	G2-27478P	250	0.36	140(s)	
Well	20N 12W 08P	G2-27565P	250	0.36	140(s)	
Well #2	20N 12W 21F	G2-27579P	530	0.76	140	
Well #3	20N 12W 21F					
Well	20N 12W 21L	G2-27480P	300	0.43	140(s)	
TOTALS			1,330	1.91	140	

TABLE 3.2.9

GRAYS HARBOR COMPREHENSIVE WATER PLAN
SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

SOUTH BEACH

Westport

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
4 Wells	16N 11W 18M&N	G2*01002C	700	1.01	1,120	
Well	16N 11W 12A	G2*00867C	250	0.36	200(s)	
Well	16N 11W 12A&B	G2-24243C	950	1.37	1,120(s)	
Well #3	16N 11W 12B	G2-27060P	500	0.72	403	
TOTALS			2,400	3.46	1,523	

Grays Harbor W.D. #1

Source	Location (1)	Water Right				Comments
		Control No. (2)	gpm (cfs)	mgd	AF/YR(s)(3)	
Well	15N 11W 17L	G2-20216C	475	0.68	504	a.
Well	15N 11W 17L	G2-24383C	150	0.22	241(s)	a.
TOTALS			625	0.90	504	

a. These wells located in Pacific County.

Footnotes:
(1) Location reported by Township, Range, Section, and 40-acre quarter where water right record identifies (e.g., 15N 11W 17L is the NE quarter of the SW quarter of Section 17, Township 15 North, Range 11 West).
(2) The control number is the Ecology Water Right Information System control No. and does not always match up with original permit or certificate numbers.
(3) Where (s) follows the AF/YR number, it means that all or part of the water right annual allocation is supplemental to other water rights. Such numbers are not included in totals.

In comparing existing public water rights on Table 3.2.7 with the total demand projections shown on Table 3.2.5, it appears that the East and South Beach areas will need to obtain additional water rights if those areas are to accommodate substantial new industrial development. It appears likely that Class 1 systems will be relied upon to expand source capacities and meet new demands in all areas. Therefore, Tables 3.2.8 and 3.2.9 provide detailed water right information for Class 1 utilities within the study area. Please note that when converting an instantaneous water right amount (gpm and cfs) into MGD the assumption must be made that the water is being diverted or withdrawn continuously, which is not always the case, particularly when groundwater is involved. Also, the annual limitation on some water rights would preclude continuous pumping. For example, the City of Elma's water rights (see Table 3.2.8) of 2,010 gpm

could only be utilized 38 percent of the time because the annual use is limited to 1,232 acre-feet per year.

Large water rights are noted for Aberdeen and Ocean Shores. The total for Aberdeen reflects its industrial supply system from the Wynoochee River as well as two claims. The availability of these large rights may be a key factor in siting future industrial facilities in close proximity to the industrial supply lines, especially if resource conflicts regarding ground-surface water continuity are significant. In addition, the City of Ocean Shores has a 12.93 MGD water right permit on the Humptulips River. The permit is conditioned to maintain a 100 cfs flow in the River. In addition, the permit specifies that construction on the withdrawal and supply facilities should begin by August 1, 1992, or the permit expires. Therefore, the long-term supply options of the North Beach area should be evaluated as soon as possible to determine the future usefulness of this permit.

3.3 WASTEWATER

3.3.1 Goals and Objectives

The wastewater planning element will focus upon three main goals and objectives whose purpose is to:

- Protect Public Health and the Environment
- Promote Economic Diversification and Growth
- Provide Guidance for Land Use Planning

These goals are greater defined as follows:

3.3.1.1 Protection of Public Health and the Environment

Provide guidance for the protection of the public against improper on-site disposal of wastewater. Indicators of improper disposal of wastewater can be high nitrate levels or the presence of fecal coliform in public or private drinking water supply, discharge of sewage effluent in localized surface water, and surfacing and overland flow of sewage effluent.

3.3.1.2 Promotion of Economic Diversification and Growth

Provide recommendations for wastewater collection disposal that will assist in promoting industrial and commercial diversification and growth.

3.3.1.3 Provide Guidance For Land Use Planning

Provide guidance for land use planning of areas best suited for industrial, commercial and residential uses. Suitability constraints would consider the availability of infrastructure improvements or the potential for infrastructure improvements, and the presence of generalized soil conditions, within certain areas of the County that are suitable for on-site waste disposal.

3.3.2 Existing Conditions

3.3.2.1(a) County On-Site Waste Disposal Rules

In 1984, Grays Harbor County adopted Ordinance 113, which complies with state requirements, for on-site disposal of domestic waste. The salient points of those rules are discussed to establish the type of systems and sites which can be approved by the County.

The present criteria uses soil depth, soil permeability, slope, depth to a water table, soil texture, size and shape of lot, setbacks from streams, roads, wells, etc. to decide whether a site is suitable. A site evaluation includes describing soil profiles and in some cases percolation tests.

Historical evidence of water tables, soil mottling, or monitoring wells are used to determine maximum height of water tables.

The main elements of the criteria for a conventional system are shown in Table 3.3.1 below.

TABLE 3.3.1

CONVENTIONAL On-Site WASTEWATER DISPOSAL SYSTEM CRITERIA

Soil Permeability	Questionable sites are tested using a standard percolation test. Most evaluations use soil profile descriptions.
Slope[1] 0 - 15% 15 - 22% 22 - 30% 30 - 45%	Depth to Restrictive Layer[2] 36" 36" 42" 60"
Depth to Water Table	Three feet of vertical separation from the trench bottom is needed unless otherwise approved. Two foot minimum.
Loading Rate	Based on soil type.
Typical Size of Drainfield	Based on 450 gpd per 3 bedroom single family dwelling, a total of 3 lines 90 feet long with 10 feet between lines is needed depending on soil type. Approximately 2,000 square feet of land area is required. This is based on trenches 3 feet wide with 1 foot of drainrock.
Lot Size	The County uses soil texture and source of domestic water to determine lot size. The minimum is 12,500 square feet for a medium sand soil and public water. The minimum is 2 acres for gravel or clay soils on individual wells.

(1) 0 - 45% is acceptable.
(2) Depends on soil.

A typical septic tank drainfield system for Grays Harbor County consists of a 1,000 gallon septic tank, 270 lineal feet of drainfield (depending on soil type), and trenches that are 2 feet deep by 3 feet wide with 1 foot of drainrock. Distribution of septic tank effluent is by gravity.

Without special approval, the site must be on a 0-45 percent slope, have a moderate permeability, be at least 5 feet deep with no restrictive layers to a depth of 30 to 60 inches depending on slope and have enough useable space for an initial drainfield of 2,000 total square feet with an equal amount for repair. Soils with a rapid permeability and those with a slow permeability require additional lot size. The source of domestic water also influences the size of the lot. Those having wells or springs require larger lots.

Special approvals exist for lots not meeting all the criteria. For those sites lacking soil depth, two types of fills are permitted. If the site is approximately 1 foot short of meeting the depth to a restrictive layer or a water table, the disposal lines can be installed so the drainrock is at the surface of the original soil. A 12 to 18 inch cap of soil can be added to protect the leach lines and keep effluent underground (capping fill).

If a site on the north and south beach areas require additional separation from groundwater, a sand fill is currently permitted. Filling is not allowed unless at least 1 foot of acceptable native soil is present above high groundwater indicators. Fill material is accomplished using similar sand gradation and installed in an acceptable manner. By definition, a drainfield must be in undisturbed soil. However, DOH has agreed with the County to allow sand on sand fills at variance to current regulation.

The above discussion does not include the set backs, material and equipment requirements, or other details of an approval. The purpose of this discussion is to illustrate what type of sites are acceptable today and what type of systems can be approved without going to "alternative or experimental" systems.

According to Ordinance #113, an "alternative system" is any system which is not mentioned above. Specifically any system which goes beyond a septic tank with either trickle flow to a drainfield or uses a dosing syphon with or without a capping fill and in native or properly constructed fill is an alternative system.

Alternative systems as defined by Ordinance #113 are permitted provided guidelines have been established by the on-site technical review committee. At the present time, the alternatives allowed are:

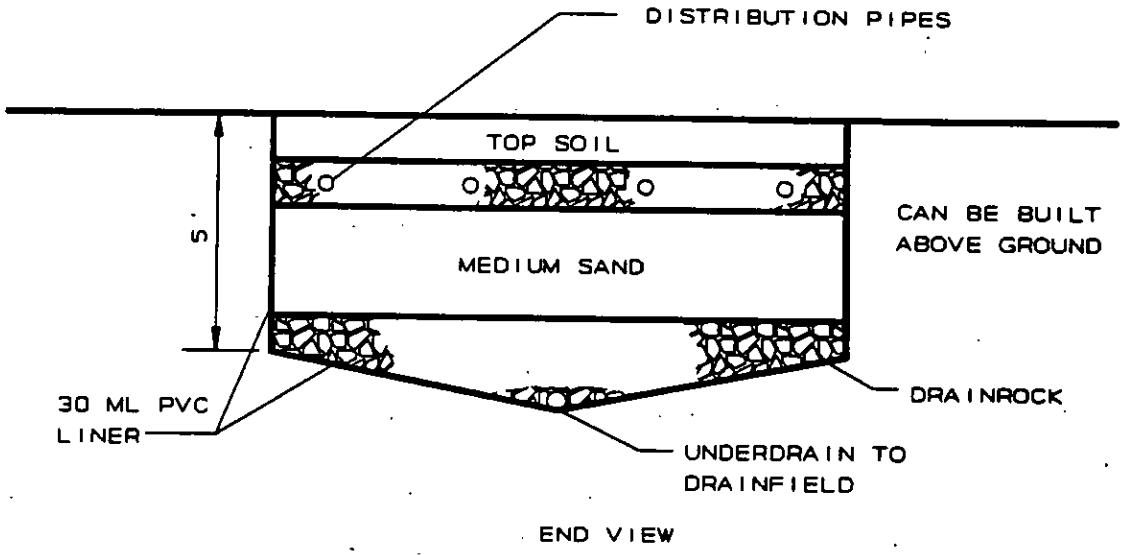
1. Mounds — A fill using 24 inches of medium sand is used to increase soil depth. Effluent is pressure dosed onto the sand and allowed to travel vertically into the native soil. This technique can be used on slopes up to 12 percent and where there is at least 18 inches of permeable soil over a restrictive layer or where the water table comes to within 24 inches of the surface.

2. Pressure Distribution — This type of system uses a pump or a dosing syphon to distribute effluent evenly over the entire drainfield at one time. Small diameter pipes (1-1/4 inch) are used in the drainfield. Small orifices in the pipe allow pressure to build in the pipe causing flow from the orifices to be uniform. Pressure distribution is used where water

tables come to within 3 feet of the surface. The method allows 2 feet of separation between trench bottoms and the water table.

3. Contained Sand Filters (Intermittent) — Mounds are intermittent sand filters. However, they should not be confused with contained sand filters. A 19'x19' box of medium sand is used to treat septic tank effluent. From there the effluent is placed into disposal trenches or a fill. Contained sand filters are used for small lots where certain setback requirements cannot be met and on steep slopes (over 12 percent). They can also be used in conjunction with a fill made of sand for sites with a water table that comes to within 12 inches of the surface. Figure 3.3.1 illustrates this technology.

Figure 3.3.1



A contained sand filter consists of a buried box of sand. Effluent from the septic tank is pressure dosed onto the top of a 24-inch thick layer of medium sand. Effluent is cleaned by a film of bacteria which grows on the sand. The clean effluent then travels to a small drainfield.

Experimental Systems may be allowed for repair of failing drainfields where existing techniques will not work or on new sites where site conditions will allow the use of a "regular system".

In summary, Grays Harbor County uses soil characteristics, groundwater levels, slope, setbacks, and lot size to decide if a site can be approved for subsurface disposal of septic tank effluent. For flows up to 3500 gpd, the County review is all that is necessary. Flows between 3500 gpd and 14,500 gpd require State Department of Health review as well as the County's. Flows greater than 14,500 gpd, or for systems using surface discharge, land application, mechanical means of treatment, or a lagoon, the Department of Ecology is the lead agency.

Depending on site conditions, the following systems are permitted:

1. 1,000 gallon septic tank and disposal trenches (conventional system)
2. Capping fills
3. Sand fills (beach areas only)
4. Mounds
5. Pressure distribution
6. Contained sand filters.

These systems exclude soils with slow permeability, soils with water tables above 12 inches, soils on slopes over 45 percent, soils with shallow depths to a restrictive layer and sites with large setback requirements.

3.3.2.1(b) Soil Suitability for Wastewater Disposal

County Ordinance #113, described in the preceding section, defines soil suitability for disposal of wastewater. That ordinance can be summarized as follows:

1. Soils Suitable for Conventional Subsurface Disposal System must:
   a. Be on slopes between 0 - 45 percent.
   b. Have an adequate permeable layer greater than 36 inches on slopes up to 22 percent, 42 inches on slopes up to 30 percent and 60 inches on slopes up to 45 percent.
   c. Have a minimum depth to a seasonal water table of 60 inches.
   d. Have a permeability which is rapid enough to accept daily flows, but slow enough to treat.
2. Soils Suitable for Mounds must:
   a. Be on slopes between 0 - 12 percent.
   b. Have an adequate permeable layer at least 24 inches thick.
   c. Have a minimum depth to a water table of 24 inches.
3. Soils Suitable for Pressure Distribution Systems must:
   a. Be on slopes between 0 - 45 percent.
   b. Have an adequate permeable layer at least 36 inches thick.
   c. Have a minimum depth to a seasonal water table of 36 inches.

4. Soils Suitable for Contained Sand Filters must:

   a. Be on slopes between 0 - 45 percent.
   b. Have an adequate permeable layer at least 24 inches thick.
   c. Have a minimum depth to a seasonal water table of 24 inches. (This can be reduced to 12 inches if used in conjunction with a mound as shown on Item #2 above.)

5. Soils Suitable for Capping Fills must:

   a. Be on slopes less than 12 percent.
   b. Have an adequate permeable layer at least 36 inches thick.
   c. Have a minimum depth to a water table of 36 inches.

6. Soils Suitable for Sand Fills must:

   a. Native soil must be sand and may only be constructed in the south and north beach areas.

The above criteria were used to evaluate the soils mapped by the SCS. Soil profile descriptions in the SCS report were reviewed and placed into three classes: Category 1, soils suitable for conventional septic tank/drainfield; Category 2, soils requiring specialized systems; and Category 3, unfavorable soil/site conditions requiring expensive systems.

It should be pointed out that SCS ratings for drainfield suitability were not used. They are very conservative and do not reflect the use of specialized systems to overcome problem soils. The SCS soil map, while it is accurate for discussing soil conditions in 50 acres, should not be considered definitive for individual lots. Contrasting soil types occur within mapping units that are not defined.

Once the soils were ranked, the SCS soil map was color coded. That map was utilized to produce Figures 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.3.6, and 3.3.7. The attached figures show approximations of the soil types as found on the SCS maps. Although these figures are useful for this planning effort, they should not be considered accurate SCS maps. Areas shown as one category could have minor amounts of another category intermixed.

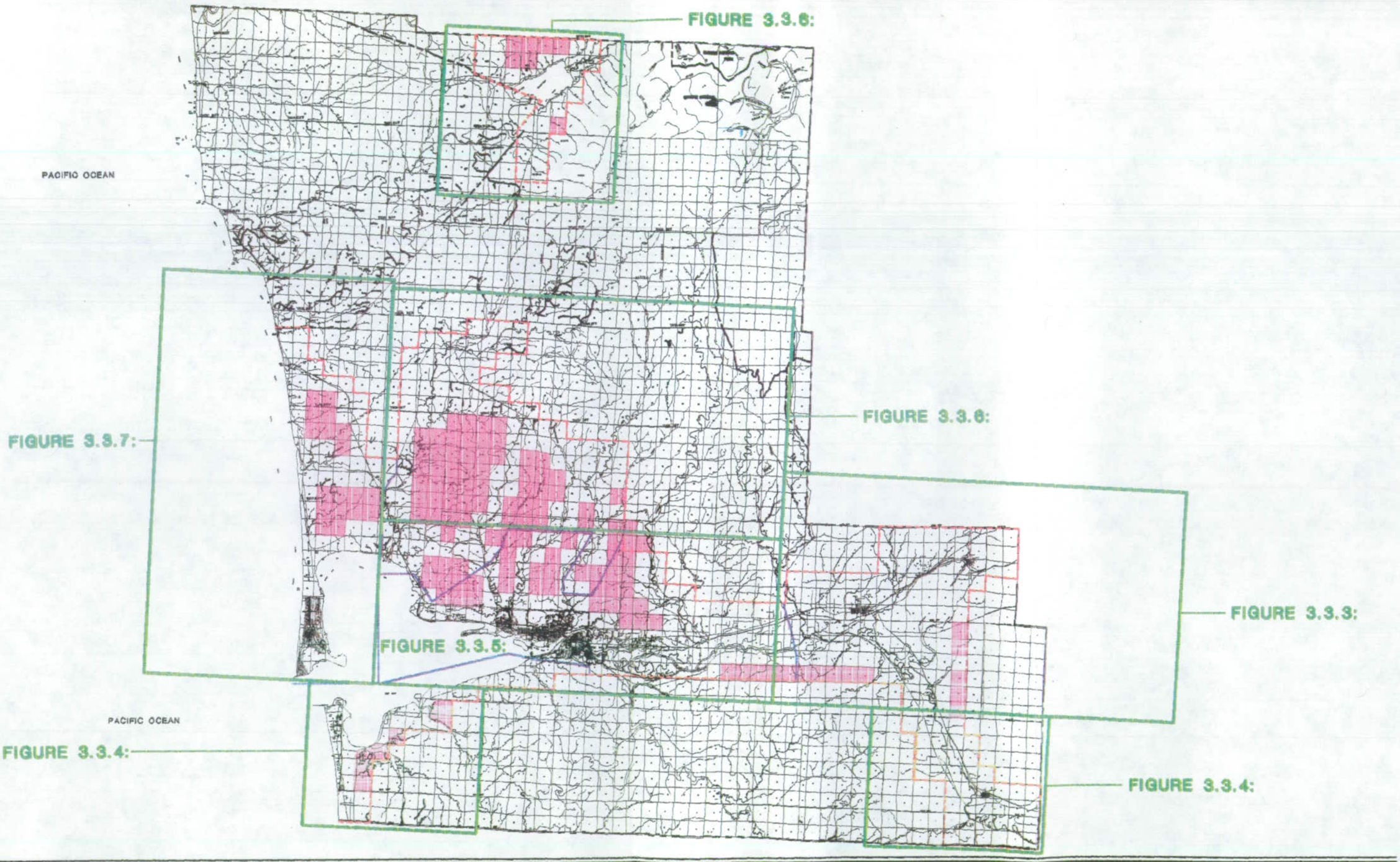
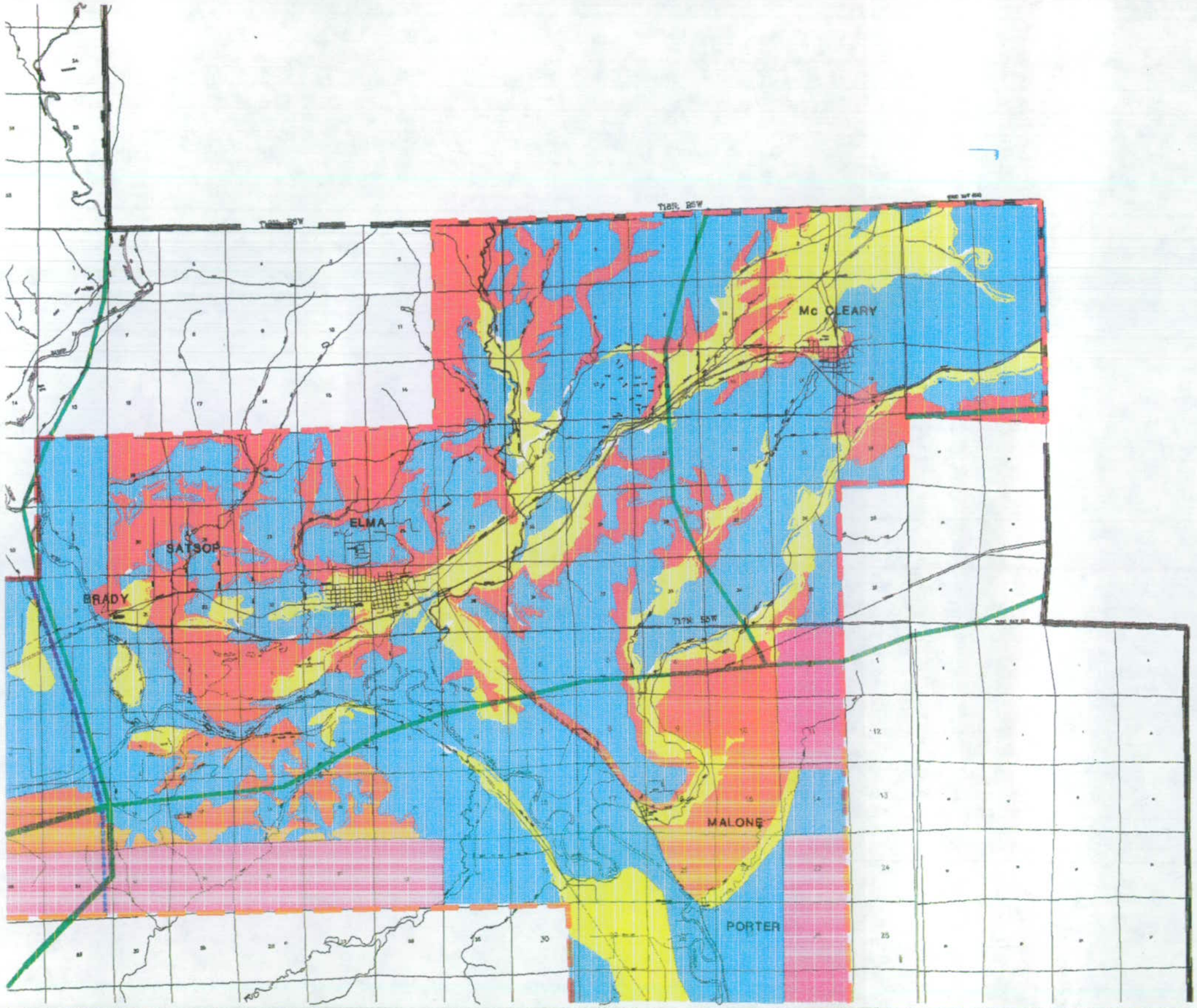


Figure 3.3.2 Index for Soil Maps



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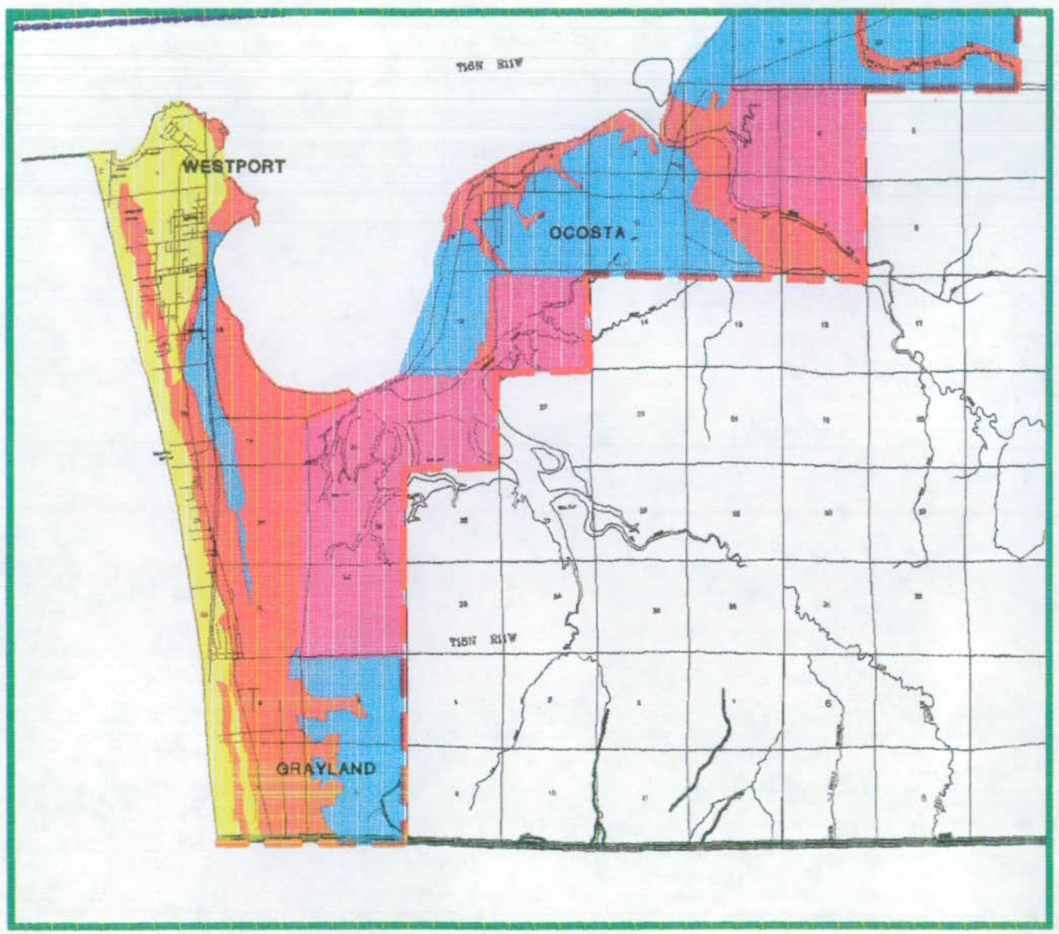
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SCALE IN FEET

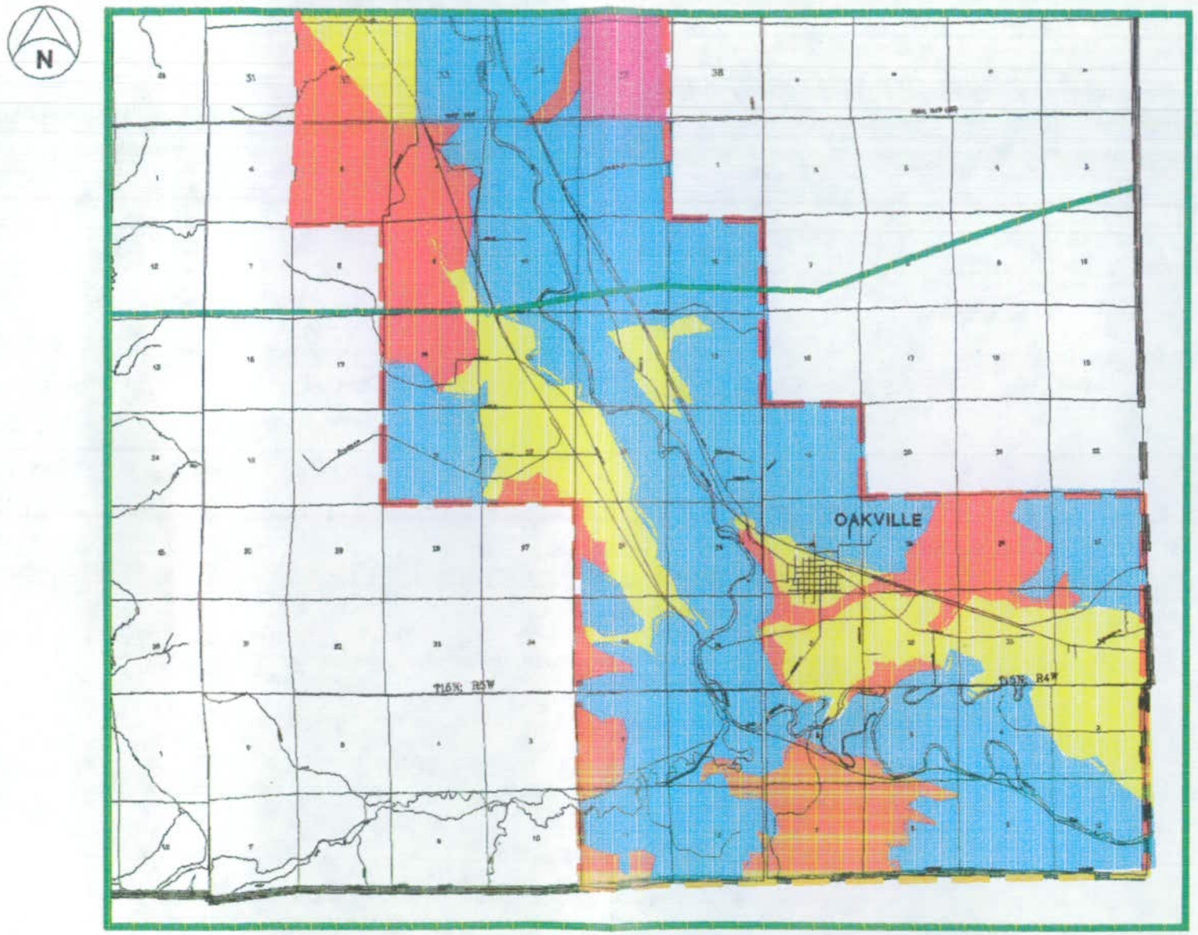
Legend

- STUDY AREA BOUNDARY
- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- LESS SIGNIFICANT SECTIONS
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

Figure 3.3.3: Soil Map
East County Sub-Area



SOUTH BEACH



EAST COUNTY

FILE: 334 JOB: 11-1558-02

Legend

- STUDY AREA BOUNDARY
- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- LESS SIGNIFICANT SECTIONS
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

0 4500 9000
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Figure 3.3.4: Soil Map
East County and
South Beach Sub-Areas

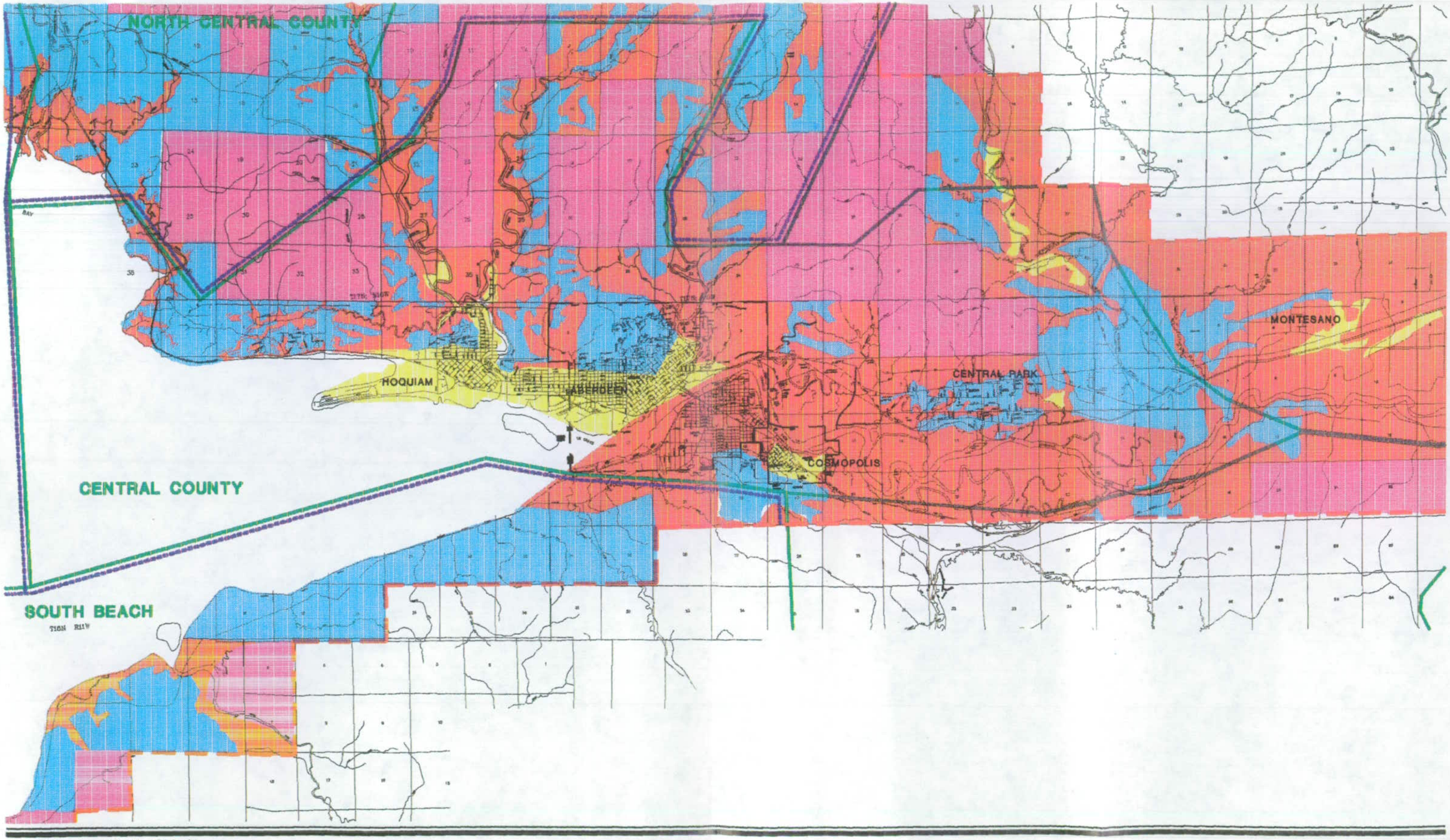


Figure 3.3.5: Soil Map
North Central County,
Central County and
South Beach Sub-Areas

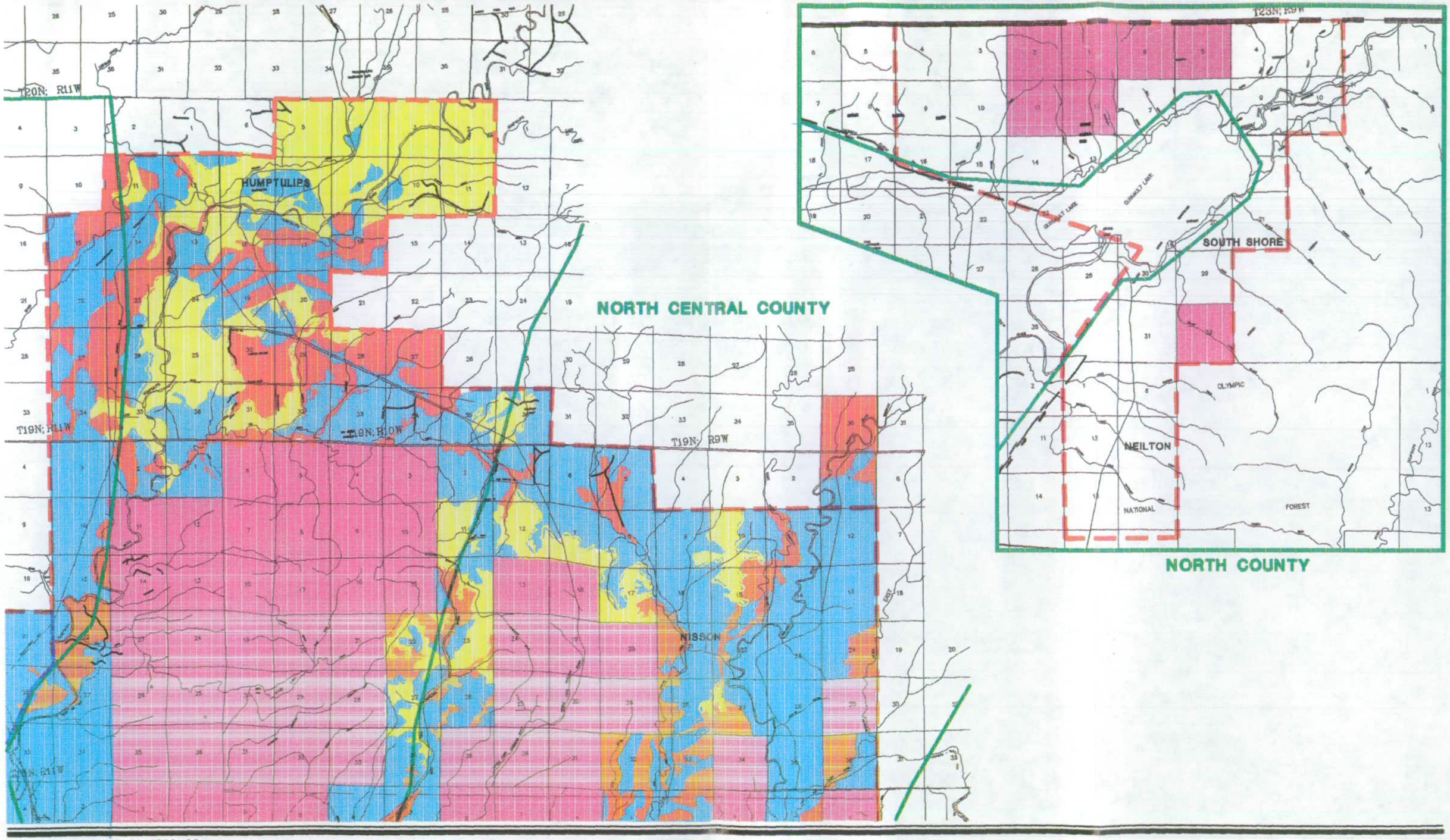
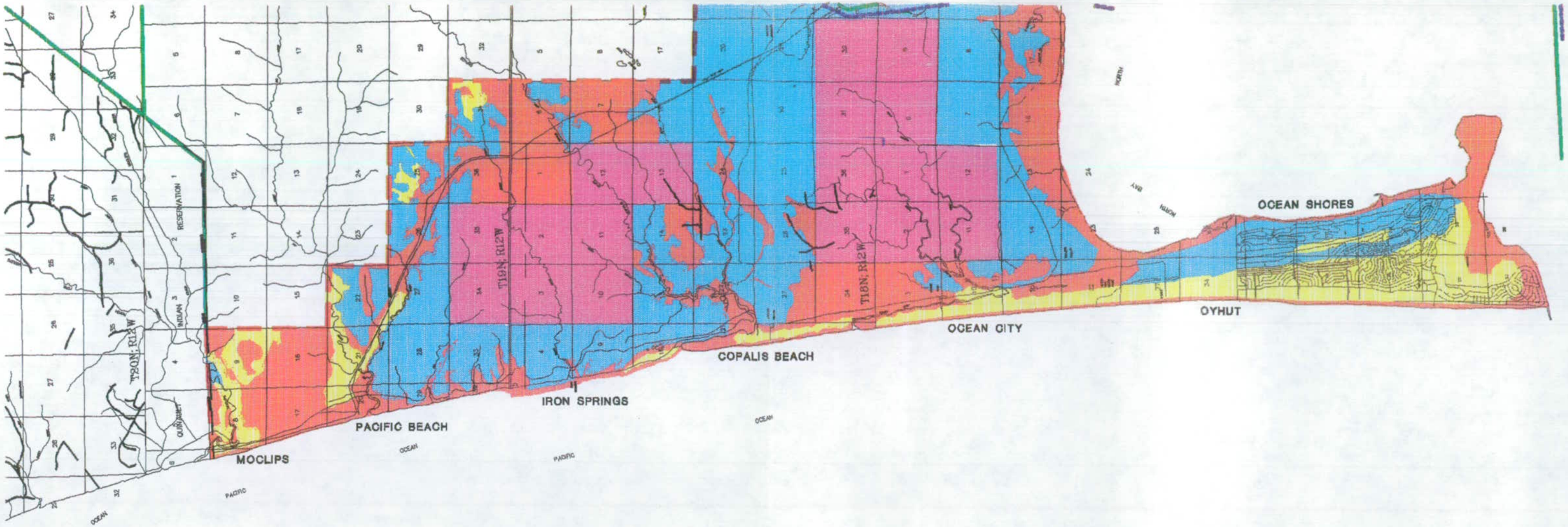


Figure 3.3.6: Soil Map North Central County and North County Sub-Areas



FILE: 337 JOB: 11-1558-02

N

0 4500 9000
SCALE IN FEET

Legend

- STUDY AREA BOUNDARY
- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- LESS SIGNIFICANT SECTIONS
- CENSUS TRACT BOUNDARY
- INTERMEDIATE STUDY AREA BOUNDARY

Figure 3.3.7: Soil Map
North Beach Sub-Area

Category 1 — Soil Suitable for a Conventional System

For this report a conventional system is one that uses disposal lines which are 2 feet deep, 3 feet wide and have 1 foot of drainrock. These lines are preceded by an appropriately sized septic tank. The soils are over 40 inches deep, well-drained, well-structured and have adequate permeability to accept septic tank effluent. No consideration was given to lot size or set back requirements. The slopes allowed by the County are 0 - 45 percent. The SCS defines most of their slope breaks at 30 percent. Therefore, those deep soils on slopes of 30 - 45 percent fall into Category 2. Table 3.3.2 below shows a list of soils suitable for conventional systems. However, certain other on-site conditions/deficiencies may affect suitability.

TABLE 3.3.2
SOILS SUITABLE FOR CONVENTIONAL SEPTIC TANK-DRAINFIELD SYSTEM

SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
5	Astoria silt loam, 3 to 8%	50	Ilwaco silt loam, 8 to 30%
6	Astoria silt loam, 8 to 30%	52	Ilwaco silt loam, cool, 1 to 8%
9	Bear Prairie silt loam, 0 to 3%	53	Ilwaco silt loam, cool, 8 to 30%
10	Boistfort silt loam, 1 to 8%	59	Knappton silt loam, 8 to 30%
11	Boistfort silt loam, 8 to 30%	65	Lebam silt loam, 1 to 8%
13	Buckpeak silt loam, 8 to 30%	66	Lebam silt loam, 8 to 30%
16	Bunker silt loam, 5 to 30%	67	Lebam silt loam, cool, 5 to 30%
19	Calawah silt loam, 1 to 8%	68	Le Bar silt loam, 1 to 8%
20	Calawah silt loam, 8 to 30%	69	Le Bar silt loam, 8 to 30%
21	Calawah silt loam, cool, 1 to 8%	73	Lytell silt loam, 8 to 30%
22	Calawah silt loam, cool, 8 to 30%	76	Melbourne silt loam, 1 to 8%
24	Cathlamet silt loam, 1 to 8%	77	Melbourne silt loam, 8 to 30%

TABLE 3.3.2
SOILS SUITABLE FOR CONVENTIONAL SEPTIC TANK-DRAINFIELD SYSTEM

SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
25	Cathlamet silt loam, 8 to 30%	80	Mopang silt loam, 5 to 30%
27	Centralia loam, 1 to 8%	83	Mopang silt loam, cool, 5 to 30%
28	Centralia loam, 8 to 30%	86	Murnen silt loam, 5 to 30%
30	Chehalis silt loam	88	Narel silt loam, 8 to 30%
31	Cloquato silt loam	92	Netarts fine sand, 3 to 12%
36	Elochoman silt loam, 1 to 8%	93	Newberg silt loam, 0 to 3%
37	Elochman silt loam, 8 to 30%	94	Newskah loam, 1 to 8%
40	Germany silt loam, 1 to 8%	95	Newskah loam, 8 to 30%
41	Germany silt loam, 8 to 30%	103	O'Brien silt loam, 1 to 15%
43	Grehelam silt loam, 0 to 3%	105	Olympic clay loam, 1 to 8%
45	Hoquiam silt loam, 1 to 8%	106	Olympic clay loam, 8 to 30%
46	Hoquiam silt loam, 8 to 30%	111	Palix silt loam, 8 to 30%
49	Ilwaco silt loam, 1 to 8%	114	Palix silt loam, cool, 8 to 30%
122	Raught silt loam, 5 to 30%	142	Tebo silt loam, 5 to 30%
128	Satsop silt loam, 1 to 8%	149	Vesta silt loam, 1 to 8%
130	Schneider very gravelly silt loam very deep, 8 to 30%	150	Vesta silt loam, cool, 5 to 30%
136	Squally gravelly silt loam, 5 to 30%	152	Vista silt loam, cool, 5 to 30%

Category 2 — Soils With Limitations Which Will Require a Alternative System.

These areas have soils which are too shallow, have a shallow restrictive layer, have a high water table, or are too rapid draining to meet standard rules for subsurface waste disposal. Once the limiting factor (or factors) are known, an appropriate on-site system can be designed. The site

conditions need to be carefully evaluated and an appropriate system needs to be used. County Ordinance #113 allows for some alternative systems but not others. These systems may be submitted for review and approval by the Department of Health and Grays Harbor for use as experimental systems.

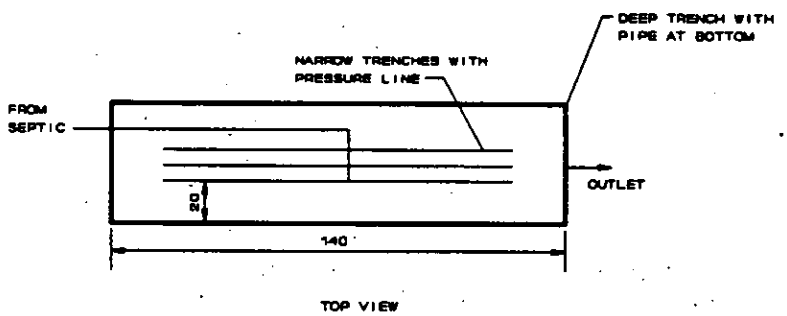
To place soils in Category 2, the specialized systems listed in Ordinance #113 were used, plus 5 additional techniques. These additional systems are not currently recognized by the County and the State of Washington, but are being used successfully by other states.

They include:

1. PERIMETER DRAIN SYSTEM

A tile drain is placed entirely around the drainfield to locally lower the water table. This technique is used on flat slopes. Small narrow trenches are used within the drained area to treat the effluent. Pressure dosing is usually required. Figure 3.3.8 is an illustration.

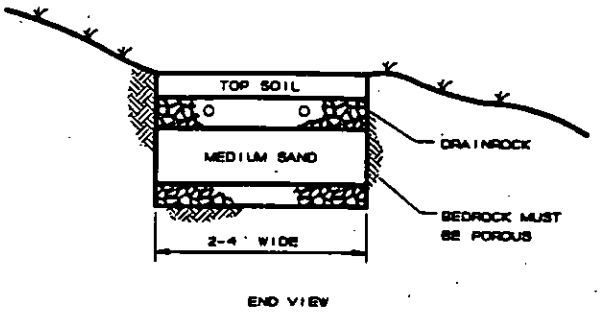
Figure 3.3.8 Perimeter Drain System



2. IN-TRENCH SAND FILTER

A bed of two feet of medium sand is pressure dosed. As the effluent passes through the sand, it is cleaned and continues its travel through an unlined trench. The filter and drainfield are one. This requires a porous soil and/or bedrock. In-trench Sand Filters are a low cost method for improving treatment in rapidly draining materials. Figure 3.3.9 is an illustration.

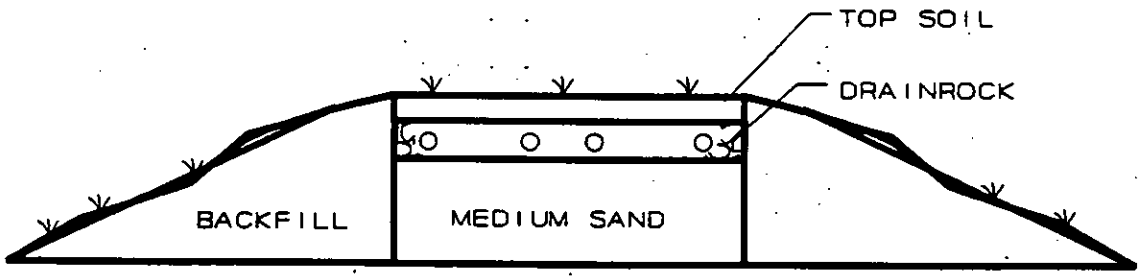
Figure 3.3.9 In-Trench Sand Filter



3. BOTTOMLESS SAND FILTER

A box of sand 20 feet by 20 feet is built above ground. The bottom of the filter is the drainfield. This technique is useful on gently sloping lots and small parcels. It is like a mound, but requires less material and costs less. The sand is contained on the sides by a wall. It can be used wherever a mound is used. Figure 3.3.10 is an illustration.

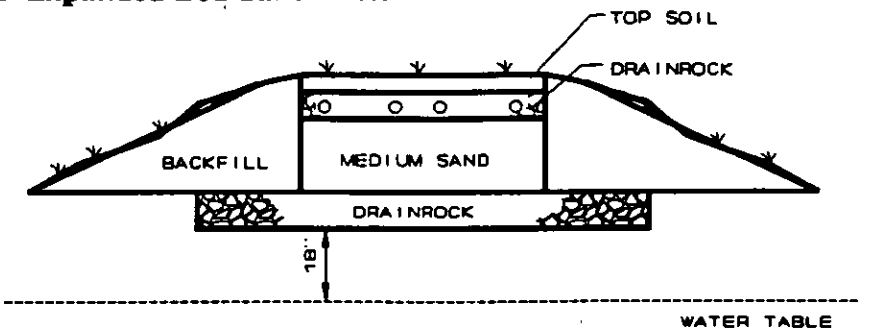
Figure 3.3.10 Bottomless Sand Filter



4. EXPANDED BED SAND FILTER

The base of the filter is larger than the filter, which allows a lower loading rate on the underlying soil. Figure 3.3.11 is an illustration.

Figure 3.3.11 Expanded Bed Sand Filter



6. NARROW TRENCHES

Many disposal trenches accept water faster through the sidewalls than the bottom. In these soils, narrow trenches are just as effective as wide trenches, and they are easier to build and will fit in a smaller area. Usually pressure distribution is used in conjunction with narrow trenches.

With specific alternative systems allowed in Ordinance #113, the following soils may be used for subsurface disposal. Tables 3.3.3(A), (B), (C), and (D) below illustrate these soil types.

TABLE 3.3.3

(A) SOILS WITH SEASONAL WATER BELOW 12 INCHES BUT ABOVE 24 INCHES[1]

SCS Map Symbol	Soil Description	SCS Map Symbols	Soil Description
2	Arta silt loam, 0 to 3%	154	Willapa silt loam, 1 to 15%
3	Arta silt loam, 3 to 15%	155	Willapa silt loam, 1 to 8%
4	Arta silt loam, 15 to 30%	156	Willapa silt loam, 8 to 30%
134	Skamo silt loam, 0 to 8%	158	Willapa silt loam, cool, 1 to 8%
139	Swern gravelly silt loam, 5	159	Willapa silt loam, cool, 8 to
141	Sylvia silt loam		

(1) These require sand filters and mounds.

TABLE 3.3.3
(B) EXCESSIVELY WELL-DRAINED SOILS

SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
23	Carstairs very gravelly loam, 1 to 8%	98	Nordby very gravelly loam, 1 to 8%
35	Dune Lands	99	Nordby very gravelly loam, 8 to 30%
48	Humptulips silt loam	99	Nordby very gravelly loam, 8 to 30%
55	Juno sandy loam	135	Spanaway very gravelly sandy loam, 1 to 8%
71	Lyre very gravelly loam sand, 0 to 8%	146	Udipsamments, level
		153	Westport fine sand, 3 to 10%

TABLE 3.3.3 (C) MODERATELY DEEP (20-40") WELL-DRAINED SOILS			
SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
32	Copalis silt loam, 1 to 8%	117	Papac gravelly silt loam, 1 to 8%
33	Copalis silt loam, 8 to 30%	118	Papac gravelly silt loam, 8 to 30%
56	Katula very cobbly loam, 5 to 30%	144	Traham very gravelly loam, 5 to 30%
62	Lates silt loam, 8 to 30%	147	Udorthents, level 1 to 8%

TABLE 3.3.3 (D) SOILS WITH A CEMENTED PAN	
SCS Map Symbols	Soil Description
72	Lyre Variant very gravelly sandy loam. Moderately deep, moderately well-drained.
109	Oyhut silt loam, 1 to 15%
110	Oyhut silt loam, cool, 1 to 15%

Category 3 — Unsuitable Soils

Soils in Category 3 are either too steep, have a water table that is too high, are too shallow for Categories 1 and 2, or are special land types such as quarries, beaches, and river wash. Category 3 also includes wetlands. Regulations and state policies prevent the unmitigated draining or filling of wetlands.

Category 3 soils are unsuitable for on-site waste disposal techniques as defined by Ordinance #113. Technology is becoming available to reduce or eliminate health threats for on-site disposal in some of the soils listed. For example, reverse osmosis can be used to produce a pathogen-free, nutrient-free, drinking water. The technology required to produce a virus-free discharge is complex and expensive. These systems also rely on homeowner maintenance for

protection of public health. It is assumed that development of Category 3 soils would not be allowed by Grays Harbor County without technology accepted by the Washington State Department of Health, Grays Harbor Health Department, an on-site management district, or a sewage collection and treatment facility that was reviewed and approved by the Washington Department of Ecology.

Tables 3.3.4(A), 3.3.4(B) and 3.3.4(C) summarize the referenced soil types and conditions.

TABLE 3.3.4

(A) SOILS ON SLOPES OVER 30% (SOME OF THESE SOILS ON SLOPES OF 30 - 40% WILL QUALIFY FOR CATEGORY MAP 1 AND 2)

SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
7	Astoria silt loam, 30 to 65%	87	Murnen silt loam, 30 to 65%
12	Boistfort silt loam, 30 to 65%	89	Narel silt loam, 30 to 65%
14	Buckpeak silt loam, 30 to 65%	90	Narel silt loam, 65 to 90% 8 to 30%
15	Buckpeak silt loam, 65 to 90%	96	Newskah loam, 30 to 65% 1 to 8%
17	Bunker silt loam, 30 to 65%	97	Newskah loam, 65 to 90%
18	Bunker silt loam, 65 to 90%	100	Nordby very gravelly loam, 30 to 65%
26	Cathlamet silt loam, 30 to 65%	107	Olympic clay loam, 30 to 65%
29	Centralia loam, 30 to 65%	112	Palix silt loam, 30 to 65%
34	Copalis silt loam, 30 to 65%	113	Palix silt loam, 65 to 90%
38	Elochoman silt loam, 30 to 65%	115	Palix silt loam, cool, 30 to 65%
42	Germany silt loam, 30 to 65%	116	Palix silt loam, cool, 65 to 90%
47	Hoquiam silt loam, 30 to 65%	119	Papac gravelly silt loam, 30 to 65%
51	Ilwaco silt loam, 30 to 65%	123	Raught silt loam, 30 to 65%
54	Ilwaco silt loam, cool, 30 to 65%	124	Raught silt loam, 65 to 90%

TABLE 3.3.4

(A) SOILS ON SLOPES OVER 30% (SOME OF THESE SOILS ON SLOPES OF 30 - 40% WILL QUALIFY FOR CATEGORY MAP 1 AND 2)

57	Katula very cobbly loam, 30 to 65%	131	Schneider very gravelly silt loam, very deep, 30 to 65%
58	Katula very cobbly loam, 65 to 90%	137	Squally gravelly silt loam, 30 to 65% 65%
60	Knappton silt loam, 30 to 65%	140	Swem gravelly silt loam, 30 to 65%
61	Knappton silt loam, 65 to 90%	143	Tebo silt loam, 30 to 65%
63	Lates silt loam, 30 to 65%	145	Traham very gravelly loam 65 to 90%
64	Lates silt loam, 65 to 90%	148	Umbric Dystrochrepts, very steep
70	Le Bar silt loam, 30 to 65%	151	Vesta silt loam, 30 to 65%
74	Lytell silt loam, 30 to 65%	157	Willapa silt loam , 30 to 70%
75	Lytell silt loam, 65 to 90%	160	Willapa silt loam, cool, 30 to 70%
78	Melbourne silt loam, 30 to 65%	164	Zenker silt loam, 30 to 65%
81	Mopang silt loam, 30 to 65%	165	Zenker silt loam, 65 to 90%
82	Mopang silt loam, 30 to 65%	167	Zyzyl gravelly loam, 30 to 65%
84	Mopang silt loam, cool, 30 to 65%	168	Zyzyl gravelly loam, 65 to 90%
85	Mopang silt loam, cool, 65 to 90%		

TABLE 3.3.4

(B) SOILS WITH A WATER TABLE ABOVE 12 INCHES FOR SOMEPART OF THE YEAR. (ON GENTLE SLOPES UNLESS OTHERWISE NOTE)

SCS Map Symbol	Soil Description	SCS Map Symbol	Soil Description
1	Aabab silt loam	127	Salzer silty clay
39	Fluvaguents, tidal	129	Sauvie silt loam
44	Halbert muck	132	Seastrand mucky peat 8 to 30%
79	Montesa silt loam	133	Seastrand Variant muck 1 to 8%
91	Nemah silty clay loam	138	Stimson silt loam
101	Norma sandy loam	161	Wishka silty clay loam
102	Nuby silt loam	162	Yaquina loamy fine sand
104	Ocosta silty clay loam	163	Zenker silt loam, 8 to 30%
108	Orcas peat	166	Zyzyl gravelly loam, 8 to 30%
125	Rennie silty clam loam		

TABLE 3.3.4 (C) UNSUITABLE MISC. LAND TYPES			
SCS Map Symbols	Soil Description	SCS Map Symbols	Soil Description
8	Beaches	121	Quarries
120	Pits	126	River Wash

Based on Figures 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.3.6 and 3.3.7, plus SCS information and a limited field review of the area, a brief overview of conditions in selected areas is given below.

Information shown on the Figures listed has been generalized based upon soils information only. Local site conditions, topography, drainage, local rainfall and groundwater conditions could affect actual approval or disapproval of a particular site for on-site wastewater disposal.

EAST SUBAREA

Chehalis Valley

From Brady to the Satsop River, the soils are generally well suited for wastewater disposal. The predominate soils are Chehalis and Cloquato. Both soils work well with conventional waste disposal.

Between Satsop and Elma there is a mixture of areas suitable for conventional waste disposal and Category 2 lands. From Elma to McCleary, soils are deep gravelly and excessively drained. Low-pressure distribution or in-trench sand filters may be needed in unsuitable soils.

The area between Elma and Oakville contains mostly soils suitable for conventional wastewater disposal systems. There are a few areas of Nemah and Salzer soils. Nemah is a very poorly drained clayey soil in depressional areas. Salzer is very poorly drained clay soil with little or no vertical permeability.

East of Oakville, Shamo and Spanaway are the most common soils. Shamo has a seasonal high water table. Spanaway is excessively drained gravels. Pressure distribution or in-trench sand filters may be needed.

CENTRAL SUBAREA

Chehalis Valley

Most of the lowlands between Aberdeen and Montesano are in Category 3 soils due to clayey soils with a high water table. Between Montesano and Brady, there are large areas of Category 3 due to high groundwater. There are small islands of Category 1 and 2 scattered throughout the area which would be acceptable for conventional or alternative methods of wastewater disposal.

Hoquiam

The lowlands adjacent to the Hoquiam River, the East Fork of the Hoquiam River and the Wishkah River are not suitable. The most common soil is Ocosta, which is characterized as poorly drained clayey soils. The uplands have soils well suited for wastewater disposal.

Central Park

This area has a mixture of well-suited soils and Category 3 soils. Careful soils work would be needed to determine which lots are suited for long-term use of on-site waste disposal. There is a large area east of Central Park that is well suited for on-site disposal. For areas experiencing problems, some type of alternative system such as a dewatering system or a sand filter may be feasible.

NORTH CENTRAL SUBAREA

This area is mostly rural. The upland areas contain soils well suited for on-site wastewater disposal. Valley bottoms contain soils with high water tables and soils that qualify as wetlands.

NORTH SUBAREA

Soils have not been mapped nor has data published by the Soil Conservation Service. Olympic National Park and the Forest Service have gathered some information. The soils around Lake Quinault have developed from glacial till and outwash. The depth of the soils vary from 2 to 20 feet deep. Textures of the top soil range from silty clay loam to gravelly loams. Subsoil textures are mostly cobbly sandy loam and very cobbly silty clay loam. Permeability of the subsoil is generally slow. Seasonal water tables can occur within a few feet of the surface. The area receives an average of 134 inches of rainfall. Soils around the lake are at the toe of long slopes. They must process the rain that falls on site plus some of the water moving laterally through the soils upslope.

There are areas with gravelly loam textures which can be used for on-site systems on the north side of the lake. A study completed in 1972 by the Forest Service concluded the south shore needed a community collection and disposal system. In 1974, a collection system was constructed and included an extended aeration plant with drainfield disposal. That system still serves most of the development along South shore. The Forest Service is currently developing a water/sewer plan update for the South Shore Area.

NORTH BEACH SUBAREA

This area includes Ocean Shores, Ocean City, Copalis Beach, Pacific Beach and Moclips.

Ocean Shores

Ocean Shores is a small community located on the Pacific Ocean just North of the entrance to Grays Harbor. This area is populated with vacation homes and facilities which support the Grays Harbor Tourist Industry. This community has small lots and some areas which have been filled and reshaped. The size of the lots and the occurrence of a seasonal water table indicates that a conventional drainfield may not be feasible as the community approaches higher density. The City

of Ocean Shores is currently developing a sewer master plan anticipated to be completed in December of 1991.

Ocean City

Ocean City is small community located approximately 5 miles north of Ocean Shores on the Pacific Coast. Like Ocean Shores, Ocean City also has small lots which can have a high seasonal water table. There are soils west of town which have acceptable characteristics for wastewater disposal. East of this community are areas of Calawah soils. These soils are deep, well-drained, silt loam soils well suited for on-site wastewater disposal.

Copalis Beach

Copalils Beach is approximately 2 to 3 miles north along the Pacific Coast from Ocean City. This is a small community located on several different soil types including Ocosta, Calawatt and Mopang soils.

Ocosta soil has a slow permeability and a high water table which is not conducive to on-site wastewater disposal. Large areas south and east of town exist which are well suited for on-site waste disposal using conventional methods. These areas consist of Calawah and Mopang soils which are deep, well-drained silty soils.

Pacific Beach

Pacific Beach is located approximately 6 to 8 miles from Copalis Beach on the Pacific Ocean. SCS soil maps indicate most of this community is built on Halbert Muck which is unsuitable for conventional waste disposal. A collection system and lagoon has been built to serve the existing community.

Northwest Corner of County

Most of the area close to the highway between Pacific Beach and Carlisle, and an area around Walker Road, fall into Category 3, Soils. The predominant soil is Wishkah. This is a clayey soil with a high water table not well suited for conventional wastewater disposal. The uplands away from the highway are generally well suited for wastewater disposal.

Neds Rock

Lowlands between Ocean Shores and Neds Rock are in Category 3 soils. The soils are Ocosta and Orcas. Ocosta soil is a poorly drained clayey soil. Orcas is a very poorly drained peat soil. An alternative to individual on-site drainfield will be needed in this area.

SOUTH BEACH SUBAREA

Bay City

Bay City is located in the Southwest area of the County. It is located on the South shore of Grays Harbor in South Bay. The area from Bay City to Ocosta generally has acceptable soils for on-site wastewater disposal. The deep well-drained Calawah soil is the most common soil in the area.

The area from Ocosta to Markham is considered Category 3 due to clayey soils with high water tables. Markham to Chapin is generally well-suited for conventional systems. The most common soil in the area is the Mopang soil.

Grayland

Grayland is located in the most south westerly corner of the County along the Pacific Coast. The low-lying areas around Grayland are generally in Category 3 due to high water tables in sands. However, the soils to the west have characteristics suitable for treatment and disposal of wastewater. Wastewater disposal in this area must meet shoreline management requirements. Alternative methods of wastewater disposal may have to be considered to provide adequate groundwater protection.

Westport

Westport is located on the Pacific Ocean just south of the entrance to Grays Harbor. The majority of the community is served by a sewage collection and treatment system. However, homes located in the vicinity of the City's drinking water wells are still using conventional septic tanks and drainfields. The City of Westport has applied for Department of Ecology financial assistance for a aquifer protection study.

3.3.2.1(c) Population Density and Proximity

A population density analysis was completed within certain areas of the County. The information gained was used to assess critical areas within the County relative to wastewater needs. These densely populated areas generated a greater volume of wastewater. This increase in wastewater production can impact groundwater or surface water from inadequate on-site wastewater disposal systems and/or soil characteristics that are unsuitable for on-site wastewater disposal. For example, sandy gravely soils may allow nitrates to be transmitted into underlying aquifers, and nitrate levels over 10 mg/L are in violation of drinking water standards. Clayey soil may cause surfacing of septic tank effluent which can cause environmental and public health concerns in adjacent surface water bodies and road side ditches.

Once areas of denser population are identified, they can be compared to results from soil surveys and water quality sampling to determine if wastewater disposal methods other than on-site should be considered. Identifying population groups is necessary when determining an area's wastewater volume, which must be conveyed to a treatment facility.

Population densities are given in Table 3.3.5 for specific portions of the study area. These areas were identified after going through a multiple-step analysis. Initially, a list was developed of

sections within the study area which were believed to have higher than usual population densities. These sections were located in the Aberdeen-Hoquiam, North Beach and South Shore census divisions. Information from the County Assessor's office was obtained on these sections containing the number of developed parcels and their usage classifications. Parcels containing a structure assessed at or above $2,000 were listed per section. These parcels are assumed to have the potential to produce wastewater.

The sections were then sorted and segregated according to the number of structures. Four categories were used as follows: those having greater than 300 structures, those having between 200 and 300 structures, those having between 100 and 200 structures and those having between 1 and 100 structures. These sections were color coded and are shown in Figures 3.3.12 and 3.3.13. This division and classification of parcels shows relative densities of population among the more populated sections within the County.

Population estimates were then prepared for each of these specific sections. The sections were first separated by their Census Division. Within each Census Division, clusters of sections were grouped into Designated Areas. From the 1980 Census, an estimate of the current value for the average number of people per housing unit was calculated. This was completed by taking the value from the 1980 Census and applying the appropriate rate of change for its Census Division between 1980 and 1990 (these rates can be found in Section 2.3.1 of this document). These housing rate values were multiplied by the number of housing units for these sections provided by the County Assessor. The results of these calculations are in Table 3.3.6.

TABLE 3.3.5
DENSITY PER EQUIVALENT SECTION

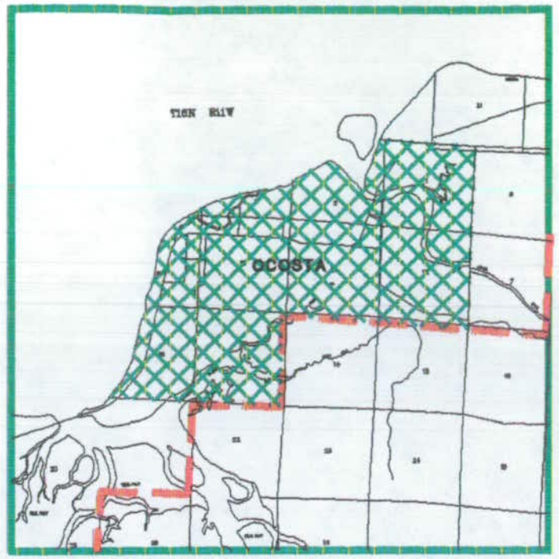
Section	Township	Range	Developed Parcels*	% Useable Land	Parcels Per Equivalent Section	
7	20	12	62	5	1,240	300+
20	20	12	202	30	673	
17	17	8	159	40	398	
8	17	8	351	100	351	
25	16	12	70	25	280	200-300
13	16	12	214	80	268	
27	18	12	132	50	264	
6	15	11	195	80	244	
31	16	11	221	100	221	
7	15	11	156	75	208	
16	17	8	155	80	194	100-200
9	17	8	158	100	158	
18	16	11	45	30	150	
4	17	7	135	100	135	
17	20	12	64	50	128	
27	19	12	124	100	124	
32	20	12	12	10	120	
5	17	7	117	100	117	
9	19	12	58	50	116	
10	18	12	84	80	105	
8	20	12	100	100	100	
19	18	5	99	100	99	1-100
22	19	12	97	100	97	
7	17	8	94	100	94	
31	18	6	88	100	88	
10	16	11	88	100	88	
10	17	8	83	100	83	
35	18	7	80	100	80	
22	18	12	40	50	80	
16	17	5	77	100	77	
3	18	12	61	80	76	
19	16	11	60	80	75	
28	19	12	75	100	75	
3	17	7	74	100	74	
33	19	12	3	5	60	
11	17	8	59	100	59	
9	16	11	21	40	53	
25	18	6	50	100	50	
10	18	9	47	100	47	
29	18	5	45	100	45	
15	18	9	44	100	44	
34	19	12	43	100	43	
28	17	5	43	100	43	
24	16	12	15	40	38	
20	18	5	33	100	33	
12	17	9	31	100	31	

TABLE 3.3.5
DENSITY PER EQUIVALENT SECTION

Section	Township	Range	Developed Parcels*	% Useable Land	Parcels Per Equivalent Section	
16	18	5	29	100	29	
31	18	5	29	100	29	
36	18	7	29	100	29	
11	16	11	28	100	28	
30	18	5	28	100	28	
35	19	9	28	100	28	
32	18	5	25	100	25	
24	18	6	24	100	24	
15	16	5	24	100	24	
23	16	5	23	100	23	
30	16	4	21	100	21	
2	18	9	21	100	21	
18	17	8	17	85	20	
16	19	12	8	40	20	
2	16	11	14	75	19	
22	17	5	19	100	19	
11	18	9	18	100	18	
15	18	12	13	80	16	
22	16	5	15	100	15	
31	16	4	14	100	14	
24	16	5	13	100	13	
14	16	5	11	100	11	1-100 (cont'd.)
2	17	9	11	100	11	
36	16	12	1	10	10	
12	18	6	10	100	10	
16	16	11	6	70	9	
30	16	11	9	100	9	
17	18	5	9	100	9	
12	16	11	8	100	8	
26	18	12	4	50	8	
4	19	12	5	60	8	
10	16	5	7	100	7	
26	19	9	7	100	7	
3	16	11	2	30	7	
5	15	11	6	100	6	
17	17	5	6	100	6	
13	18	6	4	100	4	
21	17	5	4	100	4	
8	18	5	4	100	4	
8	15	11	4	100	4	
7	18	5	3	100	3	
1	16	11	2	100	2	
26	16	11	2	100	2	
33	20	12	1	100	1	
15	16	11	0	100	0	

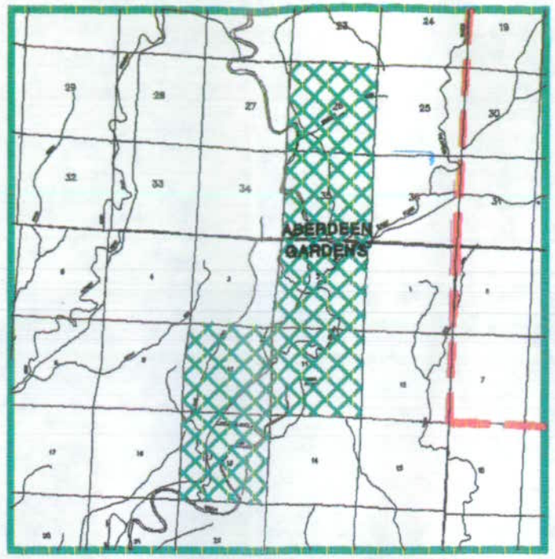
*Developed Parcels Are Those Having A Structure On It Assessed Over $2,000.

SOUTH BEACH SUB-AREA



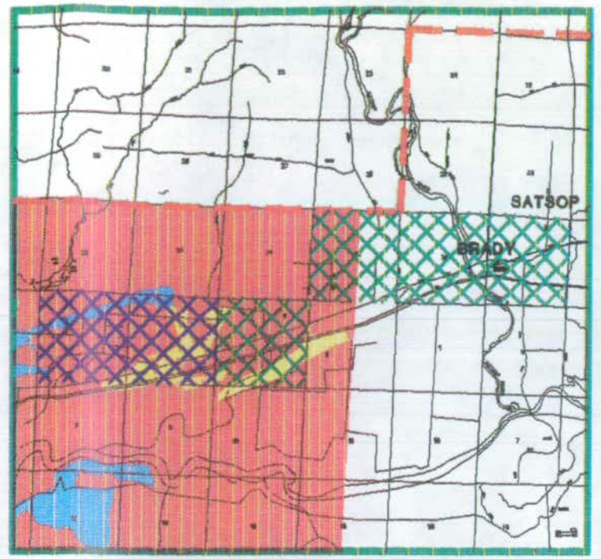
OCOSTA/MARKHAM AREA

NORTH CENTRAL SUB-AREA



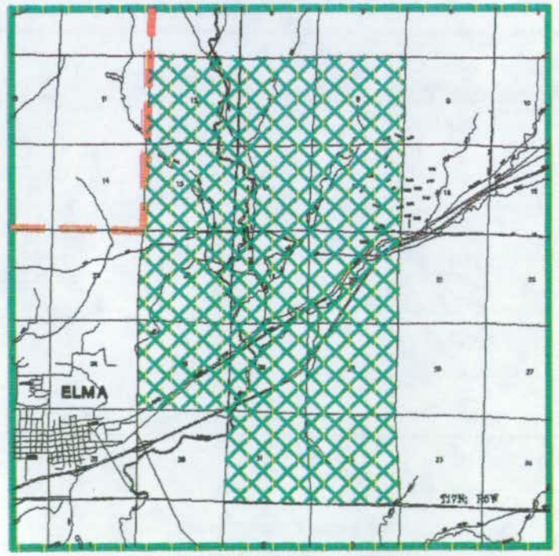
ABERDEEN GARDENS AREA

CENTRAL/EAST SUB-AREA



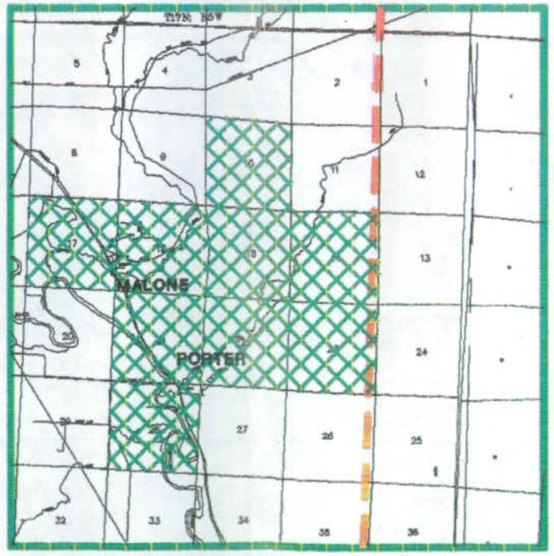
EAST MONTESANO AND
SATSOP/BRADY AREA

EAST SUB-AREA



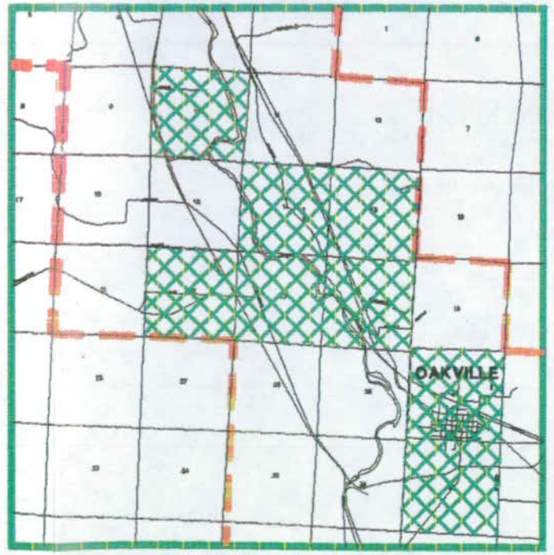
EAST ELMA AREA

EAST SUB-AREA



MALONE PORTER AREA

EAST SUB-AREA



OAKVILLE AREA

FILE: 3313 JOB: 11-1558-02

N

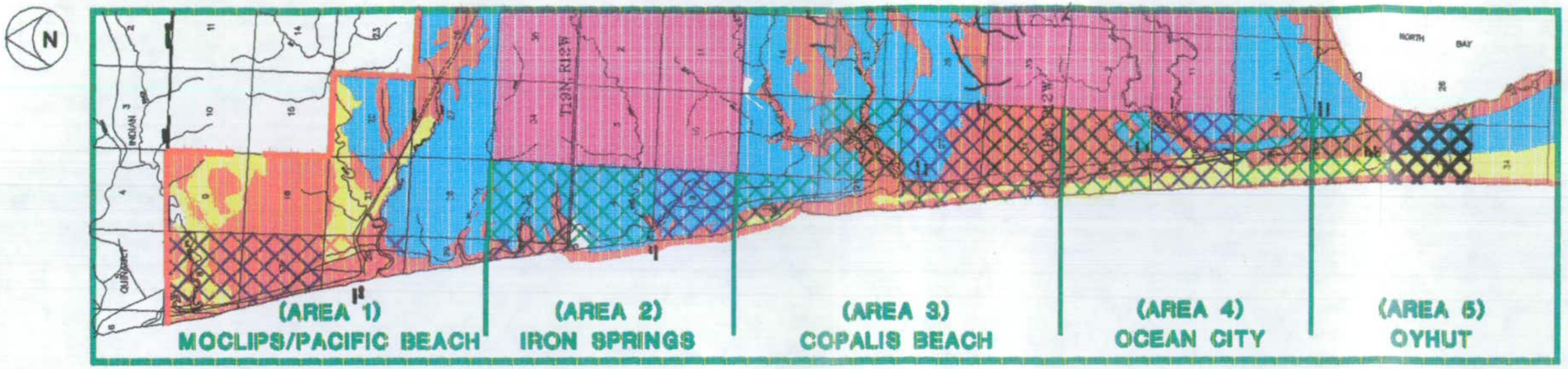
0 4500 9000
SCALE IN FEET

Legend

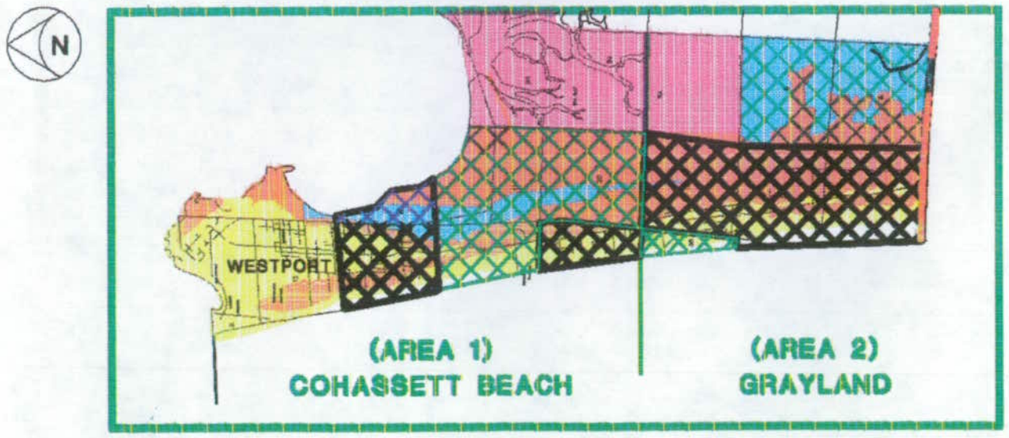
- STUDY AREA BOUNDARY
- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- 300+ BUILDINGS/SECTION
- 300-200 BUILDINGS/SECTION
- 200-100 BUILDINGS/SECTION
- 100-0 BUILDINGS/SECTION

Figure 3.3.12: Population Densities Within Specific Sections

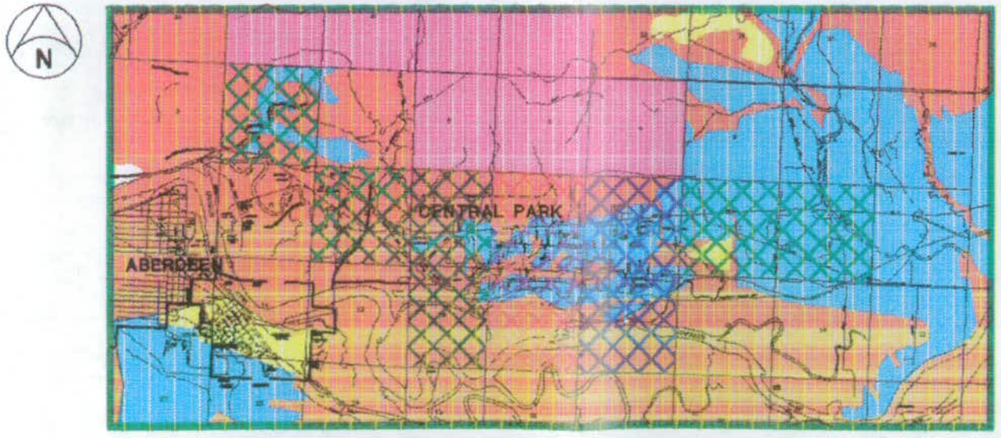
SUB-AREA NORTH BEACH



SUB-AREA SOUTH BEACH



SUB-AREA ABERDEEN/HOQUIAM



CENTRAL PARK (AREA 1)

FILE: 3314 JOB: 11-1558-02

Legend

- STUDY AREA BOUNDARY
- CATEGORY 1
- CATEGORY 2
- CATEGORY 3
- 300+ BUILDINGS/SECTION
- 300-200 BUILDINGS/SECTION
- 200-100 BUILDINGS/SECTION
- 100-0 BUILDINGS/SECTION

Figure 3.3.13: Population Densities Within Specified Sections

TABLE 3.3.6

POPULATION ESTIMATE PER SECTION WITHIN STUDY AREA

Section	Township	Range	Census Division	People/Housing Unit (from 1980 Census) (1)	Housing Units	# People (Estimate)	Area Designation	Total Area Population	% of Census Tract (1990)
17	17	8	Aberdeen-Hoquiam	2.05	154	316	1	2,167	49.1
9	17	8	Aberdeen-Hoquiam	2.05	154	316	1		
12	17	9	Aberdeen-Hoquiam	2.05	24	49	1		
2	17	9	Aberdeen-Hoquiam	2.05	8	16	1		
11	17	8	Aberdeen-Hoquiam	2.05	57	117	1		
10	17	8	Aberdeen-Hoquiam	2.05	74	152	1		
7	17	8	Aberdeen-Hoquiam	2.05	89	182	1		
8	17	8	Aberdeen-Hoquiam	2.05	330	677	1		
18	17	8	Aberdeen-Hoquiam	2.05	16	33	1		
16	17	8	Aberdeen-Hoquiam	2.05	151	310	1		
Total for Area								2,167	49.1
20	20	12	North Beach	1.79	161	288	1	594	27.9
17	20	12	North Beach	1.79	53	95	1		
7	20	12	North Beach	1.79	42	75	1		
8	20	12	North Beach	1.79	76	136	1		
32	20	12	North Beach	1.79	11	20	2	127	6.0
33	20	12	North Beach	1.79	1	2	2		
4	19	12	North Beach	1.79	2	4	2		
9	19	12	North Beach	1.79	57	102	2		
27	19	12	North Beach	1.79	111	199	3	553	26.0
34	19	12	North Beach	1.79	40	72	3		
22	19	12	North Beach	1.79	93	166	3		
28	19	12	North Beach	1.79	59	106	3		
16	19	12	North Beach	1.79	5	9	3		
33	19	12	North Beach	1.79	1	2	3		
3	18	12	North Beach	1.79	48	86	4	209	9.8
15	18	12	North Beach	1.79	4	7	4		
10	18	12	North Beach	1.79	65	116	4		
22	18	12	North Beach	1.79	38	68	5	301	14.1
27	18	12	North Beach	1.79	127	227	5		
26	18	12	North Beach	1.79	3	5	5		
Total for Area								1,785	83.8
18	16	11	South Shore	1.93	40	77	1	703	31.9
24	16	12	South Shore	1.93	13	25	1		
19	16	11	South Shore	1.93	54	104	1		
30	16	11	South Shore	1.93	8	15	1		

TABLE 3.3.6
POPULATION ESTIMATE PER SECTION WITHIN STUDY AREA

Section	Township	Range	Census Division	People/Housing Unit (from 1980 Census) (1)	Housing Units	# People (Estimate)	Area Designation	Total Area Population	% of Census Tract (1990)
13	16	12	South Shore	1.93	190	367	1		
25	16	12	South Shore	1.93	59	114	1		
8	15	11	South Shore	1.93	1	2	2	921	41.8
5	15	11	South Shore	1.93	6	12	2		
36	16	12	South Shore	1.93	0	0	2		
6	15	11	South Shore	1.93	151	291	2		
31	16	11	South Shore	1.93	211	407	2		
7	15	11	South Shore	1.93	108	208	2		
1	16	11	South Shore	1.93	1	2	3	293	13.3
2	16	11	South Shore	1.93	9	18	3		
3	16	11	South Shore	1.93	2	4	3		
9	16	11	South Shore	1.93	19	37	3		
10	16	11	South Shore	1.93	81	157	3		
11	16	11	South Shore	1.93	25	49	3		
12	16	11	South Shore	1.93	6	12	3		
15	16	11	South Shore	1.93	0	0	3		
16	16	11	South Shore	1.93	5	10	3		
26	16	11	South Shore	1.93	2	4	3		
Total for Area								1,917	87.0
30	16	4	Oakville	2.73	18	50	1	285	27.4
31	16	4	Oakville	2.73	11	31	1		
14	16	5	Oakville	2.73	8	22	1		
15	16	5	Oakville	2.73	19	52	1		
22	16	5	Oakville	2.73	15	41	1		
23	16	5	Oakville	2.73	21	58	1		
24	16	5	Oakville	2.73	11	31	1		
Total for Area								285	27.4
16	17	5	Malone	2.90	82	238	1	405	29.6
17	17	5	Malone	2.90	3	9	1		
21	17	5	Malone	2.90	2	6	1		
22	17	5	Malone	2.90	17	50	1		
28	17	5	Malone	2.90	35	102	1		
Total for Area								405	29.6
3	17	5	Wynoochee	2.72	67	187	1	1,078	36.5
4	17	5	Wynooche	2.72	129	351	1		
5	17	5	Wynoochee	2.72	116	316	1		

TABLE 3.3.6

POPULATION ESTIMATE PER SECTION WITHIN STUDY AREA

Section	Township	Range	Census Division	People/Housing Unit (from 1980 Census) (1)	Housing Units	# People (Estimate)	Area Designation	Total Area Population	% of Census Tract (1990)
35	18	5	Wynoochee	2.72	82	224	1		
Total for Area								1,078	36.5
7	18	5	Elma	2.59	2	6	1	932	26.3
8	18	5	Elma	2.59	3	8	1		
16	18	5	Elma	2.59	28	73	1		
17	18	5	Elma	2.59	7	19	1		
19	18	5	Elma	2.59	95	247	1		
20	18	5	Elma	2.59	34	88	1		
29	18	5	Elma	2.59	39	101	1		
30	18	5	Elma	2.59	25	65	1		
31	18	5	Elma	2.59	26	68	1		
32	18	5	Elma	2.59	22	57	1		
12	18	6	Elma	2.59	9	24	1		
13	18	6	Elma	2.59	2	6	1		
24	18	6	Elma	2.59	19	50	1		
25	18	6	Elma	2.59	46	120	1		
31	18	6	Elma	2.59	81	210	2	273	7.7
36	18	7	Elma	2.59	24	63	2		
Total for Area								1,205	34.0
2	18	9	Wishkah	3.10	15	47	1	409	26.5
10	18	9	Wishkah	3.10	40	124	1		
11	18	9	Wishkah	3.10	12	38	1		
15	18	9	Wishkah	3.10	42	131	1		
26	19	9	Wishkah	3.10	4	13	1		
35	19	9	Wishkah	3.10	18	56	1		
Total for Area								409	26.5

3.3.2.1(d) Documented On-Site Concerns

Information was gathered from various sources to determine whether improper on-site disposal or area-wide drainfield failures were occurring within the County. Areas reviewed were one square mile or larger, rather than single septic tank and drainfields. The information gathered consisted of past repair records generated from the database provided at the Grays Harbor Health Department, a well and ditch survey conducted in Grays Harbor County in the summer of 1990 by the Environmental Health Division for Central Park, Grayland, Ocean Shores, and East County, water quality information generated by Geohydrologist Richard Rongey and a sewage survey of the Pacific Beach area.

Data provided on past repairs of on-site drain fields were provided by Grays Harbor County Health Department. The information provided was listed by township, range and section and the year which the repair on the on-site disposal system was made. This information was contained within the County's database of permits for on-site system installations and repairs. The information provided was for those areas within the County which historically have a higher rate of repair. A summary of the number of repairs per section has been included in Table 3.3.7(b). This information has also been reorganized in Table 3.3.7(a), which shows only those sections with greater than 100 structures sorted in order of magnitude for rate of repair.

In the summer of 1990, Grays Harbor Environmental Health Division conducted a well and ditch survey in the areas of Central Park, Grayland, Ocean Shores and East County. The purpose of this survey was to sample drinking water wells and roadside ditches for nitrate levels and fecal coliform counts as indicators of failing on-site systems.

The results of the testing indicate that there may be contamination in roadside ditches in the Central Park area. Fecal coliform counts in the Central Park area ranged as high as 160,000 microorganisms/100 ml. This count is substantially greater than the 230 microorganisms/100 ml allowed by EPA for land application of effluent or 200 microorganisms/100 ml allowed by DOE for direct discharge to a surface water source. Results at Grayland revealed that two samples were higher than those levels allowed by DOE or EPA for land application or direct surface water discharge. The results in the Ocean Shores sample were in line with the limitations set by EPA for land application of treated effluent at 240 microorganisms/100 ml, and the majority of the results in Ocean Shores were well below 25 microorganisms/100 ml. It should be noted that without full understanding of the exact circumstance around each test, the results may be inconclusive. Livestock or native vegetation can produce similar results in both nitrate and fecal sampling if they are within the immediate vicinity of the test.

In well sampling the Grayland, Central Park and East County areas, all nitrate levels were well below the drinking water standards of 10 mg/L and there is no indication of a health threat to any of the drinking water supplies tested.

The information collected on drainfield repairs and the well and ditch survey conducted in the summer of 1990 are both included in Appendix C. It is also important to realize that information provided on nitrates is expressed in the form of NO_3. This expression of nitrates is different from the drinking water standards which express nitrates as N. To have a proper understanding of how the well survey compares with drinking water standards, one must divide the nitrate levels by 4.4 and then compare that reading with the drinking water standard level of 10 mg/L.

A hydrogeologic survey was conducted as part of this Phase I study. That study involved determination of water quantity and water quality for areas within the County based on a representative sample of the total wells. Information for approximately 1800 wells was collected from State Department of Ecology records, and 80 chemical analyses from the State Department of Health and U.S. Geological Survey. From this information, field locations were established for approximately 175 wells and 60 were sampled and tested for water quality. This information is contained within Section 2.2.5.2 and backup documentation in Appendix A. Of the 77 wells tested, there were no indications of health risks from levels of nitrate (expressed as N) in the range of 10 mg/L.

Included in Appendix C, are two memoranda regarding on-site sewage failures at the Round Tree Addition to Pacific Beach. Both memoranda discuss visual observation of failing drain fields in the subdivision. It is apparent that either the soil conditions in the area or the methodology of sewage disposal have resulted in a failure rate of approximately 50% of the total homes. It has been further verified through the sampling of roadside ditches, samples which resulted in fecal coliform counts of over 16,000 organisms per 100 ml were a direct discharge situation.

Due the documentation from this specific area, there is a strong indication that health concerns do exist.

TABLE 3.3.7(A)
GRAYS HARBOR COUNTY UTILITY COMPREHENSIVE PLAN

Five or More On-Site Drainfield Repairs/Section

100 or More Structures/Section

Sect.	Township	Range	# Of On-Site Repairs	# Of Existing Structures	Recording Period		% Repair/ Structure/Year	Location
9	17	8	56	158	1970	1988	1.969	Central Park
7	15	11	70	156	1967	1990	1.951	Grayland
27	19	12	28	124	1967	1979	1.882	Copalis Beach
6	15	11	64	195	1967	1990	1.427	Grayland
8	20	12	30	100	1967	1989	1.364	Moclips
16	17	8	31	155	1968	1987	1.053	Central Park
17	17	8	32	159	1970	1990	1.006	Central Park
13	16	12	42	214	1967	1990	0.853	Westport
8	17	8	55	351	1962	1990	0.560	Central Park
27	18	12	18	132	1960	1986	0.524	Oyhut
20	20	12	16	202	1970	1989	0.417	Pacific Beach
31	16	11	18	221	1968	1990	0.370	Grayland

TABLE 3.3.7(b)
GRAYS HARBOR COUNTY UTILITY COMPREHENSIVE PLAN

Five or More On-Site Drainfield Repairs/Section

Sect.	Township	Range	# of On-Site Repairs	# of Existing Structures	Recording Period	% Repair/ Structure/Year	Location
7	20	12	8	62	1970-1990	0.645	Moclips
8	20	12	30	100	1967-1989	1.364	Moclips
17	20	12	21	64	1969-1986	1.930	Sunset Beach
20	20	12	16	202	1970-1989	0.417	Pacific Beach
4	19	12	7	5	1967-1983	8.750	Iron Springs
9	19	12	6	58	1979-1989	1.034	Iron Springs
22	19	12	12	97	1967-1990	0.538	Copalis Beach
27	19	12	28	124	1967-1979	1.882	Copalis Beach
28	19	12	14	75	1968-1990	0.848	Copalis Beach
34	19	12	5	43	1977-1990	0.894	Copalis Beach
3	18	12	25	61	1962-1989	1.518	Ocean City
10	18	12	7	84	1968-1981	0.641	Ocean City
22	18	12	18	40	1972-1990	2.500	Oyhut
27	18	12	18	132	1960-1986	0.524	Oyhut
7	17	8	18	94	1969-1986	0.957	Central Park
8	17	8	55	351	1962-1990	0.560	Central Park
9	17	8	56	158	1970-1988	1.969	Central Park
16	17	8	31	155	1968-1987	1.053	Central Park
17	17	8	32	159	1970-1990	1.006	Central Park
18	17	8	5	17	1971-1987	1.838	Central Park
12	17	9	12	31	1963-1985	1.760	Central Park
11	17	9	12	N/A	1953-1986	N/A	Central Park
18	16	11	11	45	1974-1990	1.528	Laidlaw
19	16	11	18	60	1967-1989	1.365	Laidlaw
31	16	11	18	221	1968-1990	0.370	Grayland
13	16	12	42	214	1967-1990	0.853	S of Westport
24	16	12	8	15	1968-1990	2.424	S of Westport
25	16	12	16	70	1968-1989	1.088	S of Westport
6	15	11	64	195	1967-1990	1.427	Gray Land
7	15	11	70	156	1967-1990	1.951	Gray Land

3.3.2.2 Publicly Owned Treatment And Transmission Facilities

3.3.2.2(a) Regulations, Criteria, Policies

All publicly owned treatment facilities in Grays Harbor County currently discharge treated effluent to surface water sources. The only exception is a treatment facility owned and operated by the Forest Service on the south shore of Lake Quinault.

All facilities that utilize surface water discharge are required to meet specified requirements depending on the point of discharge into the environment. These requirements are defined by the Washington State Department of Ecology (WDOE) pursuant to the Washington Administrative Code (WAC) Chapter 173.

Two specific treatment requirements are currently in effect:

- Treated effluent shall meet the domestic wastewater facility discharge standards specified in WAC 173-221.
- The water quality of the receiving surface water cannot exceed specified water quality standards in WAC 173-201 outside an authorized dilution zone adjacent to or surrounding the effluent discharge.

For those plants currently required to meet secondary treatment requirements as specified in WAC 173-221-040, except as allowed under WAC 173-221-050, discharge to surface waters shall meet the following standards:

BOD_5, 30-day average:	300 mg/L or 85 percent removal, whichever is greater
BOD_5, 7-day average:	45 mg/L
TSS, 30-day average:	30 mg/L or 85 percent removal, whichever is greater
TSS, 7-day average:	45 mg/L
Fecal Coliform, monthly mean:	200 organisms/100 milliliters
Fecal Coliform, weekly mean:	400 organisms/100 milliliters
Ph:	Between 6.0 and 9.0

In WAC 173-221-050, however, alternative domestic wastewater facility discharge standards are available and may be applicable to the treated effluent from a facility. Under this rule, alternative discharge standards for waste stabilization ponds (lagoon treatment), which have less than a two million gallon per day design capacity, are specified as follows:

BOD_5, 30-day average:	45 mg/L or 65 percent removal, whichever is greater
BOD_5, 7-day average:	65 mg/L
TSS, 30-day average:	45 mg/L or TSS removal achievable, whichever is greater
TSS, 7-day average:	65 mg/L
Fecal Coliform, monthly mean:	200 organisms/100 milliliters
Fecal Coliform, weekly mean:	400 organisms/100 milliliters
Ph:	Between 6.0 and 9.0

The WDOE has also established classifications for the quality of various fresh and marine waters in the State (WAC 173-201). The classifications are AA-Extraordinary, A-Excellent, B-Good and C-Fair. Surface water classifications for Grays Harbor are included in Table 3.4.1.

In addition to the State water quality standards, EPA promulgates criteria for the protection of aquatic life from toxic compounds, and WDOE has established guidelines for initial dilution zones. The criteria for toxicants are provided in USEPA's Quality Criteria for Water, 1986. The current dilution zone guidelines (WDOE 1985) recommend a minimum initial dilution of 100:1 (river discharge to effluent flow ratio) for wastewater discharges at the 7-day, 10-year low-flow condition.

The WDOE is currently drafting new requirements for dilution zones. The new requirements are expected to be adopted into the water quality standards by December 1991. Under the new standards, chronic criteria for toxicants must be met at the authorized dilution zone boundary, and acute criteria must be met a much shorter distance from the outfall. The effluent design criteria that are most likely to be affected by the new dilution zone requirements for toxicants are ammonia and chlorine residual. The Department of Ecology, as a policy, imposes the standards as the current NPDES permit expires. Therefore, many of the plants may be subjected to modification at the time the requirement is imposed. Actual impacts to a specific treatment facility cannot be established without specific background water quality data from the receiving surface water body.

The Treatment Facility owned and operated by the Forest Service on the south shore of Lake Quinault is a federal facility and is not subject to EPA standards.

Many of the treatment facilities have not yet been subjected to the new water quality standards specified in WAC 173-201.

3.3.2.2(b) Treatment Plant Capacity/Limitations

A total of eight (8) wastewater systems are included in the planning area. These publicly owned wastewater treatment systems are outlined in Table 3.3.8. Plant flow schematics and operating data graphs are included for each plant in Appendix C.

TABLE 3.3.8
WASTEWATER TREATMENT PLANT INVENTORY

Name	Treatment Type	Design Flow, mgd	Receiving Water
Aberdeen	Activated Sludge	4.75	Chehalis River/Grays Harbor
Elma	Aerated Lagoon	0.48	Chehalis River
Hoquiam	Oxidation Ditch	3.3	Chehalis River/Grays Harbor
McCleary	Trickling Filter	0.25	Wildcat Creek
Ocean Shores	Aerated Lagoon	6.7	Grays Harbor
Pacific Beach	Non-Aerated Lagoon	0.059	Joe Creek
Westport	Oxidation Ditch	0.8	Halfmoon Bay
Montesano	Aerated Lagoon	0.36	Chehalis River

The table identifies the treatment type, average annual design flow in million gallons per day (mgd) and effluent receiving water for each plant. The following text discusses existing plant capacities in more detail.

City of Aberdeen

The City of Aberdeen operates a wastewater treatment plant on State Street in Aberdeen. It serves 19,545 persons with a service area of 2,033 acres. Treated effluent is discharged by outfall into the Chehalis River. The plant uses the activated sludge process for liquid stream treatment, anaerobic digestion and land disposal of dewatered sludge. Current facilities were put into service in 1981.

A summary of plant operating data is presented in Table 3.3.9. The average flow in 1990 was 4.74 mgd compared to an average annual design flow of 4.70 mgd. The apparent current rate of Infiltration/Inflow (I/I) averaged 1,563 gallons per acre daily (g/acd) compared to an apparent design rate of 750 g/acd. This unexpectedly high I/I flow appears to be responsible for high current average flows. The attached operating data graph shows the prominent increase in flows which occurs during the wet weather months of October through March. Winter flows averaged 6 to 7 million gallons per day (mgd) with summer flows averaging 3 mgd. The current maximum month permit limit for flow is 8.5 mgd.

Effluent Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) averaged 8 and 4 mg/L, respectively, compared to permit limits of 30 mg/L BOD and 30 mg/L TSS for the maximum month in the year and 45 mg/L BOD and 45 mg/L TSS for the maximum week average. Reported average fecal coliform organism count averaged 62 mg/L BOD and 100 mg/L TSS compared to a permit limit of 200 mg/L BOD and 100 mg/L TSS.

Unit process design data are shown in Table 3.3.10. It is seen that while current flows exceed design average rates, loadings are far less than design. Compared to conventional design criteria for unit processes included in the plant, the current plant load is at less than 50 percent of its design capacity on an organic loading basis. Several unit processes are relatively more aggressively designed than the conventional criteria. It appears from available information that plant capacity will be impacted by peak design flow of 15.0 mgd prior to organic loading limitations.

TABLE 3.3.9

OPERATING DATA SUMMARY
CITY OF ABERDEEN, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	4.74	2.80	7.50
Peak Flow, mgd	1.21	N/A	14.51
Inf BOD, mg/L	74.67	42.00	120.00
Inf TSS, mg/L	71.17	33.00	117.00
Prim BOD, mg/L	20.09	6.30	43.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	7.89	4.30	15.60
Eff TSS, mg/L	3.96	2.40	10.00
Fecals, mpn/100ml	62.00	9.00	168.00

TABLE 3.3.10

CITY OF ABERDEEN, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	4.74	4.70	4.70
General	Ave. TBOD, ppd	2,625	6,09	6,509
Bar Screens	Velocity, fps	3.69	3.81	5.00
Primary Sed	Overflow, gpd/sf	2,186	2,258	3,000
Aeration	Unit Load, ppd/kcf	5.63	31.14	50.00
Secondary Sed	Overflow, gpd/sf	1,279	1,321	1,200
Secondary Sed	Sol Load, ppd/sf	15	16	27
Disinfection	Ave. Contact, min.	128	130	60
Disinfection	Peak Contact, min.	42	41	20
CO Thickening	Sol Load, ppd/sf	5.02	15.02	20.00
Digestion	HRT, days	42.11	14.03	20
Dewatering	Flow, gpm	110	165	815
Outfall	Ave. Dilution	11.58	11.70	100.00

City of Elma

The City of Elma operates a treatment facility on South 17th Street in Elma which was first put into service in 1975. The plant provides for aerated lagoon treatment and disinfection prior to discharge to the Chehalis River as indicated in the attached Flow Schematic. Average flows in 1990 were .33 mgd compared to a design flow of .45 mgd. Currently 1,800 persons are served in a sewered drainage basin of approximately 300 acres.

The plant flow curve exhibits the same wet weather increase pattern as the Aberdeen plant with summer flows averaging .2 mgd. The apparent current rate of I/I averages 620 g/acd compared to a design rate of 240 g/acd.

In its wastewater treatment design guidelines the WDOE (1985) indicates a method for determining required detention time for aerated lagoon facilities like those of the City of Elma. A "first order" BOD removal relationship is recommended of the form:

$$\frac{S}{S_o} = \frac{1}{(1+2.3*K_1*t)}$$

Equation 1

where,

S	=	effluent BOD5, mg/L
S_o	=	influent BOD5, mg/L
K_1	=	$K_{20} * 1.047^{(T-20)}$
K_{20}	=	rate constant
T	=	temperature, degrees Centigrade
t	=	cell detention time, days

For ponds operated in series, it may be shown that the comparable formula is

$$\frac{S}{S_o} = \frac{1}{\left(1+\frac{2.3*K_1*t}{n}\right)^n}$$

Equation 2

where,

n	=	number of ponds in series

A rate constant of .12 results in a reasonable estimate of current effluent concentrations with ponds in series. If this rate constant is used to model the operation of the Elma ponds under future design conditions, a detention time of 10 days is indicated for annual average operation in series, compared to the design value of 12. For maximum month conditions, the predicted effluent concentration using this rate constant is 43 mg/L indicating that the system may be challenged during the maximum month at design loads. The plant is operating at approximately two-thirds of design flow on this basis with a current average annual detention time of 18 days. Current effluent concentrations average 19 mg/L for BOD and 20 mg/L for TSS compared to NPDES permit limits of 30/75 mg/L. The apparent dilution ratio is greater than the recommended DOE value.

TABLE 3.3.11

OPERATING DATA SUMMARY
CITY OF ELMA, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	0.33	0.20	0.57
Peak flow, mgd	N/A	N/A	1.0
Inf BOD, mg/L	221.25	129.00	314.00
Inf TSS, mg/L	168.92	120.00	258.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	18.75	12.00	24.00
Eff TSS, mg/L	20.08	11.00	36.00
Fecals, mpn/100ml	56.00	2.00	246.00

TABLE 3.3.12

CITY OF ELMA, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	0.33	0.49	N/A
General	Ave. BOD, ppd	576	800	N/A
Lagoons	Ave. Detention, day	18	12	10
Disinfection	Ave. Contact, min.	96	65	60
Disinfection	Peak Contact, min.	43	21	20
Outfall	Ave. Dilution	166.44	112.83	100.00

City of Hoquiam

The City of Hoquiam operates an oxidation ditch secondary treatment plant on Moon Island Road in Hoquiam serving 9000 persons in a 1600-acre area. The plant started up in 1980 replacing an existing non-aerated lagoon which remains in the current flow schematic as a facultative sludge treatment lagoon. 1990 flows averaged 1.98 mgd compared to a design average of 3.3. The annual flow curve outlined in Appendix C shows a pattern of high wet weather flows. Current I/I averages 788 g/acd compared to an apparent design unit rate of 950 g/acd. Effluent discharges into Grays Harbor.

As indicated in Table 3.3.14 processes are within conventional values. Based on the design BOD load, the plant is operating at 89 percent of capacity. Current effluent BOD and TSS concentrations average 5 mg/L BOD and 6 mg/L TSS, well under permitted levels of 30 mg/L BOD and 30 mg/L TSS.

TABLE 3.3.13

OPERATING DATA SUMMARY
CITY OF HOQUIAM, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	1.98	1.10	3.29
Peak flow, mgd	4.00	1.30	8.00
Inf BOD, mg/L	156.42	96.00	220.00
Inf TSS, mg/L	167.75	110.00	289.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	4.78	3.00	7.00
Eff TSS, mg/L	5.75	4.00	7.00
Fecals, mpn/100ml	45.00	16.00	112.00

TABLE 3.3.14

CITY OF HOQUIAM, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	1.98	3.31	3.31
General	Ave. BOD, ppd	2,362	2,660	2,660
Bar Screens	Velocity, fps	1.43	1.44	5.00
Aeration	Unit Load, ppd/kcf	5.89	6.63	20.00
Secondary Sed	Overflow, gpd/sf	1,019	1,,024	1,200
Secondary Sed	Sol Load, ppd/sf	15	16	25
Disinfection	Ave. Contact, min.	90	60	60
Disinfection	Peak Contact, min.	22	21	20
Sludge Lagoon	Lb VSS/ksf/day	0.77	1.05	20.00
Outfall	Ave. Dilution	50.48	30.21	100.00

McCleary

The City of McCleary treatment plant is located on Maple Avenue in McCleary. The plant serves a current population of 1490 persons compared to a design of 2056. Current/Design service areas were not indicated in the survey questionnaire for the Comprehensive Plan. The plant includes series trickling filters and anaerobic sludge digestion as indicated in the attached schematic shown in Appendix A. Flows averaged .23 mgd in 1990 compared to a design flow of .24. Based on BOD load the plant is operating at 72 percent of design capacity.

As indicated in Table 3.3.16, trickling filter organic load averages 26 pounds per day per thousand cubic foot (ppd/kcf) on the maximum month compared to a conventional loading of less than 40 ppd/kcf. Digesters are loaded to a hydraulic residence time of 18 days at a maximum month, compared to a conventional criteria of 20 days assuming a 2 percent feed. These loads indicate that plant capacity is challenged under current loads, although it should be able to operate at design rates. Optimization of the digestion operation may be needed.

Current effluent discharge to Wildcat Creek averages 13 mg/L BOD and 13 mg/L TSS compared to a discharge requirement of 15 mg/L BOD and 15 mg/L TSS. It is seen that there is little margin for error under current conditions of operation. Under the current waste removal requirements, WDOE may not allow an increase of the current maximum month flow limit of .25 mgd because

of the limited dilution available. This requirement would essentially limit the plant to operation under current loads.

TABLE 3.3.15

OPERATING DATA SUMMARY
CITY OF MCCLEARY, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	0.23	0.17	0.33
Peak flow, mgd	0.28	0.15	0.88
Inf BOD, mg/L	159.83	130.00	200.00
Inf TSS, mg/L	161.08	120.00	200.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	13.08	10.00	17.00
Eff TSS, mg/L	13.33	10.00	20.00
Fecals, mpn/100ml	469.00	80.00	1,300.00

TABLE 3.3.16

CITY OF MCCLEARY, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	0.23	0.25	0.25
General	Ave. BOD, ppd	296	411	411
Bar Screens	Velocity, fps	0.53	0.46	5.00
Primary Sed	Overflow, gpd/sf	1,245	1,067	2,000
Secondary Sed	Overflow, gpd/sf	715	613	1,200
Secondary Sed	Sol Load, ppd/sf	Unknown	Unknown	25
Trickling Filters	Org Load, ppd/kcf	26	35	40
Disinfection	Ave. Contact, min.	Unknown	Unknown	60
Disinfection	Peak Contact, min.	Unknown	Unknown	20
Digestion	HRT, days	17.75	12.05	20
Outfall	Ave. Dilution	6.64	5.89	100.00

City of Montesano

The City of Montesano is currently served by a wastewater collection system which serves 3,200 people in a service area of 600 acres. The system discharges to the Chehalis River. In December of 1991 a new STEP collection system and aerated lagoon treatment system will begin operating. The plant is designed for aerated lagoon treatment of a design waste flow of .36 mgd with discharge to the Chehalis River. Based on current annual average flow of .33 mgd the plant will start up at 92 percent of capacity.

TABLE 3.3.17

CITY OF MONTESANO, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	0.33	0.36	0.36
General	Ave. BOD, ppd	327	362	362
Lagoons	Ave. Detention, day	12	11	10
Disinfection	Ave. Contact, min.	66	60	60
Disinfection	Peak Contact, min.	27	24	20
Outfall	Ave. Dilution	260	235	100.00

City of Ocean Shores

The City of Ocean Shores operates an aerated lagoon treatment system discharging to Grays Harbor near its outlet to the Pacific Ocean. Current flows average .16 mgd. The annual flow curve indicates high wet weather flows as would be typical for the County, the Ocean Shores plant also experiences a summer peak flow generated during the tourist season.

The design flow for the plant is indicated in the Operations and Maintenance Manual as 6.7 mgd, resulting from a seasonal peak population of 101,000 persons. This "design flow" is based on a total hydraulic residence time in the lagoon system of one day. As indicated in the attached Capacity Summary, the current detention time averages 38 days. A rate constant of .05 in Equation 2 above results in a reasonable prediction of current lagoon performance. For a design influent concentration of 220 mg/L and an effluent concentration of 30 mg/L, the required detention time from this equation using this rate with two ponds in series is 23 days. On this basis, a total lagoon volume of 6.0 mgal in two cells has capacity for a flow of .27 mgd. The plant is operating at approximately 60% of this capacity under current flows. The exceedingly high peak flows for which the plant was designed apparently are not occurring at the present time. The City has recently completed an update to its Sewerage Master Plan. The recent Master Plan estimates the

capacity of the current system to be in the range of .2 to 1.4 mgd, depending on the power level in the aerated lagoons.

Effluent to Grays Harbor averaged 9 mg/L BOD and 12 mg/L TSS during 1990, an excellent effluent for an aerated lagoon system, substantially less than its permitted value of 30 mg/L BOD and 75 mg/L TSS.

TABLE 3.3.18

OPERATING DATA SUMMARY
CITY OF OCEAN SHORES, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	0.16	0.12	0.18
Peak flow, mgd	N/A	N/A	0.34
Inf BOD, mg/L	121.58	71.00	191.00
Inf TSS, mg/L	153.00	66.00	254.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	8.75	3.00	18.00
Eff TSS, mg/L	11.75	6.00	27.00
Fecals, mpn/100ml	26.00	10.00	60.00

TABLE 3.3.19

CITY OF OCEAN SHORES, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	0.16	6.60	6.60
General	Ave. BOD, ppd	154	17,170	17,170
Lagoons	Ave. Detention, day	38	1	23
Disinfection	Ave. Contact, min.	36	1	60
Disinfection	Peak Contact, min.	17	0	20
Outfall	Ave. Dilution	968	23	100

Pacific Beach

Grays Harbor County operates a facultative (non-aerated) lagoon treatment system in Pacific Beach serving a current population of 520 persons. Current flows average .08 mgd compared to the discharge permit of .059 mgd.

The attached Capacity Summary indicates a current load of 56 pounds of total BOD per day per acre of lagoon surface area (ppad). Conventional non-aerated lagoon loadings may range this high in climates with abundant sunlight. Since the oxygen resources of a facultative treatment system depend on photosynthetic production, it is likely that loadings this high are excessive in the Grays Harbor County climate. WDOE criteria recommend loadings less than 20 ppad. Based on this more conservative criteria the system is overloaded by a factor of two at the present time. Since detention time has little impact on photosynthetic production, increased capacity cannot be achieved by increasing pond depth. Increased pond area or the addition of mechanical aeration would be required to permit additional loading. The addition of mechanical aeration could be an economical means of upgrading the plant in the future.

Current average flows of .08 mgd exceed the NPDES permit value of .059 mgd. No new connections are permitted at the present time. Limited dilution in Joe Creek may restrict upgrade options.

TABLE 3.3.20

OPERATING DATA SUMMARY
PACIFIC BEACH, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	0.08	0.02	0.19
Peak flow, mgd	0.05	N/A	0.57
Inf BOD, mg/L	127.17	42.00	241.00
Inf TSS, mg/L	391.17	49.00	836.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	28.25	12.00	47.00
Eff TSS, mg/L	67.58	18.00	140.00
Fecals, mpn/100ml	10.00	10.00	10.00

TABLE 3.3.21 PACIFIC BEACH, WASHINGTON WASTEWATER TREATMENT PLANT CAPACITY SUMMARY				
Process Unit	**Parameter**	**Current Rate**	**Design Rate**	**Design Criteria**
General	Ave. Flow, mgd	0.08	0.06	0.06
General	Ave. BOD, ppd	71	104	104
Lagoons	Detention, days	52	71	10
Lagoons	Org Load, ppad	56.15	84.59	20.00
Disinfection	Ave. Contact, min.	Unknown	Unknown	60
Disinfection	Peak Contact, min.	Unknown	Unknown	20
Outfall	Ave. Dilution	Unknown	Unknown	100.00

City of Westport

The City of Westport operates an oxidation ditch treatment facility on W. Bay Street in Westport which discharges to Halfmoon Bay, adjacent to its outlet to the Pacific Ocean. Current flows average .18 mgd from a service population of 1850 persons in a 3200-acre drainage basin area. As shown in the Operating Data graph in Appendix C, the peak flow month is July.

A comparison of the current loadings to the design rate in the attached Capacity Summary indicates an ample capacity in the Westport plant to accommodate current loads. Based on design BOD load, the plant is operating at 21 percent of capacity under current loads, although the operating cycle and capacity of existing sludge dewatering equipment would need to be increased as loads increase. Main treatment units, however, including aeration tanks and secondary sedimentation tanks appear to be adequately sized for substantially more than their current load.

Effluent concentrations for BOD and TSS averaged 11 mg/L BOD and 5 mg/L TSS compared to permit limits of 30 mg/L BOD and 30 mg/L TSS.

TABLE 3.3.22

OPERATING DATA SUMMARY
CITY OF WESTPORT, WASHINGTON
1990

Parameter	Average	Minimum	Maximum
Flow, mgd	0.18	0.16	0.22
Peak flow, mgd	N/A	N/A	N/A
Inf BOD, mg/L	208.42	164.00	268.00
Inf TSS, mg/L	128.58	83.00	203.00
Prim BOD, mg/L	0.00	0.00	0.00
Prim TSS, mg/L	0.00	0.00	0.00
Eff BOD, mg/L	10.83	7.00	19.00
Eff TSS, mg/L	5.17	2.00	9.00
Fecals, mpn/100ml	43.00	0	190.00

TABLE 3.3.23

CITY OF WESTPORT, WASHINGTON
WASTEWATER TREATMENT PLANT
CAPACITY SUMMARY

Process Unit	Parameter	Current Rate	Design Rate	Design Criteria
General	Ave. Flow, mgd	0.18	0.79	0.79
General	Ave. BOD, ppd	315	1,500	1,500
Bar Screens	Velocity, fps	0.09	0.37	5.00
Aeration	Unit Load, ppd/kcf	6.74	16.74	20.00
Secondary Sed	Overflow, gpd/sf	160	649	1,200
Secondary Sed	Sol Load, ppd/sf	12	43	48
Disinfection	Ave. Contact, min.	271	61	60
Disinfection	Peak Contact, min.	159	39	20
Outfall	Ave. Dilution	Unknown	Unknown	100.00

Capacity Summary

A summary of existing flows and loads compared to plant capacity is presented in Table 3.3.24. The table presents a judgement of available capacity at each plant reflecting apparent limitations in capacity to treat organic loads compared to wastewater flow. Estimated capacities as limited by either organic or hydraulic load are presented in terms of equivalent populations based on the unit rates for organic load and I/I shown. It is seen that the largest treatment plants in the County, Aberdeen and Hoquiam, both should have a capacity excess based on projected populations in the year 2010. Capacity shortfalls appear for McCleary and Pacific Beach.

Table 3.3.24 is presented as a Summary of the information contained in Section 3.3.2.2(b) and Appendix C. The Summary table specifies a capacity range for each plant based upon data supplied by the individual municipalities; discussions with treatment plant operators; and review of plant design criteria. The information listed on Table 3.3.24 is subject to change based on revisions in the analysis data.

Additional capacity is expressed for the current customer base assuming 1990 census information. The population predictions for the municipalities is based upon historic population trends derived from census information.

Actual population trends and forecast may vary, considering all possible impacts to the municipality. Future capacity availability should be agreed upon with the individual municipality assuming their interpretation of future population production and service area needs.

TABLE 3.3.24
WASTEWATER TREATMENT CAPACITY SUMMARY

Facility	Organic, ppd		Hydraulic, mgd[3]		Population Equivalents		Populations		Capacity Excess	Unit org	Drainage, acres		I/I, gpad	Peak I/I
	Ave BOD	Limitation	Ave	Peak	Organic	Hydraulic	1990	2010[1]	Net Range[2]	load, ppcd	1990	2010	Ave	Peak
Aberdeen	6,509	Activated Sludge	5.54	15.0	29,586	20,115	19,545	16,050	(10,000 - 570)	0.22	2,033	1,669	1,563	6,400
Elma	800	Lagoon Volume	0.51	1.4	4,000	2,652	1,800	2,975	(2,200 - 850)	0.20	300	417	620	2,700
Hoquiam	3,458	Activated Sludge	2.32	8.0	13,300	9,000	9,000	8,018	(4,300 - 0)	0.26	1,600	1,425	788	4,550
McCleary	411	Digesters	0.27	0.8	2,055	1,313	1,490	1,870	(565 - 177)	0.20	300	377	355	2,440
Montesano	360	Lagoon Volume	0.36	1.0	4,520	12,500	4,200	3,959	(320 - 8,300)	0.08	300	283	0	0
Ocean Shores	1,110	Lagoon Volume	0.72	14.1	3,303	50,150[3]	1,900	7,162	(1,400 - 48,250)	0.15	300	1,131	427	1,274
Pacific Beach	73	Lagoon Area	0.08	0.8	521	2,845	520	590	(0 - 2,325)	0.14	74	84	578	7,000
Westport	1,500	Activated Sludge	0.63	4.0	7,500	3,717	1,850	3,169	(5,650 - 1,867)	0.20	320	548	102	500

(1) Based upon straight line projections from census information.

(2) Based upon 1990 City population figures for service area.

(3) Hydraulic capacity assumes original primary treatment criteria.

3.3.2.2(c) Transmission System Capacity/Limitations

During the preplanning meetings conducted by Grays Harbor County, each municipality was requested to provide information on infrastructure improvements. Specific information was requested on the transmission and collection system within each municipality. A portion of the information requested included a description of the transmission and the collection system, the age and type of the system and the average dry weather flow and peak daily flow for the last five years of operation. Also requested were any comments regarding I/I studies that have been completed on the individual collection system, whether there were any immediate plans for infiltration or inflow reduction and the anticipated peak day flow reduction in million gallons per day.

Along with the general description of the collection system, the municipality was requested to list trunk-line capacities in various areas. The specific data requested was total capacity in mgd of the transmission system along with the current flow in the pipeline including peak I/I. The purpose of the information was to ascertain potential outside service area discharge points and remaining capacities within the current transmission system. The actual information received from the cities was generally limited to total collection system flows. This information is included on Table 3.3.25.

The City of Aberdeen provided information regarding transmission capacity. There is approximately a 15 mgd capacity within two trunk mains that enter the treatment facility. The existing dry weather sewage flow in those two mains amounts to 2.9 mgd and the maximum wet weather flow is 5.4 mgd leaving an approximate 9.5 mgd surplus. A 24-inch-diameter main originates from the sewage treatment plant and serves the west portion of town. A 48-inch-diameter main originates from the sewage treatment plant and serves the east portion of town, including the Wishkah Mall area.

Phase II may require that specific information be generated on each City's transmission system capacity. That capacity may be calculated using accepted engineering practice. However, a wet weather flow analysis will have to be conducted to determine the total infiltration and inflow of ground and surface water present in the system.

TABLE 3.3.25
SUMMARY WASTEWATER COLLECTION AND TRANSMISSION FLOWS

Municipality	I/I Study Available	I/I Reduction Anticipated/ mgd Reduction	Dry Weather Flow mgd	Peak Daily Wet Weather Flow mgd
McCleary	Yes	No	.175	.880
Elma	No	No	.190	1.0
Montesano[1]	Yes	Yes	.360	.360
Aberdeen	Yes	Yes/4-5	2.5-2.9	14.5
Hoquiam	No	-	1.2	8.0
Cosmopolis	No	Yes	.16	1.57
West Port	No	-	.174	.44
Ocean Shores			.16	.34
Pacific Beach (Grays Harbor Co.)			.09	.57

(1) At the time of report preparation, impacts from I/I on the STEP Collection System could not be verified.

3.3.3 Wastewater Flows and Projections

Wastewater volume estimates were determined for each Census Division. That estimate also included wastewater flows produced twenty years into the future from residential, commercial and industrial sources. A calculation for the specific sections discussed in 3.3.2.1(c) of this report was also performed. Table 3.3.26 shows the estimates of wastewater flows from these calculations. The following section describes the methodology for determining wastewater flows.

3.3.3.1 Existing and Projected Residential Wastewater Flows

The Aberdeen/Hoquiam census division currently is producing the largest wastewater flow, estimated at 308,630 GPD. The flow from this census division is projected to grow 93,800 GPD to a total of 402,430 GPD by the year 2010. The Humptulips and Lake Quinault divisions are expected to produce less wastewater in 2010 as their forecasted populations drop. Each subarea's percent change of projected wastewater flow is directly proportional to the forecasted population change. The largest percent increase in flow will be in the Elma subdivision at 61.80% over the next twenty years. The largest percent decrease in flow is expected in the Lake Quinault Division at -28.19% over the next twenty years.

All residential flows were calculated by applying a 70 gallons/capita/day factor to a population number. The 1990 residential flow was calculated using the population values from the 1990 Census Division totals. The future values were calculated in the same manner using the projected values found in Section 2.3.1 of this report.

Residential flows for the Specific Sections were also calculated. This was completed for existing and 20-year population estimates. The sections in which these areas are located are in the North Beach, Aberdeen-Hoquiam, and South Shore Census Divisions, as specified in Section 3.3.2.1(c). A factor of 70 gallons/capita/day was used in estimating these waste flows.

3.3.3.2 Existing and Projected Commercial Flows

Since commercial and residential flows were calculated using population figures, the percent change for commercial flows is the same as for residential flows in each census division. The largest current commercial flow estimate is in the Aberdeen/Hoquiam division with 66,135 GPD. This flow is expected to increase to 86,235 GPD by 2010.

The commercial flows were calculated in the same manner as the residential flows. A factor of 15 gallons/capita/day was applied to the same population values in the Census Divisions. However, a factor of 25 gallons/capita/day was applied to the North Beach and South Shore census divisions in order to consider extra flows from tourist industries.

3.3.3.3 Industrial Flows

The Aberdeen/Hoquiam division has the largest potential for industrial wastewater flow. The high and low flows are calculated at 6,731,100 GPD and 3,243,700 GPD, respectively. The

TABLE 3.3.26
ESTIMATE OF TOTAL WASTEWATER FLOWS WITHIN THE STUDY AREA

				Residential		Commercial		Industrial			Specific Sections (6)			
Subarea	Total Population 1990	Estimated Population 2010 (1)	% in Study Area	Calculated Waste Flow (gpd) (2) 1990	Calculated Waste Flow (gpd) 2010	Calculated Waste Flow (gpd) (3) 1990	Calculated Waste Flow (gpd) 2010	# of Acres	Low Calculated Waste Flow (gpd) (4)	High Calculated Waste Flow (gpd) (4)	Total Pop. in Designated Areas 1990	Calculated Waste Flow (gpd) 1990	Total Pop. in Designated Areas (5) 2010	Calculated Waste Flow (gpd) 2010
North Beach	2,129	3,007	95	141,579	199,966	50,564	71,417	79	71,100	213,300	1,785	124,950	2,521	176,470
Humptulips	1,301	1,184	90	81,963	74,592	17,564	15,984	0	0	0	•	•	•	•
Wishkah	1,541	1,652	90	97,083	104,076	20,804	22,302	0	0	0	•	•	•	•
Wynoochee	2,953	3,408	50	103,355	119,280	22,148	25,560	255	229,500	688,500	•	•	•	•
Lake Quinault	706	507	95	46,949	33,716	10,061	7,225	0	0	0	•	•	•	•
Aberdeen-Hoquiam	4,409	5,749	100	308,630	402,430	66,135	86,235	2,493	2,243,700	6,731,100	2,167(7)	151,690	2,826	197,804
South Shore	2,205	2,911	95	146,633	193,582	52,369	69,136	677	609,300	1,827,900	1,623	113,610	2,143	149,965
North River	613	663	10	4,291	4,641	920	995	0	0	0	•	•	•	•
Oakville	1,040	1,637	95	69,160	108,861	14,820	23,327	0	0	0	•	•	•	•
Malone-Porter	1,370	2,058	85	81,515	122,451	17,468	26,240	56	50,400	151,200	•	•	•	•
Mc Cleary	1,446	2,181	95	96,159	145,037	20,606	31,079	766	689,400	2,068,200	•	•	•	•
Elma	3,544	5,734	95	235,676	381,311	50,502	81,710	535	481,500	1,444,500	•	•	•	•

(1) Future population based on "Most Likely" population projection for 20 years into the future.

(2) Waste flow calculated as 70 gallons/capita/day.

(3) Waste flow calculated as 15 gallons/capita/day except for North Beach and South Shore which are calculated as 25 gallons/capita/day.

(4) Waste flow calculated as 900 gallons/acre/day for low and 2,700 gallons/acre/day for high.

(5) Future population calculated from 1990 value and escalated at "Most Likely" percent change.

(6) Specific sections taken from "Population Estimate Per Section Within Study Area" table.

(7) Central Park only.

divisions of Humptulips, Wishkah, Lake Quinault, North River, and Oakville have no industrial sites and are not expected to produce significant industrial wastewater flows. Of the divisions which are likely to produce industrial wastewater, Malone-Porter has the lowest potential at 151,200 and 50,400 GPD, respectively.

Industrial flows were calculated on a per acre of industrial land basis. Industrial lands are only those properties listed in the Industrial Lands Study as prepared by Grays Harbor Regional Planning. Section 2.3.2 of this report has totals for industrial land acreage. The total number of acres per Census Division was tabulated and a factor applied to estimate the total wastewater flow for each Division from potential and existing industrial sites. Wastewater values were calculated for a low end and a high end of the potential flow range. The low end wastewater estimate was calculated as 900 gallons/day/acre and the high end was calculated as 2,700 gallons/day/acre. These values assume 10 percent consumptive use of those values used in Section 3.2, Water, which assumes water usage of 1,000 gallons/day/acre and 3,000 gallons/day/acre.

All flows shown on Table 3.3.26 represent wastewater flow only. Sizing sewage facilities should consider infiltration/inflow (I/I) allowance depending upon the type of collection system selected. I/I allowance should be assessed on a gallons per acre per day, gallons per capita per day, or gallons per linear foot of collection line installed per day basis.

3.3.4 Problem Identification For On-Site Sewage

This section will define areas which warrant additional review in the Phase II document. These areas have indications of potential or existing on-site wastewater disposal problems which could impact public health and the environment. This review will focus on information that was contained in Section 3.3.2, Existing Conditions.

Primary indicators of problem on-site waste disposal areas are high building densities per square mile, soil characteristics and their suitability for on-site waste disposal and the total area population that may be affected by improper on-site waste disposal. These indicators are further described as follows:

- Areas with a minimum of 100 buildings per square mile, or section, as listed in Table 3.3.5 and as shown on Figures 3.3.12 and 3.3.13 from Section 3.3.3.2.1 (c).
- Areas with unsuitable soil are shown on Figures 3.3.2 through 3.3.7 in Section 3.3.2.1 (b).
- Areas with significant population as listed in Table 3.3.6 of Section 3.3.2.1 (c).

The evaluation of various areas within Grays Harbor County for on-site waste disposal will also use secondary indicators to establish priorities for defining those areas which warrant additional review in Phase II. These secondary indicators are:

- Known or documented on-site wastewater disposal problems as provided in Section 3.3.2.1 (d).
- A high or escalated on-site waste disposal repair rate as listed in Section 3.3.2.1 (d) Table 3.3.7.

Each subarea is evaluated on a favorable, moderately favorable, or an unfavorable basis. Criteria were established from each of the primary or secondary indicators to determine priority levels. These criteria are listed in Figure 3.3.14.

Those selected areas within the subareas shown on Figures 3.3.12 and 3.3.13 that did not have 100 buildings per square mile were not formally evaluated due to low density. The subarea evaluation is contained in Figures 3.3.15, 3.3.16 and 3.3.17 using a matrix format. The evaluation provides a prioritization of areas which must be evaluated in greater detail in the Phase II document.

The "unfavorable" evaluation of any area does not mean that there is a specific health risk or a hazard exists, but does suggest that a problem may exist within those areas.

The priority for the Phase II review is listed in order as follows:

1. Moclips/Pacific Beach area
2. Oyhut/Illahee
3. Central Park
4. East Montesano
5. Grayland

FIGURE 3.3.14
PROBLEM IDENTIFICATION CRITERIA

LEGEND

Least Favorable	Moderately Favorable	Highly Favorable
●	⊖	○

Primary Indicators

Population Density

Building/Sections (Square Mile)

300 +	300 - 100	100 - 0
●	⊖	○

Soil Suitability

Unsuitable	Alternative	Suitable
●	⊖	○

Affected Population

People/Designated Area

500 +	500 - 200	200 - 0
●	⊖	○

Secondary Indicators

Known Or Documented On-Site Waste Disposal Problems

Known Health Concern	Problem Indicator	No Problems Known
●	⊖	○

On-Site Drain Field Rate Of Repair

Repairs/Year/Building

2% - 1.25%	1.25% - .75%	.75% to 0
●	⊖	○

Figure 3.3.15

SUBAREA EVALUATION

Subarea: CENTRAL

	PRIMARY INDICATORS			OTHER INDICATORS		OVERVIEW
Location	**Population Density**	**Soil Suitability**	**Affected Population**	**Known On-Site Problems**	**On-Site Rate of Repair**	
Central Park	●	⊖	●	⊖	⊖	●/⊖
East Montesano	⊖	●	●	⊖	-	●/⊖

NOTES:

○ Highly Favorable
⊖ Moderately Favorable
● Least Favorable

Figure 3.3.16
SUBAREA EVALUATION

Subarea: North Beach

	PRIMARY INDICATORS			SECONDARY INDICATORS		OVERVIEW
Location	Population Density	Soil Suitability	Affected Population	Known On-Site Problems	On-Site Rate of Repair	
Moclips Sunset Beach (Area 1)	●	●	⊖	●	●	●
Iron Springs (Area 2)	⊖	○	○	⊖	○	○
Copalis Beach (Area 3)	⊖	⊖	●	⊖	●	⊖
Ocean City (Area 4)	⊖	●	○	⊖	○	⊖
Oyhut (Area 5)	●	⊖	●	●	⊖	●/⊖

NOTES:

○ Highly Favorable
⊖ Moderately Favorable
● Least Favorable

Figure 3.3.17
SUBAREA EVALUATION

SUBAREA: SOUTH BEACH

	PRIMARY INDICATORS			OTHER INDICATORS		OVERVIEW
Location	**Population Density**	**Soil Suitability**	**Affected Population**	**Known On-Site Problems**	**On-Site Rate of Repair**	
Laidlaw (Area 1)	⊖	⊖	●		⊖	⊖
Grayland (Area 2)	⊖	⊖	●	⊖	●	●/⊖
Ocosta	○	⊖	⊖		○	⊖/○

NOTES:

○ Highly Favorable
⊖ Moderately Favorable
● Least Favorable

3.3.5 Alternatives

3.3.5.1 General

The following sections discuss alternatives outlined to address priority problems listed in Section 3.3.4, Problem Identification. These alternatives are in addition to the use of Ordinance #113 which allows for enforcement of on-site wastewater disposal under its rules and regulations. Items listed employ the use of both on-site waste disposal systems and various methods of collection and transportation of wastewater to a municipally owned treatment facility.

3.3.5.2 On-Site Management Districts (OSMD)

Septic tank - drainfield systems were once considered to be an interim method of treating wastewater in urban areas. They were to be used until a sewer was available. Today, the cost of traditional sewer systems is too great or not available for many communities. Federal and state funds to assist in the treatment facilities have diminished in recent years. Since the late 60s, many people have taken a second look at small subsurface systems and discovered they can work very well for longer periods and are more cost effective than a sewage collection and mechanical treatment plants.

History has shown that the majority of homeowners do very little to maintain their systems. The success of on-site systems depends on the correct system being designed for specific soil/site conditions. Further, it requires proper construction, routine inspections and appropriate maintenance.

Communities faced with the decision of what direction they should take for wastewater treatment should not overlook the option of continuing with on-site treatment. A thorough evaluation of existing systems is the first step. A careful survey is needed to assess the condition of the systems. This includes determining the size and condition of septic tanks, square feet of absorption surface in the drainfield, soil conditions, height of water tables and proximity to surface waters. Owners need to be interviewed to prepare a history of the systems and to determine users' satisfaction. Monitoring of the receiving waters should be completed to assess the degree of treatment provided by the on-site systems. Bacteria, nitrate and ammonia are generally used to assess the degree of treatment. The survey and monitoring are used to estimate the expected life of the systems. If the survey shows on-site treatment to be feasible, the next step is to establish a method of managing the systems. (Most often this means forming a district.)

For an OSMD to be successful, four essential criteria must be met:

1. Legal authority to permit, construct and operate on-site systems and to enforce their repair and maintenance.

2. Local support of users and regulatory agencies.

3. Ability to generate funds for management, monitoring, maintenance and repair, at a reasonable user fee.

4. Technically sound leadership and guidelines for designing systems.

Twenty years ago, most states did not have laws which would allow OSMDs. Today, Washington State has legislation [WAC 248-96-070(4)] that sets the minimum requirements for a district (Appendix C). There are at least three districts in operation; the closest one is in Jefferson County.

Recently formed is the Federal Way Sewer and Water District. They will be handling all small systems—old and new. This district may be closer to the type of district needed for Grays Harbor. A third OSMD is Spokane County Utility Department which manages only larger systems. Contact names and phone numbers have been included in Appendix C.

The OSMD is an entity to provide maintenance and operation of individual and small community wastewater systems, provide regular inspections of systems, keep records, review and approve all new systems, collect fees, disperse funds and provide continuing education about care of on-site systems to users. To understand what is involved financially, Table 3.3.27 is offered. It lists operating expenses from the Stinson Beach OSMD for 1987 to 1991. The district handles both water and sewer. Table 3.3.28 is for on-site management only.

This OSMD is one of the oldest in the United States. It has 620 homes. For 1990 - 1991, the average cost per home was $20.67. This compares favorably with the average sewer costs for northern California cities. Table 3.3.28 shows the average for 9 cities was $19.74 per month per home.

TABLE 3.3.27
OPERATING BUDGET FOR STINSON BEACH WATER DISTRICT*

Resources	1987-88 Actual	1988-89 Actual	1989-90 Budget	1990-91 Budget
Wastewater Fees				
Discharge Permit Fees	62,226	86,624	86,832	90,288
Monitoring Inspection Fees	936	531	810	450
Plan Check/Inspection Fees	525	3,720	1,720	800
New Connections	8,550	9,975	2,375	1,750
Special System Plan Check Fees	3,700	14,300	6,500	2,500
Variance Application Fees	350	450	175	105
Loan Administration Fees	0	2,197	0	0
Property Taxes				
Property Taxes and Relief	41,311	5,220	47,253	0
Miscellaneous				
Penalties and Interest	0	0	0	0
Miscellaneous	178	93	250	100
Transfers From FAF				57,854
TOTAL RESOURCES	117,776	123,110	145,915	153,847

TABLE 3.3.27
OPERATING BUDGET FOR STINSON BEACH WATER DISTRICT*

Appropriations	1987-88 Actual	1988-89 Actual	1989-90 Budget	1990-91 Budget
Employee Services				
Salaries	55,252	50,838	60,864	75,850
Workers Compensation	(59)	572	662	710
Unemployment Insurance	0	0	196	219
Health Insurance	3,742	6,930	6,925	8,455
Lift Insurance	166	141	145	284
Dental Insurance	930	710	758	1,236
Retirement	5,744	7,275	9,570	11,495
Education and Training	18	128	500	525
Clothing Allowance	100	227	125	400
Maintenance				
Building Maintenance and Minor Imp.	980	1,567	1,155	1,520
Equipment Maintenance	946	1,571	1,470	1,550
System Repair and Restocking	113	267	425	425
Equipment Rental	921	69	150	150
Vehicle Expense				
Vehicle Repair and Maintenance	13	5	500	700
Gasoline and Oil	205	205	300	200
Replacement Reserve			1,000	1,000
Insurance				
Liability and Property Insurance	8,419	7,147	7,500	6,500
Employee Bonds	228	294	325	300
Utilities				
Utilities	685	518	600	600
Telephone	855	778	800	800
Analysis and Treatment				
Lab Testing Service	6,738	6,381	11,000	11,000
Lab Supplies	499	168	500	500
Vector Control Chemicals	0	0	300	300
Office Expense				
Office Supplies	1,562	2,007	1,890	2,400
Dues and Subscriptions	941	1,050	1,000	1,100
Postage	970	929	700	700
Photocopy	475	9	0	0
Publications and Legal Notices	1,783	1,875	1,500	1,500

TABLE 3.3.27 OPERATING BUDGET FOR STINSON BEACH WATER DISTRICT*				
Outside Services				
Accounting	2,087	1,924	1,750	1,750
Annual Audit	2,813	2,880	3,000	3,050
Legal	1,365	3,650	2,500	2,500
Engineering	6,203	1,100	6,000	2,000
Manager's Fees	7,592	15,000	15,855	7,928
Miscellaneous				
Travel Expense	473	874	575	500
Rent	4,665	4,797	5,075	5,300
Miscellaneous	555	220	300	300
		1,000		
Transfers (to Fixed Asset Fund)		1,000		
TOTAL APPROPRIATIONS	117,994	124,106	145,915	153,747

*Budget courtesy of Mark Richardson - Stinson Beach Water District. For on-site management only.

TABLE 3.3.28 – AVERAGE MONTHLY SEWER CHARGES FOR CITIES IN NORTHERN CALIFORNIA	
Town or District	**Sewer Service Rate, Residential**
Geyserville	$27.25
Graton	21.75
Healdsburg	10.75
Mill Valley	19.25
Penngrove	20.75
Petaluma	10.00
San Rafael	14.66
Santa Rosa	30.45
Sebastopol	23.40
Average	$19.74

Table 3.3.26 also shows a breakdown of expenses. Salaries include a full-time manager, field person, and secretary.

In summary, OSMDs are permitted in Washington. Legislation is in place to give districts the power they need to manage the operation and maintenance of individual rural systems. Three OSMDs are currently in operation in Washington. Operational costs to the homeowner are similar to what they would pay for city sewer service. OSMDs offer a proven approach to waste management for small communities and scattered individual homes. Most of the time, they represent a low cost, low maintenance long-term solution.

3.3.5.3 Conventional Gravity Collection Systems

Conventional gravity collection systems are the most well-known and widely used form of sewage collection in the United States. Current technologies employ standards, as dictated by the Department of Ecology, that strive for collection systems which are void of extraneous water originating from the groundwater or surface water sources. Conventional gravity systems are best suited in areas with consistent slope and to areas with high-density to moderate-density development.

Advantages:

- Simplicity
- Well understood by the public.
- The ability to expand for future development.

Disadvantages of conventional gravity over alternative methods of sewage collection are:

- The unavoidable infiltration and inflow of surface or groundwater, the cost of reconstruction of existing sewer lines and the associated surface improvements.
- Higher waste strengths and flow in comparison to other alternative collection technologies.

3.3.5.4 Alternative Methods Of Sewage Collection

In the last 10 years, alternative methods of sewage collection and transportation have become more widely accepted as legitimate methods of sewage transportation. Among the more noted technologies available today are STEP Collection System, Small Diameter Gravity collection systems and grinder collection systems.

3.3.5.4(a) STEP Collection Systems

STEP is an acronym for Septic Tank Effluent Pumps. Even though the tank is referred to as a septic tank, its only resemblance to a conventional septic tank is in the biological action that takes place in the tank. The tank acts as a primary clarifier. The heavy solids sink to the bottom of the tank and form sludges. The floatable materials rise to the top to form a scum layer. Rather than discharging into a drain field, the septic tank effluent is collected and taken to a common facility for treatment. A pump located in a tank at each home or group of homes conveys the effluent

under pressure to the treatment facility. This system only pumps from the relatively clear layer found between the sludge and the scum layers in the tank.

STEP systems are well suited to areas with rolling terrain, moderate-density development, flat terrain or areas with difficult subsurface conditions such as high groundwater or bedrock. Capital costs for STEP Collection Systems have been found to be less than conventional gravity systems when generated wastewater is less than 1,000 gallons per acre. This figure excludes the cost advantage of the treatment facility.

Advantages:

- Due to the reduced waste strength of the STEP Effluent, expansion requirements or modification requirements to the treatment facilities can sometimes be reduced, resulting in additional cost savings. STEP Collection Systems have a 25 to 70 percent reduction of waste strength for BOD and TSS, respectively.

- Lower capital costs, based upon conventional gravity for rural areas, have difficult sub-surface conditions, or require a large number of pump stations to implement conventional gravity.

- Since the STEP Collection System utilizes a pressure pipeline, infiltration and inflow of ground or surface water is eliminated in the pipeline portion of the STEP Collection System. Past STEP systems such as that in Glide Oregon have also been successful in elimination of infiltration inflow in the tank portion of the collection system. Care, however, does need to be taken to assure the overall system is water tight.

Disadvantages:

- STEP Collection Systems do use a mechanical method for transportation which requires a power source usually from the individual homes. This can require upgrades of subcode electrical panels found in many older homes.

- STEP Collection System Installation usually requires individual coordination with the homeowner.

- STEP Collection Systems are difficult for the public to understand, however, installation of numerous systems within the State of Washington, (at Montesano, Boston Harbor, Diamond Lake, and Camas), help to educate the public on the advantages and disadvantages of the system.

3.3.5.4(b) Small Diameter Gravity Collection Systems

A Small Diameter Gravity System (SDG) is similar to a STEP Collection System which employs a septic tank to separate solids and scum from the relatively clear liquid in the waste stream. This process consists of primary clarification of the waste matter. The difference between a STEP Collection System and an SDG System is the method of transportation. An SDG System does not use a pump in the septic tank to transport the relatively clear liquid. Rather it allows the clear liquid to drain from the tank as it would drain to a leach field. However, it utilizes small diameter collection lines under gravity flow to transport liquid to a centralized treatment facility. This

requires that the area to be served with small diameter gravity should have adequate topography to allow fall from the small diameter gravity tanks to a transmission main and ultimately the treatment facility. When natural topography does not allow for adequate fall, booster pumps can be added onto the collection and transmission mains for transportation of sewage to a centralized treatment facility. When appropriate, SDG Systems and STEP Collection Systems have been combined within the same collection system.

Advantages:

- Reduction in waste strength identical to the STEP Collection System. Waste strengths are approximately 120 mg/L BOD and 30 mg/L suspended solids on a yearly average. This lower waste strength lessens treatment plant impacts and costs for improvements.
- Collection and transmission mains can be sized hydraulically rather than by means of minimum pipe sizes, as specified for a conventional gravity system required by the Department of Ecology. Pipelines can be as small as 2 inches in diameter as compared to an 8-inch minimum pipe for the conventional gravity system.
- Since solids have been removed in the SDG tank, collector lines can alternate between gravity and pressure.
- Capital costs for SDG Systems can be less than for conventional gravity and STEP Collection Systems assuming the right topographic conditions.
- As with the STEP Collection System, an SDG System uses a pressure collection pipe in its construction. This allows for the elimination of extraneous infiltration and inflow from surface and groundwater, thus reducing the overall flow to the centralized treatment facility.

Disadvantages:

- Collection and transmission mains must be constructed at an adequate depth to allow fall from the SDG tank to the right-of-way. The depth of the collection system oftentimes offsets the capital cost savings due to impacts on surface improvements.
- The SDG tanks are located on private property which requires direct coordination with the homeowner.

3.3.5.4(c) Grinder Collection System

Grinder systems vary greatly from either STEP Collection Systems or Small Diameter Systems. When utilizing this type of pumping system, all solids are transported through a macerating or chopping type pump to collection and transmission pipe lines and, ultimately, a centralized treatment facility. Most grinder systems utilize a small, 60-gallon vault as a holding vessel and use a 1.5 to 2 horsepower pump. All liquids and solids that enter the vessel are macerated or chopped into finer particles and transported through the service line to either a gravity or pressure main line. These systems are well suited to areas with a limited on-site area for pump installations and areas that do not require a high amount of lift to get from the house to the transmission system. Grinder systems are used in connection with gravity main lines and low-pressure main lines.

Advantages:

- Small amount of land required for installation.
- No solids pumping of the holding vessel required as with a STEP or SDG System.

Disadvantages:

- Due to the horsepower required to transfer solids, a substantial amount of electrical power is required to run the pump. This requires additional upgrade of subcode electrical panels and increases monthly power costs.
- High initial capital cost.
- A minimum amount of storage available for emergency shutdown or periods of power outage.

3.3.5.5 Planning Area Evaluation

This section will provide indicators of alternatives previously listed that will seem appropriate for priority areas within the County listed in Section 3.3.4, Problem Identification.

Only the subareas that have priority problems listed will be evaluated in this section.

3.3.5.5(a) Central County Subarea

Central Park

If it is determined in Phase II that the Central Park area warrants a sewage collection system and waste treatment, several options are available. Central Park is currently included as a service area for the City of Aberdeen and capacity is available within the treatment system for the residents within that area.

Collection options allow for a combination of the STEP Collection System or SDG which would allow for the use of a variable grade gravity line between Central Park and the City of Aberdeen through the relatively flat low-lands area in the Junction City Area. Central Park also could implement a conventional gravity system, however, a pump station would probably have to be installed to provide adequate lift for transportation to the City of Aberdeen.

The Central Park area could also consider requesting the use of treatment facilities at the City of Montesano. Expansion of the treatment facilities will be required to meet secondary treatment requirements and a STEP Collection System or SDG System would probably be recommended to be consistent with city waste characteristics.

There is an indication from the Soil Conservation Service Maps that the majority of the soils within the Central Park area are acceptable for on-site waste disposal. After detailed review of actual soil conditions in the Central Park area, an on-site management district could prove to be a reliable alternative for wastewater disposal.

East Montesano

There are limited wastewater collection and treatment options for the area directly east of the City of Montesano. To be compatible with the City of Montesano's collection system, a STEP Collection System would have to be implemented. This may require that a substantial amount of transmission main be constructed to the central portion of the City as the current collection system does not provide sufficient capacity for an area this large. Expansion of the treatment facility may be required depending upon the amount of flow out of the system.

There is an indication from Soil Conservation Service Maps that the soils in the area east of Montesano are unsuitable or may require alternative methods of wastewater disposal. After detailed soils review, it must be determined if this area is suitable for on-site waste disposal and the probability of formation of an on-site management district.

3.3.5.5 (b) North Beach Subarea

Moclips/Pacific Beach Area

Wastewater collection and treatment alternatives that are available to this area of the County consist of transmitting wastewater to the Pacific Beach treatment facility. There is currently a moratorium on hookups to this facility and expansion of the treatment facility would be required.
The treatment facility is currently a facultative lagoon, and the addition of aeration may provide sufficient capacity to allow for additional connections. The plan outfall must be reviewed in relation to dilution requirements and adherence to the surface water quality standards. Collection system alternatives for this area include conventional gravity, STEP Collection, SDG or potentially Grinder Collection Systems, depending upon the actual location.

Certain areas of the Moclips/Pacific Beach Area could consider an on-site management district depending upon the soil conditions of the area and the proximity to the treatment facility and collection system.

Oyhut and Illahee Area

Collection and treatment options for waste disposal are limited to the City of Ocean Shores collection and treatment facility. A connection point for Oyhut and Illahee has been provided in the recently installed collection system for the new high school and Ocean City state park.

The comprehensive plan currently outlines a gravity collection system as a preferred alternative for serving the Ocean Shores spit area. The Department of Ecology has allowed a small STEP Collection System within the corporate limits as a pilot program only. No additional STEP Collection Systems will be allowed without amendment to the City's Comprehensive Plan. To be consistent with the current comprehensive planning document, a gravity collection system would have to be utilized.

The City of Ocean Shores is currently proceeding with a Comprehensive Planning Process. Under that process, the approved method of waste collection may change from that specified in the original comprehensive document.

It is recommended that the County coordinate with Ocean Shores and request that they consider the Oyhut and Illahee area as a service area.

3.3.5.5(c) South Beach Subarea

Grayland

Formal wastewater collection and treatment systems available for the area of Grayland are limited to utilizing the treatment facility at the City of Westport. The City of Westport currently has sufficient capacity to be able to serve their needs and the current populous of Grayland for the next 5 to 10 years. The collection system best suited to rural areas with relatively flat terrain and difficult subsurface conditions would be a STEP collection system. However, in the process of evaluation a gravity collection system should be compared for capital, operation and maintenance costs.

If sewage collection and treatment are not feasible due to the distance to Westport, alternative methods of on-site wastewater disposal may be acceptable. The formation of an on-site management district may be an alternative that would apply to this area of the County.

3.4 STORM DRAINAGE

3.4.1 Introduction

The Storm Drainage Section of the Grays Harbor County Utilities Comprehensive Plan outlines the County policies necessary to provide the drainage facilities needed to promote and support economic development in Grays Harbor County. The provisions of this section also recognize that the protection, preservation and enhancement of the natural functions of the drainage system are vital for an effective stormwater management program and will contribute to the economic well-being of the County. A preliminary draft of the goals, objectives and policies required to implement the Storm Drainage Comprehensive Plan is included in Appendix E.

The four elements of the Storm Drainage Section present the strategies and principles for achieving the goals of the Comprehensive Plan. The first of the Storm Drainage Section's four elements, Economic Development, outlines the need for the Utilities Comprehensive Plan to prepare for and accommodate new development and growth opportunities. This element also recognizes that existing economic opportunities must be protected and enhanced. Tourism, fisheries, and agriculture are vital components of the County's economic base, and each relies on the water resource.

The next two elements, the Storm Drainage Facilities and Surface Water Resources elements, describe the physical portions of the drainage system. The Storm Drainage Facilities element describes the man-made portions while the Surface Water Resources element describes natural components and functions of the drainage system. The two elements are interdependent.

When a site is developed, the constructed storm drainage facilities must duplicate and replace the natural drainage functions that existed on the site prior to development. Failure to do so will result in negative impacts to property and other storm drainage facilities. The objectives and policies in the Storm Drainage Facilities and Surface Water Resources elements are intended to limit negative impacts and ensure that no loss of the natural surface water drainage system occurs.

Finally, the Program Implementation element describes the components of the administrative support services that must be set up to carry out the objectives of the other three program elements. The staffing, financial resources, capital improvements, resource protection programs and regulations, maintenance, and intergovernmental coordination objectives are outlined.

3.4.2 Discussion and Alternatives

Introduction

The Storm Drainage Section of the Grays Harbor County Utilities Comprehensive Plan Update will serve as a guide to the County in providing for necessary public drainage facilities, upgrading of existing stormwater facilities and protection of water resources. For the Utility

Plan to be effective, the Storm Drainage Section should be used in conjunction with the Sewer and Water elements of the Plan.

This portion of the Utility Plan discusses the four elements of the Storm Drainage Comprehensive Plan. A description of existing conditions, economic development issues and a discussion of alternatives is included in each section. The discussion will provide support for the objectives and policies set forth in Appendix E. The summary of the Action Plan and schedule for implementation of the objectives and policies is included in Section 5.4.

3.4.2.1 Economic Development

Introduction

A primary purpose of the Grays Harbor Utilities Comprehensive Plan is to ensure that both public services and infrastructure are available to accommodate new growth opportunities. The most effective way to provide infrastructure in an orderly and economic manner is to develop a capital improvements plan (CIP). A CIP will identify the location of growth opportunities and areas needing drainage improvements, secure funding sources and provide a work plan to implement construction of the required drainage infrastructure.

Discussion

The Overall Economic Development Plan (OEDP) for Grays Harbor County (GHRPC 1990) outlines the strategy for economic development. The six goals are as follows:

(1) Economic diversification to broaden the economic base of the region in order to stabilize and increase employment.

(2) Resource development to build the three great renewable resources of the region (forestry, fishery, and agriculture) and continue the development of the industries which use these resources, in order to provide a permanent and growing sustained base for employment.

(3) Strengthening existing firms to maintain the existing diversified economic activities and provide for increased growth in jobs and business income.

(4) Environmental protection to make the region attractive to industry, tourists, and its own young people, in order to provide a permanent, desirable environment for both living and working.

(5) Effective growth management to optimize benefits and minimize costs which may result from development activities.

(6) Encouraging partnerships between business, labor and government to promote economic and community development.

Grays Harbor Regional Planning Commission (GHRPC), has prepared the Industrial Lands Study (GHRPC 1989) as an initial step toward achieving the first goal, diversification of the region's economic base. The study identifies sites for future industrial development in unincorporated Grays Harbor County, McCleary, and Hoquiam. The Utilities Comprehensive Plan will address drainage infrastructure needs of those sites considered for viable industrial development. Also, the policies and guidelines provided by the Comprehensive Plan will assist the OEDP in identifying new sites, or in eliminating sites from consideration that will impact the existing stormwater system.

The second and fourth goals of the OEDP are the protection and enhancement of existing water-related economic opportunities, such as fisheries, shellfishing, tourism and nature study. New developments should be of the type and construction that do not cause impacts to water quality, loss of significant fish or wildlife habitat, or impact the aesthetic features that attract tourists. Protection of existing water resources will maintain the quality of life that makes the County attractive to industry, tourists and the people of Grays Harbor County.

The protection of natural drainage features, such as wetlands and floodplains, is important to keeping down development costs, both private and public. The filling of stormwater storage areas in wetlands or flood water conveyance in floodplains can cause existing bridges and culverts to become overloaded, thus requiring public funds for repair and improvements. Impacts to water resources requiring mitigation, such as loss of functions in wetlands and floodplains due to filling, should be discouraged.

Alternatives/Recommendations

In developing the CIP, the County will include areas experiencing growth or new development as identified by the OEDP. Potential development sites will be reviewed for compliance with resource and stormwater facility protection policies and included in Industrial Development Plan (IDP) updates. Development sites in the IDP no longer complying with the policies of the Utilities Comprehensive Plan will need to be reconsidered.

New developments will be required to mitigate impacts to existing economic resources. Stormwater runoff impacts due to new development will be mitigated on development sites or in regional stormwater control facilities. Alteration of existing natural drainage features, such as wetlands and floodplains, will be avoided to limit the need for public funds to mitigate impacts.

Development that potentially causes water quality or aesthetic impacts to existing economic resources will be regulated through land use restrictions. Land use in resource areas such as wetlands, floodplains, shorelines, or fisheries will be limited to water-dependent activities.

3.4.2.2 Storm Drainage Facilities

Introduction

Storm drainage facilities collect stormwater runoff and convey it to lakes, rivers, and other surface waters. They are the man-made component of the drainage system that is intended to replace the natural drainage features and functions existing on a development site prior to construction. Drainage facilities are designed to protect public and private property, such as roads, houses, and businesses, from damage due to stormwater runoff. The degree of protection that will be provided to homes, roads and property by these stormwater management facilities is often referred to as Level of Service (LOS).

The Storm Drainage Facilities section will discuss the following four issues: 1) LOS standards for drainage facilities and protection of property; 2) inventory of the existing drainage system; 3) flooding problem areas, and 4) policies to prevent decreases in the LOS of existing drainage systems due to new development.

Discussion

Level of Service Standards

LOS standards for the design of storm drainage facilities are based on several criteria. Ideally, the standard selected will balance the cost of the drainage improvement with the cost of damage that would occur should the drainage improvement not be constructed. However, several other less tangible factors usually enter into the equation. For example, if the LOS standard allows for the frequent flooding of yards and no monetary damages result, at what point does the nuisance become unacceptable? Public health and safety is another factor that is difficult to measure. For example, a temporary septic tank failure can be considered a nuisance or a public health threat. Water running over the highway can be considered a nuisance if it causes traffic to slow, or a safety threat if traffic fails to slow and accidents occur. The LOS standards selected for Grays Harbor County will suggest design storm standards for storm drainage facilities, culverts, bridges, roads and storm sewers.

Existing Drainage System

Undertaking an inventory of the County's drainage system should be high priority for the new Stormwater Program. The inventory of the existing drainage system will accomplish three objectives. It will: 1) identify the location of drainage facilities that the County is responsible for maintaining (this will assist in developing the budget and equipment needs for the maintenance plan); 2) determine which facilities do not meet LOS standards (for inclusion in CIP work plans); and 3) identify the need for new facilities. The inventory will also identify additional chronic flood problem areas for inclusion in the CIP.

Standards for New Development

In its subdivision ordinance, the County has stormwater management regulations which limit the impacts of new development. The design storm used is the 25-year, 24-hour storm. These regulations apply to long, short, and large lot subdivision developments, as well as mobile home parks, recreational vehicle parks, commercial, and industrial developments.

The 25-year, 24-hour design storm is used by several communities. It generally provides an appropriate balance between the cost of the facilities and the level of protection provided for flood control. However, for the 100-year flood, which is the national standard for flood protection, the County's standard may not provide the level of protection needed to mitigate impacts in developed watersheds. The new Draft State Stormwater Management Manual (DOE 1990) recommends that stormwater impacts from the 2-, 10-, and 100-year, 24-hour storm be mitigated.

Limiting runoff from new development sites caused by smaller storms, such as the 2-year, 24-hour storm, is important to mitigate stormwater runoff impacts to fisheries resources. Presently, the County does not have a standard for smaller storms. The County should also consider additional stormwater standards for larger storms (less frequent) or storms of greater duration (7-day). Longer duration storms appear to be more representative of the normal storm events that occur in Grays Harbor County.

The County's current stormwater regulations are deficient in three areas: 1) offsite analysis of stormwater facilities, 2) stormwater design standards for closed drainage basins, and 3) enforcement and maintenance of stormwater facilities. Offsite analysis is necessary to determine downstream impacts to be avoided or mitigated. Design standards for closed basins are particularly important along the coast, where the areas between the dune ridges have no drainage outlet and pond water for long periods. New stormwater management facilities have no provision for perpetual maintenance. The County should determine whether revisions to the drainage regulations are warranted.

Flooding Problems

Several complaints about flooding suggest that grading activities are responsible for many stormwater drainage problems. In response to citizen complaint, the County Planning and Building Department adopted Chapter 70 of the Uniform Building Code in January of 1990. Prior to that time, there were no regulations regarding grading and filling activities. The County grading ordinance should be reviewed to determine if the standards should be revised or if maintenance and enforcement criteria in the ordinance need to be increased.

Alternatives/Recommendations

The County should establish LOS standards for new and existing roads, drainage structures, stormwater facilities and storm sewers. The LOS will relate to a design storm event and the

performance of the facility. LOS for new facilities will be based on existing or proposed design standards in development ordinances, such as the 25-year, 24-hour design storm in current subdivision regulations. The LOS for existing facilities will be determined using a design standard that has been standard practice in the County, with consideration given to the County's financial ability to improve systems that do not meet the LOS. For example, if the LOS of a 100-year flood is used to judge the adequacy of existing roads, and if all roads in the County flood in the 100-year flood, then the LOS standard is too high because replacing all roads in the County is infeasible.

In order to develop plans to provide routine maintenance of drainage facilities, the County should inventory and map all existing County-maintained drainage facilities. The inventory has been scheduled to start during the third year of the Storm Drain Master Plan implementation.

The County should consider whether additional or increased stormwater management standards are needed to provide the necessary protection for storm drainage facilities and water resources. The following storm drainage design criteria are recommended for consideration:

1. The 25-year, 24-hour storm for the design of new stormwater facilities should be reviewed to determine if the standard is adequate.

2. To control local impacts to streams from smaller storms, the County should require that the post-development discharge from a developed site not exceed the pre-development discharge for a 2-year, 24-hour design storm.

3. The County should adopt design criteria for closed drainage basins. The 100-year, 7-day storm or other long-duration storm is recommended.

4. The County should review the grading permit procedure to determine whether improvements in drainage control can be made.

5. The County should consider unique features of each drainage basin when determining individual LOS.

3.4.2.3 Surface Water Resources

The natural surface water features of Grays Harbor County, such as rivers, streams, harbors and fisheries, have played a significant role in the County's development. The river and harbor have provided a transportation route for the forestry products produced in the County and have yielded an abundance of fin fish and shellfish. The natural beauty of the County's surface waters, and the related outdoor sports activities, have produced a significant tourist and resort industry. The rich soils of the Chehalis River flood plain provide a resource for a viable agricultural industry. The County's wetlands provide habitat for abundant wildlife which attracts birdwatchers, naturalists and hunters. Coastal lowlands and bogs support a strong cranberry industry. Because of these economic benefits, it is important to properly manage and protect

these natural systems. The management of the surface water resources in the County has a three-fold purpose: 1) to protect their use for economic purposes, such as fishing and shellfish harvesting; 2) to prevent the degradation of natural and aesthetic features, resulting in loss of tourism and land development opportunities; and 3) to minimize the cost to the public resulting from flooding and water quality impacts.

The five following water resources have been identified as important components of the natural surface water system: floodplains, wetlands, water quality, fisheries and shorelines. Each component has functions and attributes that affect the others. For example, a loss of storage volume from filling wetlands can increase flooding in lowland areas. Filling in flood plains can increase flooding in other portions of the flood plain, causing loss of shoreline by erosion, which in turn degrades water quality, creating impacts to the fishery. The management and protection plan recommended in the Storm Drain Master Plan will protect the functions of the surface water resources from degradation.

Changes to the elements of the natural surface water system will also impact man-made storm drainage facilities. For example, the filling of wetlands and subsequent loss of storage volume will increase the volume of stormwater runoff in the drainage system. This may result in exceeding the capacity of existing road culverts and storm sewers.

3.4.2.3.1 Floodplains

Introduction

A floodplain is the area of normally dry land adjacent to a lake, river, or stream susceptible to temporary inundation caused by the overflow of surface waters. Floodplains have many important functions. They store flood waters, which minimizes downstream flooding and erosion impacts in rivers. Floodplains are the areas where sediments and nutrients in the river are deposited, improving water quality and providing rich farm lands. In addition, Grays Harbor County has coastal areas which are impacted due to high tides and offshore storm conditions. These areas are mapped as coastal floodplains.

Flooding that has a 1 percent chance of occurring in any year is termed the "base flood," (also known as the 100-year flood). For the purposes of flood protection and flood control, the 100-year flood is the standard adopted for the National Flood Insurance Program (NFIP) by the Federal Emergency Management Agency (FEMA).

Located within the limits of river floodplains is the floodway, which is the portion of the floodplain that must be reserved in order to discharge the base flood without cumulatively increasing the flood elevation by more than one foot. The floodway is an area of high velocity waters and is important because it conveys a significant amount of floodwater. Floodways are usually determined for major rivers where detailed flood studies have been prepared.

Detailed flood studies have been prepared for several rivers in the County; these include the Chehalis, Wynoochee and Satsop Rivers. A Flood Insurance Study (FIS) (FEMA 1990) has been prepared for the County. The results of the study are depicted on the Flood Insurance Rate Maps (FIRM) and Floodway Maps (FEMA 1986, 1990).

Discussion

The County is an NFIP participant; to be eligible, the County has adopted flood protection standards in Chapter 13.07 of the Grays Harbor County Comprehensive Zoning Ordinance. The flood standards have two basic missions: 1) to protect the floodplain from encroachment which can result in higher flood elevations, and 2) to floodproof construction within the floodplain.

Floodplains and floodways have been determined for selected rivers in the County. The floodways are areas where no encroachment or fill is allowed. However, floodways have not been determined on several smaller streams in the County; therefore, there are no specific "no-encroachment" standards for those streams. Filling could be occurring in the floodways of those streams. There are also several streams in the County that have not had floodplains determined or mapped. Development, building, or filling in those floodplains could cause significant impacts. Since no floodplain exists on the maps, the regulations would not apply, even though all streams have floodplains. Development could not be discouraged or regulated by flood plain designations since the designation has not been made.

Fill or encroachment in the floodway fringe (the area of the floodplain not included in the floodway) is not regulated for impacts caused by filling. A cumulative loss of floodplain storage, due to incremental filling in the flooding fringe by each new development, has the potential either to cause lands that were not previously flood-prone to flood or to overload drainage structures and bridges.

Alternatives/Recommendations

It is recommended that the County continue to participate in the NFIP. Enforcement of flood plain filling and encroachment regulations should be improved. The County should also consider whether a modification to the floodway encroachment standard allowing an increase of 1 foot of flood elevation should be implemented. As an alternative, the requirement for elevating or floodproofing structures above the base flood elevation (BFE) could be increased to 1 foot or more above the BFE or the County may wish to consider restricting filling in riverine floodplains.

The County should develop policies that limit the use of floodplains to water-dependent activities or to no-encroachment uses such as agriculture. Encroachment into the flood plain should be approved only if fill placed in the flood plain is mitigated.

The County needs to review the flood plains of small streams and develop flood studies for those streams that are being developed. Additional standards may be needed for developments into

the flood plains of streams having no detailed flood studies. These standards should recommend "no-encroachment" widths for streams until detailed studies can be completed. New flood studies should also be included in the development of basin plans. The County Storm Drainage Plan should include policies on development in unmapped floodplains.

3.4.2.3.2 Wetlands

Introduction

Wetlands perform many important natural functions, including water quality protection, flood protection, wildlife and fisheries habitat, groundwater recharge and stream flow maintenance. Several of these functions, such as water quality and fisheries habitat, relate directly to the vitality of existing economic opportunities, such as the shellfish and fishing industries, agriculture and tourism. Loss of these existing functions throughout the County could cause irreversible long-term impacts.

Discussion

The protection of wetlands functions begins with defining wetland areas. Although regulatory agencies use several definitions, wetlands are generally areas that are at least periodically inundated, that support primarily hydrophytes (wetland adapted vegetation), and that have a substrate of predominantly hydric soils. Most wetland areas are obvious to the casual observer because they are wet year-round. The transitional areas located along the fringes of wetlands and areas that have been disturbed, are usually not so obvious. The County should adopt a definition for delineating wetland limits that is specific to conditions typically found throughout the County.

Wetlands provide functions that need to be protected and integrated into the County's new Storm Drain Master Plan. A brief description is provided below:

Flood Protection. Wetlands areas have the capacity to store significant volumes of stormwater runoff. If these areas are eliminated, stormwater runoff is discharged directly into rivers and streams, and flooding and downstream erosion is substantially increased. Stormwater stored in wetlands is released slowly into the rivers and streams, lowering the "peaks" that occur during large floods.

Streamflow Maintenance. Stormwater that is stored in wetlands, which act as natural reservoirs, is released slowly into streams and rivers throughout the entire year. When wetland areas are filled, stormwater runoff discharges directly into lakes, streams, and rivers and this reservoir effect is lost. The result is larger flows during the wet seasons, and lower flows during the dry season. If summer stream flows become too low, permanent damage to fisheries resources can occur.

Groundwater Recharge. Water stored in wetlands will infiltrate through the underlying soil into the aquifer systems. These shallow aquifers are frequently used for potable water supply. Without wetlands, permanent reductions in well levels and groundwater resources can occur.

Water Quality. Stormwater runoff from urban and agricultural land uses carry several pollutants that are "washed off" by rainfall. Wetlands areas act as filters to trap sediments, remove nutrients and provide biochemical conversion of toxic chemicals trapped in sediments into less harmful chemical forms.

Wetland functions vary depending on the type and location of the wetland. These functions can be significantly altered by human activities and often are. The County should classify wetland types by the relative importance and condition of the wetland. Preservation, protection and mitigation standards for each classification should be determined.

An inventory of the wetlands in the County should be completed, using the National Wetlands Inventory prepared by the U.S. Fish and Wildlife Service. The inventory will be used to determine the approximate total area of wetlands in the County. A policy to minimize the loss of wetlands or wetland functions should be used by the County for consideration of proposed land use activities. Mitigation guidelines will be developed and presented in a wetlands management plan.

Alternatives/Recommendations

The County should select a definition and methodology for delineating wetlands on a development site. The definition should be consistent with that of other agencies that are permitting wetland development. The definition used by the U.S. Army Corps of Engineers is recommended.

The County will develop criteria for the development, mitigation and conservation of wetlands based upon a classification of the relative importance of the wetland. It will also be important to establish criteria that consider conditions that may be unique to Grays Harbor County. By developing a strong, well-designed wetlands management program that addresses the specific needs of the County, the County will have greater local control over the use of the resource in the future.

Maintaining the functions of wetland areas is critical to the long-term success of the County's stormwater management program. Wetlands areas provide benefits to all aspects of the surface water drainage system. Because the public expense of replacing lost wetland functions exceeds the public benefit of filling and developing wetland areas, the review of land use proposals should identify impacts to wetland functions, and recommend mitigation that may be required. Developments will be encouraged to minimize the loss of wetland areas.

3.4.2.3.3 Water Quality

Introduction

The water quality of Grays Harbor County varies from very poor in some parts of the Grays Harbor estuary to very good in the upper reaches of many of the watersheds. Table 3.4.1 lists the larger water bodies and rivers in the County. Generally, the rivers in the area have a relatively high level of water quality. Most of the rivers are either Class AA or Class A waters as defined in WAC 273-201. Inner Grays Harbor estuary, the lower portion of the Hoquiam River, and the lower portion of the Wishkah River are all Class B waters, indicating that they are somewhat degraded waters.

The Department of Ecology has studied most of the large water bodies of the State and made assessments of the beneficial uses which those water bodies provide (DOE 1989). Waters of the State are expected to provide the beneficial uses defined by their class. For example, Class A waters are expected to be suitable for fisheries use, secondary recreational use such as boating, and primary recreational use such as swimming. Table 3.4.2 lists all of the beneficial uses expected for each water quality class. The following discussion explains the status of the water quality of some of the more degraded water bodies in the County based on the beneficial use assessments made by the Department of Ecology.

Table 3.4.1

Water Quality Classification for Water Bodies in Grays Harbor County

Area/Water Shed	Class*	Status of Beneficial Uses	Causes	Sources
Grays Harbor (inner)	MB (shall exceed 5 mg/l D.O.)	Not supported	Metals & organics, pathogens	Industrial discharge, forestry, municipal discharge, on-site systems, combined sewers, pastureland, animal areas
Grays Harbor (outer)	MA	Mostly threatened	Metals & organics, pathogens, taste & odor	Municipal discharges, pastureland, animal holding areas, on-site systems
Humptulips River (lower E.F.+W.F.) (upper sections of all forks)	A AA	Fully supported –	– –	– –
Chehalis River (Grays Harbor to Wynoochee)	A	Partially supported	Pathogens	Municipal discharges, agriculture, on-site systems
Satsop River (Chehalis to E.F./W.F. split)	A	Threatened	Siltation, suspended sediment	Unknown nonpoint
Satsop River (M.F.)	AA	Threatened	Siltation, suspended sediment	Unknown
Satsop River (E.F.)	AA	Threatened	Siltation, suspended sediment	Unknown
Cloquallum Creek	–(A)	–	–	–
Wildcat Creek	A	Mostly threatened	Nutrients, thermal modifications	Municipal discharges, storm sewers, flow modification
Chehalis River (Porter Creek to Scammon Creek)	A	Partially supported	Pathogens	Municipal discharges, pastureland, animal areas
Chehalis River (Scammon Creek to Newaukum)	A	Partially supported	Organic enrichment, pathogens	Municipal discharges, unknown nonpoint
Copalis River	–(A)	–	–	–
Johns River	–(A)	–	–	–
Hoquiam River (to mile 9.3) (above mile 9.3)	B –(A)	– –	– –	– –
Wishkah (to mile 6)	B	–	–	–
Wishkah (mile 6 to W.F. mile 8)	A	–	–	–
Wishkah (W.F. mile 8 to head) (mile 32 to head)	AA (no waste discharge allowed)	–	–	–
Elk River	–(A)	–	–	–
Lake Quinault	lake	Fully supported	–	–
Quinault River	AA	Fully supported	–	–

*Class A in parentheses indicates there is no specific state designation for this water body.

Discussion

The following Discussion Section has been divided into the following topics:

- Water Quality Problem Areas
- Pollutants and Pollutant Sources
- Economic Impacts Due to Water Quality Problems

Water Quality Problem Areas

Inner Grays Harbor estuary (east of a line from Point New to Markham) is by far the most degraded water body in the County. The inner harbor is expected to meet at least Class B beneficial uses for marine water, but it was found to support only a few beneficial uses. Inner Grays Harbor has been classified as an "impaired" water body. The primary known cause of poor water quality is pathogens (mostly bacteria) from human and animal wastes. Shellfish beds in this part of the harbor have been decertified by the State Department of Health because of high bacteria levels.

Outer Grays Harbor is considered Class A marine waters and supports Class A beneficial uses some of the time. However, the levels of pollutants are close to or sometimes exceed Class A limits, and the beneficial uses are considered to be threatened. Pathogens are the primary cause of water quality problems in the outer harbor as well.

The Chehalis River from the harbor to the confluence with the Wynoochee River is also considered to have Class A waters. However, the Class A criteria are exceeded often enough that the potential beneficial uses of the river are only partially supported. Again the primary known cause is pathogens.

TABLE 3.4.2

BENEFICIAL USES OF WATER BODY CLASSES

	Class AA	Class A	Class B
Beneficial Uses: (same for freshwater and marine water)			
Domestic Water Supply	*	*	
Industrial Water Supply	*	*	*
Agricultural Water Supply	*	*	*
Stock Watering	*	*	*
Salmonid Spawning	*	*	
Other Fish Spawning	*	*	*

TABLE 3.4.2 BENEFICIAL USES OF WATER BODY CLASSES			
	Class AA	Class A	Class B
Shellfish Harvesting	*	*	
Wildlife Habitat	*	*	*
Primary Contact Recreation	*	*	
Secondary Contact Recreation	*	*	*
Commerce and Navigation	*	*	*

Source: WAC 273-201

The Wynoochee River, from its mouth up to the Olympic National Forest boundary, is another Class A water body that is also "impaired." Similar to the lower Chehalis, it often exceeds its set criteria, and its beneficial uses can only be considered partially supported. The primary known cause of impairment is the high water temperatures caused by the removal of trees and vegetation along the banks of the stream.

All parts of the Satsop River exceed water quality standards with some frequency. The middle fork and east fork are considered Class AA and the lower river is considered Class A. Because of widespread siltation and suspended sediment problems, the entire river is often impairing expected beneficial uses. The Satsop River has been designated as "threatened."

All other water bodies in the planning area either usually support their respective designated beneficial uses or have not been assessed by the State. However, there are two exceptions, the Lower Hoquiam and the Lower Wishkah (which have not been assessed) are both Class B waters. Such a ranking indicates water quality problems are known to occur in these rivers.

Pollutants and Pollutant Sources

Identification of pollutants and their sources is the first step towards preserving and enhancing water quality. The following pollutants have been identified in previous studies as being of concern in at least one water body in the study area:

- sediment
- oxygen demand
- pathogens
- nutrients
- toxic metals and organic compounds

Economic Impacts Due to Water Quality Problems

Although not always obvious, there are economic impacts associated with the loss of water quality in natural receiving waters. In Grays Harbor County, forestry, fishing, agriculture and tourism are all directly impacted by the degradation of water quality.

Forestry and Related Industries

The erosion and the resulting high sediment loads in surface water can have some negative effects on the forest industry.

- Erosion can cause poor soil conditions which may reduce land productivity.
- Sedimentation of downstream waterways can reduce the number of suitable shoreline sites for mills, shipping and transport, and can increase dredging maintenance costs at existing sites and waterways.

Commercial Fisheries

Both fin-fish and shellfish require clean water quality conditions in order to grow and reproduce. If these conditions are altered, productivity of the fishery will suffer. The following pollutants can impact water quality:

- Sediments in waterways impact fisheries in four ways: (1) Eggs are smothered and buried, increasing mortality; (2) Sedimentation of shallow areas destroys plant life and fish-rearing areas; (3) Survival of young fry decreases significantly; (4) Sediment buries shellfish beds or the substrates needed to reproduce.
- Reduced levels of oxygen can cause poor growth, reduce reproduction, or even kill fish.
- Fin-fish can become infected by certain pathogens and become unacceptable for human consumption or die as a result of the infections. Shellfish tend to accumulate bacteria as they filter water. The retail value of shellfish in decertified beds in Washington State alone has been estimated at $3,164,000 (Taylor 1987).
- Some toxic compounds, such as heavy metals, are fatal to aquatic organisms at concentrations measured in parts per million or even parts per billion. Long lived toxic substances also can accumulate in the flesh of aquatic animals and become concentrated enough to harm humans who consume them.

Tourism

Tourists are attracted to the Grays Harbor area for many reasons, including sport fishing, outdoor activities (such as camping, hiking, and boating) and wildlife activities (bird watching and hunting). Bird watching alone is estimated to attract several thousand people annually to Bowerman Basin. Good water quality is essential for all of these tourist attractions.

Many outdoor activities rely on the aesthetics of so called "natural" environments. Healthy water systems in turn promote healthy ecosystems which is the essential factor that attracts campers, hikers, bikers, boaters and others.

Agriculture

As with forestry, most of the water quality impacts to agriculture are through erosion and sedimentation. Loss of soil by erosion reduces productivity. Cranberries, one of Grays Harbor County's most important crops, directly depends on good water quality. Cranberries have low tolerance for widely fluctuating water conditions. Consistently high water quality is essential to the continued success of this cash crop.

Alternatives/Recommendations

Poor water quality directly affects the economy of Grays Harbor County. It is important that the amount of pollution in the surface waters of the County be minimized. Expenditures made in the improvement of water quality will be returned in the form of long-term savings and the growth of water quality-dependent economies. The following section details objectives of a water quality program and some general policies that should be implemented in order to meet these objectives.

Water Quality Monitoring Program

In order to properly understand the water quality problems that exist in the Grays Harbor area more data on existing water quality conditions must be collected. The new information on water quality can then be used to plan effective programs and policies.

The water quality monitoring program should be designed to obtain the following information:

- The extent and degree of contamination of pollutants of concern
- The extent and degree of contamination in sensitive or significant surface waters such as shellfish beds, fisheries habitat areas, and wildlife habitats
- Identification of the pollutants of greatest concern
- Identification of the activities and regions which are the primary source of these pollutants.

This information can then be used to identify specific geographic areas (such as watersheds) and specific activities (such as combined sewer overflows), which will be the focus of water quality programs. The water quality monitoring should be conducted on a continuing basis so that long-term effectiveness of water quality control policies can be evaluated.

Water Quality Improvement Program

Once the appropriate information has been collected, the design and implementation of programs to enhance and improve water quality can begin. The programs should be designed to concentrate effort and funds in areas that are most severely impacted or are the primary sources of problem pollutants.

Water quality programs should contain some or all of the basic elements discussed below.

Watershed Management Plans

Watersheds and areas with substantial water quality problems will be identified through the water quality monitoring programs. Watershed Management Plans, often referred to as Basin Plans, should be developed to resolve widespread water quality problems. Using Basin Plans for guidance, these watersheds should be given high priority for implementing water quality improvement programs. Watershed management plans should include the following water quality components:

- Sources of pollutants and causes of pollution
- Identification of control strategies
- Description of specific watershed policies, regulations and activities.

County-Wide Policies, Regulations, and Source Controls

Stormwater Runoff Control

The County should develop new regulations for the control of stormwater runoff from new developments. The regulations can be adopted as a part of comprehensive stormwater management policies and regulations and will apply to any development that applies for drainage permits. Water quality regulations should include:

- Analyses of potential water quality impacts from stormwater.
- Best management practices such as biofiltration and water quality wet ponds.
- Special water quality controls for sensitive areas such as wildlife habitats or direct drainage to shellfish beds.
- Maintenance procedures for water quality facilities.

In addition, the County should encourage the retrofitting, reconstruction, repair and maintenance of existing stormwater facilities in order improve their water quality functions. Establishment of some best management practices should be encouraged on existing sites which presently have little or no stormwater management facilities.

Sediment and Erosion Control

New regulations and policies limiting and controlling activities which create erosion and sediment will be applicable to at least the following activities:

- New development during and after construction.
- Land clearing for other purposes.
- Soil and gravel stockpiling operations.

The regulations would encourage the use of sediment retention practices such as: vegetative cover, silt fences, sedimentation basins and vegetative buffers.

The County should review forest practice permits to ensure that an adequate amount of sediment and erosion control is being provided. The County will also adopt some policies that encourage farmers to adopt farm management plans. The policies could include low interest loans, technical help, tax incentives, free design work, implementation guidance and assistance with existing state programs which encourage soil conservation. The local soil conservation district could provide technical resources, advertisement and liaison with farmers.

Repair and Maintenance of Sanitation Systems

Although the exact location and number of combined sewer storm drains is not known, information suggests that combined sewer overflows do occur in Grays Harbor (DOE 1989). Sewer overflows introduce large amounts of BOD, nutrients and pathogens directly into receiving waters and are therefore a serious water quality hazard. The County and cities should start a program to correct this problem. The program would contain the following elements:

- Sanitation system and storm drain system inventory.
- Dry weather storm drain system inspections to identify connections.
- Sampling and dye testing to confirm unauthorized connections.
- County or city repair of large trunk line connections.
- Citizen repair of private connections.

Recommendations

One of the primary functions of the County Health Department is to monitor, inspect and require repair of inadequate on-site wastewater disposal systems. Recommendations within the wastewater section to increase monitoring of on-site disposal to protect ground or surface waters should be considered.

Hazardous Waste Spill Program

Accidental industrial spills and improper disposal of household wastes are two common sources of hazardous waste in surface waters.

All industries which use hazardous chemicals in any part of their processing or manufacturing are required by the EPA to have a Spill Prevention, Control, and Countermeasures Plan. The County will confirm that most large industries do have such plans and that they have been updated recently. In addition, large transfer operations should be required to write and submit emergency clean-up and contingency plans for major spills of chemicals.

Used oil dumping and improper disposal of hazardous wastes is quite common in most communities. The County should start a public awareness campaign on the environmental

problems caused by common household products. Information on the proper handling and storage, proper disposal, environmentally sound alternative products, and sources of more information would be among the topics of the awareness campaign. Information could be in the form of flyers, pamphlets, local paper advertisements (or articles if possible) and features in existing local newsletters. The County should also provide locations for periodic collection of household hazardous wastes from the public.

Point Discharges of Municipal and Industrial Wastes

Point discharges of wastes and stormwater are permitted under the National Pollutant Discharge Elimination System process. However, these regulations do not generally consider the placement of outfalls or manufacturing sites. The County should encourage diversion of municipal and industrial discharges away from significant water bodies and sensitive wildlife habitats. Proper planning of discharge locations can avoid detrimental discharges to sensitive areas for a relatively low cost.

3.4.2.3.4 Fisheries Resources

Introduction

The term "fishery" describes a type or group of fish that is captured for food, profit or enjoyment. Fisheries resources encompass all of the biological elements necessary to sustain a fish population, including habitat, water and food. Because freshwater and anadromous[1] fish depend on surface water for all or most of their life cycle, the quality of surface water runoff has a tremendous impact on fish survival and productivity.

The Grays Harbor area supports a wide variety of commercial fisheries. The salmon, trout and sturgeon fisheries depend on the water quality of the numerous river systems which drain into Grays Harbor and the Pacific Ocean. A valuable commercial shellfish industry within the Grays Harbor area relies on the quality of surface water runoff and river input to maintain harvestable populations of oysters, shrimp and crab.

Most fish targeted in commercial fisheries, such as steelhead, trout, and salmon, are also sought in sport fisheries. Their fluctuating populations are indicative of the intense harvest pressures placed on such limited resources. Recreational shellfish harvesting is also popular in the harbor and at area beaches.

Discussion

Resource Productivity

Salmon, steelhead trout and sturgeon rely on freshwater to spawn. Sturgeon may spend most, if not all of their lives within a river and estuary system. High-quality spawning and rearing habitat is critical to egg hatching success and juvenile survival rates. High-quality habitat

[1] Anadromous fish are spawned, hatched and reared in freshwater, but migrate to saltwater for most of their adult life.

requires clean, cold, fast-flowing water, unsilted spawning gravel and undisturbed streamside vegetation to moderate stream temperature and provide cover. An adequate food source, which is also dependent on water quality conditions, must be readily available.

Access to the streams where adults need to return to spawn must be maintained for a run to survive. Obstructions, such as dams or steep culverts, can prevent salmon and trout from reaching spawning areas. Obstructions can also prevent juveniles from migrating downstream to the ocean. Diversions, such as irrigation ditches, can lower summer creek levels so that the flow slows, temperatures rise, dissolved oxygen drops and the juveniles die.
Adverse impacts to the upper watershed are carried through the river system into Grays Harbor. Sediment deposits in the harbor area can smother shellfish habitat. Contaminated runoff that reaches the water can affect the survival of shellfish or render them unfit for human consumption. Shellfish are acutely dependent on good water quality for both survival and sale value.

Economic Value

Grays Harbor County is home to many commercial and recreational fishing businesses. According to OEDP 1989 Annual Progress Report (GHRPC 1989), fisheries provide the second largest economic source to Grays Harbor County. Fisheries generate income and tax revenues and create jobs through the purchase of equipment and services used in conjunction with fishing. These adjunct activities include dock and boatyard facilities, processing plants, net and line manufacturing, foulweather gear and associated apparel, and merchandise distribution outlets.

Not surprisingly, people who fish recreationally spend more money on equipment and services (such as fishing charter guides and motel rooms) per pound of fish than do commercial fishermen. Sport fisheries generate high license and sales tax revenues; therefore, they are an increasingly important source of employment and local tax revenues.

Since 1980, Grays Harbor County has actively participated in salmon and steelhead fisheries protection and enhancement, through the County's Fisheries Enhancement Task Force (GHRPC 1989). Supporting funds have grown from $25,000 in 1980 to over $150,000 in 1989. The Task Force's *Action 1990* plan reported that in 1989, the value of matching goods and services donated by the community exceeded $1.25 million.

Resource Protection

Maintaining and restoring good water quality is imperative for fisheries success. Thoughtful planning and careful control of development near stream corridors will help to ensure a profitable economic return for the thriving fisheries of Grays Harbor County.

Land use and development practices can be formulated to protect and enhance fish production by encouraging development that is compatible with water quality goals, and by restricting any development near stream corridors that would harm fish habitat. These development goals are compatible with the Grays Harbor County Fish Task Force's objectives of water quality improvement and stream enhancement to restore the fisheries resource.

Identification of water quality problems that undermine instream fishery health must be recognized and understood by the community, so that effective decisions can be implemented. Impacts to water quality that have deleterious effects on fisheries can be grouped in four major areas: 1) stormwater runoff; 2) construction activities; 3) loss of habitat; and 4) direct pollutant discharges. These impacts are described below:

- Stormwater Runoff

Stormwater can affect fisheries resources by increasing the volume of runoff and by carrying contaminants, sediment and debris into a stream. Under normal conditions, rain is absorbed into the soil and runoff is slowed by vegetation. High volumes of surface water runoff result in erosion and sediment loading. Among the sources creating runoff problems are logging and clearing, especially on moderate to steep slopes, building and road construction, compacted dirt or gravel surfaces, and pavement.

Stormwater runoff will collect pollutants and sediment from the ground. Under natural conditions, contaminants settle out before reaching the stream and degrade through natural processes, or are retained by vegetation. Development and land-clearing activities remove these natural processes. Runoff contaminants that affect fisheries stream productivity may come from roads, parking lots, livestock wastes, landfills, and agricultural lands.

- Construction Activities

Vegetation along stream channels serves to slow runoff into the stream, stabilize stream banks, shade the stream, and moderate temperature fluctuations (especially during egg incubation and juvenile emergence). Instream vegetation and natural woody debris help to vary stream velocities, provide cover from predators and support populations of insects and animals that fish feed on. Construction within or near a stream corridor usually results in the elimination of streamside vegetation and loss of critical fish habitat. Construction in the stream bed eliminates spawning gravel, and increases sediment loading. These impacts are typical results of culvert installation, irrigation diversion construction and ditching for stormwater control.

- Habitat Loss

The destruction of stream corridor habitat results in damages to the fishery. Diking stream banks, piping streams through culverts and filling wetlands all destroy the functional buffering capacity of soil and vegetation to protect water quality. The effects of degraded water quality are accumulative downstream, so that harbor habitat becomes degraded and fails to support shellfish and juvenile salmonids.

- Direct Discharges

Discharges from both point and nonpoint sources degrade water quality by adding harmful contaminants to fisheries habitat and by adding chemicals which alter the water chemistry. Leaking septic systems or sewer lines contribute to high fecal coliform levels in shellfish. Untreated industrial discharges can affect the amount of oxygen and nutrients available to fish and shellfish. Chemicals in sewage discharges can bioaccumulate in fish and shellfish tissues, causing lesions, contamination or unacceptable taste. In severe cases of harmful discharges, a

fishery may be wiped out for the season, or, in the case of shellfish beds, permanently destroyed. Accidental discharges, such as fuel spills, have similar consequences that may prove to have longer-term impacts on fisheries and food supplies due to oil's physical and chemical properties.

Alternatives/Recommendations

Policies will be developed to encourage appropriate land use in areas adjacent to and upstream of streams, rivers, lakes and the harbor. The criteria will recommend types of development compatible with high quality fisheries resources, and avoid instream and shoreline construction, including ditching, diversions, and culvert installations. Buffer zones for protection of fisheries will be defined, appropriate to the significance of the habitat. Buffer zones and limited stream access standards will be designed for livestock management. State and federal resources should be used to assess the location and quality of existing fisheries habitat.

Stormwater management standards will be considered that specifically address fisheries habitat. These would include: 1) runoff control for small storm events (2- to 5-year) to reduce large flow erosion impacts, 2) stormwater runoff quality guidelines, and 3) sediment and erosion control standards for construction sites.

A continuation of existing public education programs that incorporate community members into protection and enhancement activities should be supported by community development policies. Programs that replant or supplement streamside vegetation, remove debris and instream barriers and improve water quality and habitat should be developed for each watershed and the harbor. Property owners should share responsibility for the maintenance of waterways within or along their property. Methods of maintenance and enhancement should be reviewed by a fisheries habitat biologist or program leader to promote effective practices and prevent unforeseen habitat damage.

Standards and methods of enforcement to maintain water quality goals should be designed for the long-term benefit of fisheries resources. County residents should participate in the identification of water quality problems and the formulation of solutions. Emphasis should be placed on the restoration and enhancement of natural fisheries habitat, rather than off-channel or hatchery mitigation. Any mitigation measures approved should be shown to have consistent, long-term benefits for the water quality and the health of the resource, over short term economic gain.

3.4.2.3.5 Shoreline Resources

Introduction

For regulatory purposes, shorelines include: marine water areas, streams with a mean annual flow greater than 20 cubic feet per second, and lakes larger than 20 acres. Shorelines include

land extending 200 feet from the ordinary high-water mark on these water areas, and wetlands associated with the above-described water areas.

Significant public interest is associated with the functions of shoreline areas and the unique opportunities they provide. Certain types of uses, such as marinas, ports and facilities providing public access to water, can occur only in shoreline areas. Also, shoreline areas can provide buffers that help reduce stormwater runoff, protect and enhance water quality, provide wildlife habitat and protect fisheries.

Discussion

The County has developed a master program for managing shorelines of statewide significance. The Grays Harbor County Shorelines Management Master Program was developed in accordance with the Washington State Shoreline Management Act. In this Act, the state legislature declared that the state and local governments "shall" give preference to uses in the following order of preference which:

1) Recognize and protect the state-wide interest over local interest;
2) Preserve the natural character of the shoreline;
3) Result in long term over short term benefits;
4) Protect the resources and ecology of the shoreline;
5) Increase public access to publicly owned areas of the shorelines;
6) Increase recreational opportunities for the public in the shoreline;
7) Provide for any other element as defined in RCW 90.58.100 deemed appropriate or "necessary."

In accordance with the provisions of the Shoreline Management Act of 1971, Grays Harbor County has accomplished the following to implement the Act.

- Initiated and now administers a regulatory program specifically authorizing the County to issue Shoreline Management Permits for substantial developments (defined as any development on which the fair market value exceeds $1000) on shorelines in the County;

- Compiled a comprehensive inventory of shorelines of the County;

- Developed and maintains a Master Program for regulating uses of the County's shorelines in accordance with State Department of Ecology guidelines. The Master Program includes: goals and policies for each element of the Program; policy statements for each applicable use activity; classifications of all shorelines by one of four "environmental designations" (natural, conservancy, rural, urban); and, regulations for each applicable use, activity and environment.

Alternatives/Recommendations

The County should continue to administer the Shoreline Master Program. Enforcement of the regulations regarding allowable uses and development standards for each shoreline environment should be increased. The County should consider reviewing the consistency of the Shoreline Master Program with current zoning regulations, growth distribution projections, economic development objectives and the Growth Management Act. Planning for the provision of utilities within the County's designated shorelines should be consistent with the restrictions and performance standards for uses within the designated shoreline environments. Also, because management practices, mitigation techniques, and the regulatory environment have changed since when the Shoreline Master Program was developed, the County should review the Program and update it, as necessary.

3.4.2.4 Implementation

This final section on implementation has been divided into two elements. The first element addresses development of the Storm Drainage Comprehensive Plan (3.4.2.4.1) and the second element addresses generating the funding necessary to implement this plan (3.4.2.4.1).
The Storm Drainage Comprehensive Plan developed for Grays Harbor County is intended for long-term implementation (20 years) in direct response to development pressures and economic needs. Over the first 1-3 years of the program, it is recommended that the plan focus on solving existing localized drainage problems and on developing the policies necessary to guide and regulate new development. In the beginning of plan implementation, a considerable emphasis shall be placed on identifying and funding capital improvements. Similarly, the County will find it necessary to hire at least one full-time staff person to write drainage policies, assemble the annual stormwater programs and budgets, and actively track the development and implementation of the various elements of the master plan. Other elements of the plan would be added in the future, as the need arises, according to the Implementation Schedule proposed in Section 5.4.2.

3.4.2.4.1 Storm Drainage Comprehensive Plan

Introduction

When considering the development of a comprehensive stormwater plan, drainage problems and their solutions should be the responsibility of all County and local agencies. As discussed in greater detail in the following section on funding, no single agency will be responsible for controlling stormwater throughout Grays Harbor County. The cities, County, and drainage/flood control districts must all work together using the Storm Drain Comprehensive Plan as a guidance document to ensure individual efforts are not at cross-purposes and also to ensure that the people who are causing the problems are part of the solution. Using the plan for direction will help ensure that the master plan is used to stimulate and support development and economic opportunities for Grays Harbor County, while at the same time solving existing drainage problems and achieving the goals of the plan.

Discussion

The recommended Storm Drainage Comprehensive Plan is composed of six elements:

- Administration
- Capital Improvements Plan
- Maintenance
- Resource Management: floodplains, wetlands, fisheries, shorelines, water quality
- Intergovernmental Coordination
- Implementation

The administration element assists the implementation of the Plan by providing staffing, resources, and the policy direction necessary to initiate and complete the various objectives and policies of the plan. The capital improvements plan solves existing problems; maintenance ensures that the investment and function of the existing drainage infrastructure/facilities are protected; resource management identifies the elements of the natural drainage system that are to be used and protected; intergovernmental coordination ensures that regional solutions are developed; and implementation provides the directive to begin the plan's processes.

Administration

The Comprehensive Plan needs a certain level of administrative and technical support to develop policies, brainstorm solutions and develop annual stormwater work programs and budgets. It is recommended that one or more qualified stormwater staff be hired on a permanent basis to track the development and implementation of the Comprehensive Plan and act as a technical resource to the program. Additional staff may be necessary in the future as the program matures and development in the County increases.

Capital Improvements Plan

One of the most important elements in the Comprehensive Plan is the development and implementation of a capital improvements program. Capital improvements are often the best and only solution available to solve existing drainage problems created by previous decisions, land use, and/or lack of adequate regulatory policies.

It is recommended that the County develop a 5-year CIP plan and use this plan to prioritize, fund and construct capital improvements throughout the County. Drainage facilities needed to support economic development shall be given priority along with reduction of flooding problems along Vance Creek, Grayland Drainage Ditch, Conner Creek, and other identified chronic

flooding areas. Inventories of drainage facilities shall be incorporated into the development of basin plans for rapidly growing urban areas in order to identify the size and type of facilities needed to accommodate future development.

Maintenance

The importance of maintenance is often overlooked or underestimated in the management of stormwater. In the long term, a well-designed and executed maintenance program is the best way to protect previous investments, reduce minor localized flooding problems, extend the life and use of the drainage system and reduce future capital costs.

Most agencies in Grays Harbor have already recognized the importance of annual maintenance, and they regularly fund a certain level of maintenance related activities. Few agencies, however, have funded or staffed their local programs to the point of being proactive and preventative. Most maintenance is in direct response to a problem and is often performed on a crisis basis.

The Storm Drainage Comprehensive Plan emphasizes routine maintenance on all drainage facilities and suggests that a Maintenance Plan be developed to guide maintenance activities. The Plan prioritizes maintenance tasks and allows decision makers to set service levels by selecting levels of funding through the annual budget process. As with capital improvements, it is important for an effective maintenance program to have a secure and dedicated funding source.

Resource Management

This element of the plan covers a broad series of issues relating to preserving and utilizing the natural drainage system as an integral part of the County's comprehensive stormwater management program. From a management perspective, it is much easier and cheaper to "take advantage" of the natural flood control, water quality enhancement, erosion control capabilities and functions of the natural drainage system of lakes, rivers and streams, than it is to destroy the natural system during new development and attempt to reconstruct it using modern technology. Obviously, some of these natural systems need to be altered in order to support new development and provide economic opportunities. But new development can and should be done in a way that retains and uses as many of the natural drainage features as practicable.

To achieve the above goal, a series of policies and regulations need to be developed to guide development in floodplains, protect and utilize wetlands, preserve and enhance water quality, and protect and enhance native fisheries. It is recommended that the County take a leadership role, and that the cities follow the County's lead in developing and adopting resource protection and utilization standards, in incorporating them effectively into the development approval process, and in implementing a County-wide water quality monitoring program to identify the effectiveness of these policies.

Intergovernmental Coordination

Many agencies in Grays Harbor County are looking to neighboring agencies to help them solve their drainage problems. Since drainage knows no boundaries, it is very appropriate that cities, counties, and drainage/flood control zone districts all work together. It is important that each agency assume responsibility for its own problems; it is equally important that each contributing jurisdiction recognize its responsibility to be part of the solution.

There are many opportunities for intergovernmental coordination ranging from the sharing of technical standards and regulatory language to participating in cost-sharing to design and build capital improvements. Specific examples of coordination that should occur over the next 1 to 5 years in Grays Harbor County are listed below:

- The County should take the lead in developing and sharing stormwater regulatory policies with the cities
- Cities experiencing drainage problems due to activities in unincorporated areas should take the lead in informing the County and seeking cooperative methods for their reduction and/or resolution
- The County should help stimulate the formation of local improvement districts in order to solve regional drainage problems
- Drainage and flood control zone districts should reevaluate their missions and funding, directly involving the cities and County in this process.

Alternatives/Recommendations

It is recommended that the Storm Drainage Comprehensive Plan be developed according to the discussion presented above. The County will likely initially choose the elements from this plan that best serve its immediate needs, i.e. the regulatory policies and the capital improvements. The other elements can be integrated into the program as development occurs and need arises. Listed below are the relative order of priority for the major elements of the Comprehensive Plan.

	Priority
• Storm Drainage Facilities	
- LOS standards	#2
- Inventory/solve deficiencies	#1
- Flooding	#1
- New development controls	#2

- Surface Water Resources
  - Floodplains #2
  - Wetlands #2
  - Water Quality #3
  - Fisheries #3
  - Shorelines #3

- Implementation
  - Adopt Comprehensive Plan #1
  - Procure funding #1

3.4.2.4.2 Funding

Introduction

Because existing problems are largely the result of the lack of appropriate development policies, the drainage issues facing Grays Harbor County focus on resolving existing problems and developing policies to reduce or eliminate future problems. The County would like to work with cities and local agencies, such as drainage and flood control zone districts, to stimulate economic growth. However, they would like to locate and regulate new development so drainage, flooding and erosion problems can be minimized.

In developing a Storm Drainage Comprehensive Plan for the County, the goal is not necessarily to create a new program with a new, dedicated funding source. Grays Harbor County wants to develop a program that assists cities and local agencies in raising the necessary revenues to resolve existing problems which are largely localized historic flooding problems. For the long-term, the County's goal is to establish the appropriate land use and regulatory policies to reduce the financial resources needed to effectively manage stormwater in the future.

Using the above goals as guides, this section summarizes the nature and costs of stormwater control currently being practiced throughout the County. Alternative funding sources are evaluated and a series of recommendations are made to generate or acquire the necessary resources to build, maintain and plan effective stormwater management throughout Grays Harbor County.

Discussion

Historically, financial resources for controlling drainage have been raised on an as-needed basis to solve specific flooding problems. The County, as well as many of the cities, have raised the capital to resolve drainage problems by forming drainage districts or local improvement districts. Road funds are often used to provide culvert and ditch maintenance within road right-of-way and is occasionally used for smaller construction projects, such as culvert upgrading and replacement. In some cases, larger flood control projects have been funded by outside

governmental agencies. The flood control ditch through the town of McCleary, for example, was funded by the Resource Conservation and Development Agency.

The amount each agency spends on stormwater varies greatly depending on the size of the city, the nature of the drainage problems, and the priority each agency gives to flood control. Listed below in Table 3.4.3 are cost estimates from some local agencies that control stormwater.

Many cities in Grays Harbor County admit that they have done very little stormwater management because they have no dedicated funding source for drainage activities. Smaller drainage projects are often incorporated into local street projects. The drainage maintenance program often consists of culvert and catch-basin cleaning incorporated into the annual street maintenance program. Few agencies have a capital improvements plan or perform much drainage facility construction. Some cities have been using state grants and loans to the extent that they have time to fill out the application forms and do the up-front research needed to be competitive. These resources supplement the annual appropriation from the city's street funds. The Centennial Grant Fund and Flood Control Assistance Account Program Fund have been used for planning, water quality and maintenance activities. The Public Works Trust Fund Loans have been used for low interest loans for capital and large maintenance projects.

The most significant flood control facilities have been developed by the City of Hoquiam. In the late 1950s a series of pump stations and trunk lines were installed to protect the city. Originally funded using about 50 percent federal or state monies, this storm drainage system presently pumps about 80 to 90 percent of all stormwater runoff flowing into the city. Since its construction, the city has spent a substantial amount of money replacing the pumps and expanding the trunkline system. It also spends over $200,000 a year for maintenance and repair of this system.

The drainage program for Grays Harbor County is larger but very similar in scope to that of many of the cities within the County. The program stresses maintenance and allocates about $230,000 to the cleaning and restoring of roadside ditches and culverts.

In addition to expenditures for maintenance, the County spends an additional $100,000 per year for capital construction. This is primarily used to install large culverts to control localized flooding. The County spends additional resources to support the permit development process and provide emergency response services.

A number of flood control zone districts and drainage districts, such as Grays Harbor Drainage District #1, have been formed to solve specific flooding problems and/or provide local management of water resources to support agricultural interests (i.e. cranberry farming). When formed, these Drainage Districts usually set specific capital, maintenance, and operating objectives, and assess themselves a tax or fee to provide the drainage control services. Because staffing is primarily by volunteers and there are often unfilled vacancies, these districts are usually short of funding, and they are often not effective as they need to be.

Table 3.4.3

Summary of Current Drainage Funding
Grays Harbor County Comprehensive Utility Plan

Name of Agency	Type of Agency	Annual Drainage Funds Appropriated ($)	Have Developed a CIP Plan	Source of Funding	Major Drainage Control Activities
McCleary	City	2,500	No	Street Fund	Culvert, ditch, pipe cleaning. Program supplemented by some grants and loans.
Elma	City	5,000	No	Street Fund	Primarily on-going maintenance to keep existing drainage system working.
Montesano	City	20,000	No	Street Fund	City's system is 100 yrs old and needs upgrading. Currently providing only as-needed maintenance.
Aberdeen	City	125,000	Yes (1977)	Street Fund	About $10K/yr for CIP, rest for O&M; primarily salaries and some materials supplemented by some grants. CIP plan needs updating.
Ocean Shores	City	160,000	Yes (1989)	Drainage Fund	Many serious drainage problems. Has drainage assessment per lot. Program is primarily maintenance of old, undersized system.
Hoquiam	City	100,000	--	Sewer Fund (separate drainage fee)	Significant drainage system of pumps and trunk lines built in 1950s; rebuilt and expanded since its original construction.
Grays Harbor County	County	330,000	No	Road Fund	Maintenance $230K/yr is primarily for ditching. CIP is $100K/yr for installing large culverts. Emergency Response and some Planning is in addition to $330K/yr.
Drainage District #1	Drainage District	10,000	No	Tax to Selected Landowners	Owns and maintains large drainage ditch. Annually cleans debris and dredges about several thousand lineal feet of ditch.

Drainage District #1 needs to make a thorough review of its scope, mission and financial needs in order to meet its growing drainage control responsibilities. New development within the district and in the surrounding area has caused significant changes to traditional drainage storage and release rates which is now causing widespread flooding during peak storm events.

Alternatives/Recommendations

The financial plan to be developed to support the County's Storm Drainage Comprehensive Plan will recommend a number of different revenue generating options. Many of these options need to be developed and implemented simultaneously. Listed below in Table 3.4.4 are a number of revenue generating alternatives which can be used to fund one or more of the elements of a drainage program.

No single agency is able to assume all the responsibility for stormwater management in Grays Harbor County. No single agency has the authority or the financial resources to implement all the drainage needs. Cities need to maintain and replace older, under-capacity systems. The County needs to guide new development properly, coordinating with local agencies, while continuing to provide maintenance and capital solutions to localized problem areas. Local improvement districts, including drainage districts and flood control districts, need to review their mission and revenues, then revise and update both, as needed, to provide regional drainage control sources.

TABLE 3.4.4

REVENUE ALTERNATIVES

Financial Alternative	Stormwater Program Elements			
	Capital	Maintenance	Basin Planning	Operations/Policy Development
• General Fund			x	x
• Street/Road Fund	x	x		
• Grants	x	x	x	x
• Loans	x	x		
• Utility (service charge)	x	x	x	x
• LID (DD, FCID)	x	x	x	
• Bonds	x			
• Developer Fees			x	x

To accomplish these goals each group of agencies will need to pursue a different mix of funding options. Cities will need to reprioritize stormwater services, increase street fund allocations, and actively pursue grants, loans, and bonds, as appropriate. Drainage and flood control districts should increase their revenues both by increasing assessments and by pursuing grants. Comprehensive planning should assess new drainage service needs and update capital and maintenance programs to better solve current flooding problems and plan for future needs.

The County should consider increasing developer fees, increase Road Fund appropriations for maintenance and stimulate the formulation of local improvement districts. A CIP should be established so that grant and bonding options can be pursued. The County needs to provide the direction for stormwater management throughout the County. This process can be enhanced by providing effective coordination and support to local agencies and drainage districts.

REFERENCES

Federal Emergency Management Agency. Flood insurance rate map and floodway panels for unincorporated Grays Harbor County. Federal Emergency Management Agency. Maps for community number 530057, panel numbers 0001-0625, 1986, 1990.

Federal Emergency Management Agency. Flood insurance study for Grays Harbor County, Washington unincorporated areas. Federal Emergency Management Agency. Flood insurance study February 16, 1990.

Grays Harbor Regional Planning Commission. 1989. Grays Harbor Fisheries Enhancement Task Force. Grays Harbor Regional Planning Commission. Action Plan: 1990. Aberdeen, Washington.

Grays Harbor Regional Planning Commission. 1989. Overall Economic Development Program for Grays Harbor County. Grays Harbor County Regional Planning Commission. Annual progress report. August 1989. Aberdeen, Washington.

Grays Harbor Regional Planning Commission. 1990. Overall Economic Development Plan for Grays Harbor County. Grays Harbor Regional Planning Commission. Annual progress report. June 1990. Aberdeen, Washington.

Taylor, M.M. 1987. "They Shoot Oysters, Don't They? Henderson Inlet: A Case Study in Nonpoint Source Bacterial Pollution," pp. 138-154 in R.W. Seabloom and G. Plews, editors. Proceedings from Northwest Nonpoint Source Pollution Conference. Washington Department of Social and Health Services. Olympia, Washington.

Washington Department of Ecology. 1989. Nonpoint Source Pollution Assessment and Management Program. Water Quality Program, Department of Ecology. Olympia, Washington.

Washington Department of Ecology. 1990. Stormwater Management for the Puget Sound Basin. Department of Ecology. Technical review draft. June 1990. Olympia, Washington.

3.5 INTERGOVERNMENTAL COORDINATION

3.5.1 Description of Service

Each of the towns and cities within Grays Harbor provide a certain level of infrastructure service to its citizens. All the cities provide a potable water source with fire flow supply to the majority of the incorporated area. The towns and cities also provide wastewater collection and treatment within these boundaries, with the exception of the City of Oakville which utilizes on-site waste disposal.

On-site waste disposal occurs in most of the cities in Grays Harbor; however, this is typically a very small percentage of the total of incorporated service area. The residents of Ocean Shores still rely heavily in on-site waste disposal for the majority of its residential service. There are plans to provide greater coverage of sewage collection within the corporate limits to reduce or eliminate the potential of shallow aquifer contamination.

The municipalities have provided service outside their corporate limits for both water and sewer, although the majority of the outside service provided is water service. The City of Aberdeen is the water source for the Cosmopolis and also provides waste treatment for the Cosmopolis collection system. Some of the municipalities provide sewer service (Elma, Montesano, Aberdeen and Cosmopolis); however, these sewage collection services are limited. The largest provider of outside sewer service is the City of Montesano with 72 total outside connections serving approximately 216 people.

3.5.2 City Policy for Outside Infrastructure Service

Those municipalities which have provided outside services in the past have historically allowed extension of utility lines or connection to exiting utility lines without requiring annexation. Many of the municipalities do charge increased connection fees and service charges to compensate for lack of tax revenues.

During the cities surveys, as referenced in Section 2.1.5, Public Participation, information was requested regarding current outside service policies. Table 3.5.1 outlines the various responses.

TABLE 3.5.1 OUTSIDE UTILITY SERVICE POLICY	
Municipality	Annexation Required, Encouraged, Not Required
McCleary	Required by Resolution 271
Elma	Encouraged
Oakville	N/A
Montesano	Required
Aberdeen	Encouraged
Hoquiam	Not Required
Cosmopolis	Not Required
Westport	Encouraged
Ocean Shores	N/A

3.5.3 Interlocal Agreements

Currently there are no interlocal agreements between the County and the municipalities for providing services to unincorporated areas. There are also no restrictions regarding providing services to areas that may cause impacts from on-site waste disposal and areas that are prone to flooding. The few areas that have been included in city planning documents for future service are Central Park and Junction City. These are specified as service areas to be considered within a 20-year planning period as stated in the Wastewater Facilities Plan for Aberdeen, Hoquiam, and Cosmopolis, Grays Harbor County, as prepared by URS in September of 1976. Excess capacity has been allowed for in the Aberdeen treatment facility for these two areas in the County.

CHAPTER 4
RECOMMENDATIONS

This chapter outlines recommendations for general and/or specific areas of Grays Harbor County that are consistent with the first phase of the utilities planning effort. Final recommendations for utilities planning will be contained in the Phase II document. These recommendations consider general planning, including land use planning; industrial lands development; water utility planning; wastewater utility planning; and storm drainage utility planning.

4.1 GENERAL PLANNING RECOMMENDATIONS

4.1.1 Comprehensive Land Use Plan

Develop a consistent, coordinated, updated comprehensive plan.

- The process of developing a comprehensive plan is the key to its success. The process should include extensive interagency cooperation, interjurisdictional coordination, and above all, seek and encourage active public involvement. Committees are very useful in developing coordination and sense of ownership for the community's goals. Other planning and development efforts are then related to these core, accepted goals and objectives. The process of developing the plan is important in generating cooperation and a sense of empowerment.

- Much of the substance for the plan exists. Many of the existing elements provide substantial background information and framework. Existing information, elements, and objectives would provide resources to use in updating the comprehensive plan, but the authority to change and update these elements is necessary.

- Given the current task to develop a comprehensive utilities plan, it is not reasonable to expect that the core of the comprehensive plan (land use element, etc.) could be updated first. It is recommended that a review and update of key elements of the comprehensive plan be accomplished within the next five years, before the next update of the utilities plan. The plan review and update should be coordinated with the Phase II utilities comprehensive planning effort.

- A discussion of basic planning goals for the County should begin in the County Planning Commission. The Community Congress could also be used to provide input on the basic needs for updating plans, including insight on updating goals and objectives for the County in terms of land use, community character, economic development, etc.

- It is appropriate that the Comprehensive Plan utilize tools defined in Growth Management Act (GMA) whenever possible.

- Subarea planning could help reveal and utilize the unique characteristics and opportunities that differentiate distinct parts of the County. However, County-wide participation, including all cities, should direct and coordinate basic goals.

- County land use and zoning determinations should consider availability of infrastructure improvements and naturally occurring features such as soil characteristics and ground and surface water availability.

4.1.2 Industrial Lands Study

It is recommended that the County consider the following modifications to the Industrial Lands Study prior to considering adoption. It is also recommended that the County consider additional planning measures to assist economic development and diversification.

- Eliminate proposed industrial lands that contain substantial restrictions due to critical areas (wetlands, floodplains, etc.)

- Eliminate proposed industrial sites that are likely to adversely impact other natural resources.

- Eliminate proposed industrial sites that cannot reasonably be supplied with adequate utilities, or reasonably accessed.

- Eliminate proposed industrial sites that would conflict with adjacent uses.

- Review potential adverse impacts of industrial development on tourism, consider: 1) eliminating sites along popular tourist highways and near tourist/recreational facilities; and/or, 2) establishing performance standards/development restrictions (e.g., buffers) to minimize potential impact of industrial development on tourism/recreation.

- Consider an Environmental Impact Statement on a selected/limited number of proposed industrial sites. This would help accomplish one of the original objectives of the Industrial Lands Study.

- Provide assistance for the development of large contiguous parcels of industrial land that are consistent with land-use and zoning goals and objectives. These larger parcels are more easily served by infrastructure from the City or County owned and operated facilities.

- Consider preparation of an economic development plan which will address County-wide economic goals to guide types and locations of industrial properties. This plan should be coordinated with development of the Phase II Utilities Comprehensive Plan. The Economic Development Plan should list potential industrial users and identify utility requirements.

4.1.3 Zoning

- Consider reviewing and revising zoning designations given utilities restrictions and opportunities.

- Establish zoning regulations to protect tourism from impacts of industrial development, and vice versa. The Industrial Lands Study provides some useful policies to consider in determining lands appropriate for industrial development.

4.1.4 Population Projections

The Phase II document should incorporate the following recommendations pertaining to population projections. This information is useful for projecting future water demands and wastewater flows in specific areas of the County.

- Conduct research on Class I water systems in the areas of South Beach and North Beach to estimate impacts, from part-time residents or tourists, on water and wastewater infrastructure. This research should be conducted during peak vacation times such as 4th of July weekend, Labor Day weekend, etc.

- Population projections for each municipality is provided in the Phase I document, based on straight line interpretations of historical population patterns. Much of this information is utilized to determine future capacities of existing City infrastructure improvements. The County should coordinate with key municipalities to agree upon the percent per year population increases or decreases.

4.2 WATER RECOMMENDATIONS

4.2.1 General

Key recommendations are listed regarding the quantity, quality and management of water resources necessary to meet existing and future requirements within planning areas of Grays Harbor County. The general description of the water section defines overall County and management recommendations. The planning area portion of the water section outlines specific area recommendations and defines issues which must be addressed in the Phase II document.

- Establish service area boundaries with defined management roles. Class 2, 3, and 4 water systems that do not comply with Department of Health Standards may fall into receivership which may require Grays Harbor County to assume ownership and management responsibilities. The lack of service area boundaries and a definition of which party is responsible for providing service, greatly promotes small public water systems and industrial wells.

- Develop reliable water sources that meet current requirements of the Department of Health and the Safe Drinking Water Act to provide for future development and supply potable water to existing smaller water systems that are in non-compliance.

- Develop a program for proper monitoring and management of public water systems that are in non-compliance.

4.2.2 Planning Areas

The planning area portion of the water section lists issues and concerns that should be considered for detailed evaluation in the Phase II document.

East County

Quantity

- Development of high production wells in the Chehalis River Valley Aquifer may be limited from "base flows" established by Ecology on the Chehalis River and water authorized to the WPPSS Satsop Nuclear Plant. It may be difficult to obtain additional groundwater rights in the Chehalis River Valley to provide a large amount of potable water and still meet the surface water continuity requirements. Water is authorized to the WPPSS Satsop Nuclear Plant by the Energy Facilities Site Evaluation Council. Development and use of water from the Chehalis for WPPSS will further impact base flows and reduce the chance for additional withdrawal.

- Industrial development in the Chehalis River Valley may require intertie with supplies from Elma or McCleary as well as the development of groundwater in the McCleary area to meet projected demands.

- Industrial development may have to be concentrated in urbanizing areas to maximize existing utility infrastructure.

Quality

- In areas of poor water quality, the County should pursue development of deeper groundwater supplies to minimize iron and manganese removal requirements.

Central Area

Quantity

- The potential for large quantities of industrial water is available starting from the Central Park area preceding west to Hoquiam. Industrial land and other water

demands should be focused toward the proximity of the industrial water supply originating at the Wynoochee Dam.

Quality

- The Phase II document should evaluate industrial requirements to establish the quality of the water supply needed.

North Beach Area

Quantity

- Heavy industrial use of the lands within the North Beach area is not anticipated at this time. The North Beach area is impacted from the tourist industry. Infrastructure improvements are needed to support substantial growth and meet existing peak seasonal demands.

- The City of Ocean Shores' water rights permit on the Humptulips River expires in August 1992. The Phase II document should discuss whether this water right should be developed to meet anticipated demands.

Quality

- Shallow aquifers within the beach area have the potential of being contaminated from both on-site waste disposal and from inadequate storm drainage facilities. A program for protecting shallow aquifers needs to be developed.

- Improvements are needed for management and monitoring of Class 2, 3 and 4 water systems in the North Beach area to meet current Safe Drinking Water Act requirements.

North-Central Area

Quantity

- Further analysis of Humptulips flood plain and Chenois Creek need to be conducted to establish whether regional groundwater supplies exist.

Quality

- North Central County needs to be concerned with providing an adequate and reliable source of water which meets the Safe Drinking Water Act.

North

Quantity

- Further analysis of undefined aquifers need to be conducted to establish aquifer characteristics.

Quality

- Pursue development of centralized groundwater sources including iron and manganese treatment facilities, as needed, to meet future demands as well as SDWA requirements.

South Beach Area

Quantity

- Pursue evaluation and characterization of local aquifers. A high industrial use or high potable water demand will require the development of an additional groundwater source. This groundwater source may require treatment and aquifer protection from on-site waste disposal.

Quality

- Focus on information regarding a deep aquifer to provide an additional protective barrier. Develop groundwater protection strategy.

4.2.3 Management Issues

- Establish future service area boundaries for County, Cities and Water Districts to delineate areas of water utility responsibility in the urbanizing unincorporated County areas.
- Establish County's role as a utility manager in unincorporated areas and specific financial and management services to be provided by the County.
- Develop a contingency plan for County receivership responsibilities and action.
- Establish a uniform review procedure within County departments to ensure new developments are adequately constructed, financed and managed.
- Promote and enforce renewable operating permits by individual utilities which require qualified operators and confirmation of financial viability consistent with DOH guidelines.

- Review phased revenue sharing for annexation programs developed by Lacey, Gig Harbor and Puyallup.

4.3 WASTEWATER RECOMMENDATIONS

The wastewater section has been organized in a manner similar to the water section and begins with general recommendations which apply to the entire County. This section is followed by specific recommendations per planning area, including issues which need to be addressed in the Phase II document.

4.3.1 General

Listed are key recommendations that the County should consider for inclusion in the Phase II document and considered as future development requirements.

- Development must address area wide soils characteristics and potential impacts on groundwater and surface water sources from increased use of on-site wastewater disposal systems.

- Service area boundaries should be considered for wastewater collection and treatment including defining management roles. Wastewater service area boundaries should coincide with or consider service areas for water systems.

- Public water systems currently supply many areas that do not have sewage collection and treatment facilities. Public water supply allows minimum lot size to be reduced to one quarter of an acre, compared to one acre if an individual well is used. A public water system can potentially increase wastewater flows by a factor of four. If a water system is installed in an area of unsuitable soils, area wide impacts can occur in the form of groundwater or surface water contamination.

4.3.2 Planning Areas

This section includes pertinent information on wastewater treatment facilities in Grays Harbor County. These descriptions can provide insight to the availability of municipal wastewater treatment and disposal in selected areas of the County. Also included are issues and recommendations which need to be further addressed in the Phase II document.

East County

- The City of McCleary has potential limitations for receiving high volumes of wastewater due to limitations at the treatment plant outfall. This issue may be resolved by construction of a new outfall line to an adequate receiving water such as the Chehalis River.

- The City of Elma has the potential of receiving a high volume of wastewater based on the current outfall dilution at the Chehalis River. The existing plant has the ability to receive wastewater to handle current local needs including future growth. However, future high volumes of wastewater would probably require expansion of existing treatment facilities.

Central County

- The City of Aberdeen has the organic capacity in the existing wastewater treatment facility to serve Junction City and Central Park. These portions of the County were originally included in the Aberdeen service area as stated in the Wastewater Facilities Plan for Aberdeen, Hoquiam and Grays Harbor County. The treatment facility is, however, experiencing high peak flows from Infiltration and Inflow (I/I) in the collection system which may reduce or eliminate the possibility of connecting these two communities.

- The City of Montesano is completing a wastewater lagoon treatment facility. That facility accepts wastewater from a STEP Collection System which is low in BOD and TSS. Introduction of wastewater to this facility from potential industrial sources would require pre-treatment.

North Beach

- The Sewage Treatment Facility at Pacific Beach is at or over capacity. A moratorium on additional hook-ups is in effect. Sewage treatment is not available for additional development without modification to the treatment facility. This facility should be modified to serve the existing and future needs of the community.

- The current practice of using sand on sand engineered fills for on-site wastewater disposal in the North and South Beach area can cause impacts to localized drainage systems. It is recommended that the County review discontinuance or minimization of this practice.

North County

- There are potential adverse impacts to surface water and groundwater drinking sources from on-site waste disposal within the area. These impacts should be addressed in Phase II.

- The North County area includes the recreational facilities around Lake Quinault. The Forest Service owns and operates a small sewage collection and treatment facility on the South Shore of Lake Quinault and is supplied with water by the Lake Quinault Water Company. The Forest Service is initiating a water sewer comprehensive plan to address existing and future needs of the area. The County is supporting, and should continue to

support, this planning effort to provide consistency and to address needs of this region of the County.

South Beach

- The City of Westport currently has capacity in its existing treatment facility for a large population increase or a limited amount of industrial development. The City of Westport also has the potential to substantially increase the size of its treatment plant and still meet dilution requirements for secondary treatment.

- Similar to the North Beach area, tourism could be promoted within unincorporated areas of Grays Harbor County by providing infrastructure improvements. Consideration for infrastructure improvements must address water, wastewater and storm drainage to avoid adverse impacts to public health and the environment.

4.3.3 On-Site Wastewater Disposal

The Phase I document also establishes those areas currently relying upon on-site wastewater disposal which are considered priority concerns. It is imperative that actual health risks for these areas are determined in the Phase II document. Priority areas identified in Phase I are:

Central County

- East Montesano
- Central Park

North Beach

- Moclips/Pacific Beach
- Oyhut

South Beach

- Grayland

Each area will need to be carefully examined to determine the adequacy of treatment from on-site waste disposal. Recommendations for priority areas for Phase II are:

- Sample receiving waters to determine the efficiency of existing on-site disposal systems. Testing should examine bacteria, nitrates, ammonia and chloride levels. Testing should be conducted on roadside ditches and in either private or monitoring wells. Sampling should include a sufficient number of tests and should be collected in the summer and winter months.

- Re-evaluate priority areas based upon results of the receiving waters testing program.

- Submit applications to the Department of Ecology for financial assistance for a facility plan or an engineering report for selected priority areas. Priority areas should be included in a 5-year project schedule.

- Conduct a detailed soil survey for sites that remain priority projects. A hand powered auger and/or backhoe should be used to construct a detailed soils map using standards set forth by the National Progressive Soil Survey.

- Conduct a visual observation of priority areas to assess potential malfunctioning systems; interview homeowners to gather information on age, installation and operation of selected systems; outline soil and site conditions.

- Develop final alternatives that can provide solutions to existing problems.

- Present an engineering evaluation of alternatives and recommendations of the final alternative.

- The engineering analysis will conform to requirements for a general sewer plan as specified in WAC 173-240-050.

- Prioritize remaining areas or needs for the next 10 and 20 year periods. Provide sufficient detail for remaining areas to allow for early implementation, should local interest dictate.

- Assist land use planning by recommending specific urbanizing areas, which can be supported by generally suitable soils or existing infrastructure improvements.

- Provide assistance in determining geologically sensitive areas.

4.3.4 Ordinance #113

Recommendations and suggestions have been listed to improve the ordinance:

- Criteria need to be written that clearly show what soil/site conditions warrant the use of a particular type of system.

- Monitoring techniques of larger systems or a large number of individual systems should be listed. This should include a method of measuring flow and periodic sampling of receiving waters for indicators of how the system(s) is performing.

- Establish housing density that requires implementation of monitoring techniques.

- Consider requirements for formation of on-site management districts to support a higher level of monitoring and on-site review.

- Provide additional recommendations in Phase II pertaining to amendments of the existing ordinance.

- Minimize or eliminate permitting sand fills on native sand for conventional septic tank and drainfield systems in the North and South Beach areas.

- Allow for greater monitoring and evaluation of existing systems, including area-wide impact analysis.

4.4 STORM DRAINAGE RECOMMENDATIONS

The Recommendation Section of the Grays Harbor County Utilities Comprehensive Plan describes the strategy and schedule for implementation of the policies listed in the Goals, Objectives and Policies presented in Section 3.4.1. This section establishes priorities for the actions described and outlines a schedule by year for Plan implementation.

A primary mission of the Storm Drainage Plan is to encourage and accommodate economic growth in Grays Harbor County. The stated goal of the Storm Drainage Section is to protect and enhance the surface waters and stormwater drainage facilities of the County. The Action Plan described in this chapter has been developed to meet these special needs of the County.

4.4.1 General

The County has established four major county-wide drainage priorities that need to be addressed in order to meet the goal of the Storm Drainage Plan. The first priority is to reduce or resolve existing chronic drainage problems. Several areas have been identified and conceptual alternatives have been developed. These are presented in Appendix D. These types of drainage problems have been used to identify the deficiencies of the stormwater program that need addressing in the second priority, which is the establishment of stormwater regulations, policies, and guidelines to protect the existing drainage system and guide new development. These regulations will reduce public expenditures required for the repair and maintenance of drainage facilities and protect existing economic opportunities by preventing the degradation of water resources. The third priority is the establishment of long-term plans to monitor, maintain and improve existing drainage facilities and water resources. The fourth priority is the development and implementation of basin plans in areas that are identified as growth areas. Basin plans provide the mechanism for undertaking an integrated approach to solving drainage problems, protecting existing facilities and constructing new infrastructure in a specific geographic area or drainage basin. Each of these priorities can be met by establishing the following Storm Drainage Plan.

4.4.2 Recommended Storm Drainage Plan

The recommendation for development of the Storm Drainage Plan for Grays Harbor County has 20 main objectives, including the acquisition of funding needed for implementation. One to six specific activities have been identified to achieve each objective. The objectives and activities

have been prioritized and an implementation schedule has been developed in the form of an Action Plan, as shown in Table 4.4.1. The Action Plan lists 59 different activities needed to be undertaken to implement the Plan over a 20-year period. The activities are grouped by year to facilitate the development of the annual drainage programs and budgets.

In year 1 the primary activities are to adopt, staff and fund the Storm Drainage Program. Other major first year activities include:

- Identifying major flooding problems and defining a 5-year CIP plan
- Address existing flooding problems identified in Phase I
- Developing a series of regulatory policies and continuing application of existing regulations and policies
- Identifying sites for economic development
- Beginning closer coordination with state and other local agencies

In year 2 of the Storm Drainage Program, the emphasis is on identifying and resolving flooding problems and developing and implementing regulatory controls. Other major activities include:

- Funding capital construction in drainage problem areas
- Developing LOS standards
- Developing stormwater management regulations
- Developing erosion control standards
- Developing/adopting stream encroachment standards
- Developing wetland regulations
- Inventorying wetlands
- Identifying fisheries resources
- Establishing the CIP
- Adopting regulatory policies and ordinances.

In years 3-5, the primary focus is to complete adoption and implementation of regulatory standards and begin developing resource management programs. Other major activities include:

- Inventorying and mapping drainage systems
- Identifying water quality problem areas and drainage problem areas
- Reducing industrial discharges
- Increasing enforcement
- Identifying growth areas for basin planning
- Entering into interlocal agreements with local agencies
- Developing a maintenance plan
- Developing water quality monitoring plans.

The emphasis on the program in the long term, years 6-20, should be on securing adequate annual funding, continuing to enforce the regulatory policies, operating and building new facilities and coordinating with local agencies. Major activities during this period include:

- Upgrading deficient facilities
- Developing watershed management plans
- Preparing basin planning studies
- Continuing the maintenance and enforcement program.

The above Storm Drainage Plan presents a series of objectives and recommended activities for implementation by the County, cities and local agencies. In developing this Plan, priorities and program direction have been largely assumed by the authors based on preliminary discussions with the cities, local agencies and the County. It is important for all reviewers of this document to analyze and comment on the various elements of this county-wide comprehensive plan. To be realistic and workable for all parties there must be a consensus on the program objectives and relative priorities of the different program elements.

4.4.3 Preliminary Scope of Work for Phase II of the Storm Drainage Plan

In developing the first phase of the Storm Drainage Plan a series of issues have been identified for inclusion in the scope of work for Phase II (Table 4.4.1). Many of these issues require further analysis and consideration before they are included in the final Storm Drainage Plan. Recommendations for programs proposed for the first two years of the Plan will be included in the Phase II scope. Guidance will be sought from the County and local agencies to determine what level of detail is desired in the final Plan, i.e. is it enough to say that stormwater and water resource standards should be developed and included in the Plan or should preliminary drafts of these standards be developed and included in the Phase II final Plan.

Issues to be addressed in the Phase II scope of work are listed below:

- Identify staffing/implementation plan
- Development of a step-by-step implementation Action Plan
- Engineering analysis of special flood study areas
- Funding alternative analysis and recommended financial plan
- Public participation in Plan adoption
- Final determination of goals, objectives and policies
- Preparation of years 1 and 2 programs and budgets
- Develop initial 5-year CIP plan and identify funding
- Recommend resource protection standards/regulations
- Recommend stormwater management standards/regulations
- Recommend BMPs for existing and new development
- Recommend sedimentation/erosion control standards
- Develop fisheries program
- Develop wetland management program
- Develop water quality monitoring plan

The above issues, along with the County's original scope of work for Phase II of this project, will be reviewed with the County and local agencies. Discussions will result in a final scope of work for Phase II.

4.4.4 Planning Areas

Listed are specific items, either County-wide or area specific, which should be incorporated into development standards or the Phase II Utilities Comprehensive Plan.

General

- Direct development away from wetlands, flood plains and areas prone to flood. Avoid providing sewer and water service to flood sensitive areas, which would promote localized flooding conditions.
- Develop drainage maintenance responsibilities between the cities and the County. Develop a schedule for routine maintenance of key drainage sources of facilities.
- Implement better control of site grading practices.
- Coordinate storm drainage management practices between the County, cities and districts.
- Provide adequate storm drainage facilities in areas that have been platted and are provided with utility services.
- Future development of industrial sites should be directed outside of flood plain and wetland areas.

East County

- Chronic flooding problems are occurring on Vance Creek near Elma Elementary School (See Appendix D). Additional development in this area could aggravate the flooding conditions and should be avoided until facilities can be provided to alleviate the problem.

Central County

- The stormwater portion of this plan and Department of Ecology policy suggests regionalization of treatment facilities. It is recommended that new large industrial sources consider expansion of existing treatment facilities before proposing new treatment plants.

North Beach

- Chronic flooding exists along SR 109 and near Conner Creek and improvements are recommended (see Appendix D).
- Flood plain and wetlands encroachment from new development could increase existing flooding problems. It is recommended that development not be allowed without installation of proper drainage facilities.

- Better control of site grading and filling should be implemented to minimize localized flooding problems.

South Beach

- Most concerns are common to the North Beach area.
- Much of the area within the South Beach section of the County is currently platted and it is extremely difficult to implement a storm drainage plan due to lot configurations.
- Chronic flooding occurs on SR 105 and along the main drainage ditch north of SR 105 and improvements are recommended (see Appendix D).
- Better control of site grading and filling is needed to minimize localized flooding problems.

STORM DRAINAGE PLAN

TABLE 4.4.1
RECOMMENDED IMPLEMENTATION PLAN

Corresponding Planning Element Section Number	Year 1	Year 2	Years 3-5	Years 6-20	Phase II Task
3.4.1.1 ECONOMIC DEVELOPMENT					
Obj. 1 Coordinate CIP with EDC					
Policy 1.A Prepare CIP with EDC		X			
Policy 1.B Assist EDC with site selection	X				
Obj. 2 Protect existing economic opportunities					
Policy 2.A Review land use for water resource impacts	X				• Recommend land use criteria to limit impacts to existing water-dependent economic resources • Recommend stormwater management standards
Policy 2.B Maintain natural drainage features	X				
Policy 2.C Implement standards to limit impacts to water dependent economic resources		X			
3.4.1.2 STORM DRAINAGE FACILITIES					
Obj. 1 Adopt LOS standards					
Policy 1.A Adopt road construction LOS		X			• Recommend LOS standardsfor new and existing stormwater management facilities
Policy 1.B Adopt road upgrade LOS		X			
Policy 1.C Adopt LOS for new construction		X			
Policy 1.D Adopt LOS for existing facilities					
Policy 1.E Upgrade flood problem areas to LOS for existing conditions		X		X	
Obj. 2 Inventory drainage system					
Policy 2.A Inventory and map drainage system			X		
Policy 2.B Develop maintenance program for county- maintained facilities			X		
Obj. 3 Identify chronic flood problem areas					
Policy 3.A Identify chronic flood problem areas		X			• Identify chronic flood problem areas
Policy 3.B Include chronic flood problem areas in CIP		X			
Obj. 4 Establish stormwater management policies and regulations					
Policy 4.A Develop stormwater management regulations		X			• Recommend criteria for stormwater management regulation revisions • Recommend criteria for sediment and erosion control regulations • Recommend criteria for revisions to grading ordinance
Policy 4.B Develop sediment erosion control standards		X			
Policy 4.C Review forest practice permits					
Policy 4.D Review grading permits for stormwater management	X				
	X				

TABLE 4.4.1
RECOMMENDED IMPLEMENTATION PLAN

Corresponding Planning Element Section Number	Year 1	Year 2	Years 3-5	Years 6-20	Phase II Task
3.4.1.3 SURFACE WATER RESOURCES					
3.4.1.3.1 Floodplains					
Obj. 1 Continue flood protection measures					
Policy 1.A Continue to participate in the NFIP	X				
Policy 1.B Limit land use in floodplains					
Policy 1.C Develop standards for encroachment into streams without detailed studies	X	X			• Map flood plains for comparison with service areas • Recommend standards regulating stream floodplain encroachment
3.4.1.3.2 Wetlands					
Obj. 1 Develop wetlands management program					
Policy 1.A Inventory and map existing wetlands		X			• Map wetlands for comparison with service areas
Policy 1.B Adopt a wetlands definition					
Policy 1.C Classify wetland types	X				• Recommend a definition for determining wetlands
Policy 1.D Adopt a no net loss policy for wetlands					
Policy 1.E Develop wetland policies and regulations	X	X			• Recommend wetland classification system
		X			• Recommend wetland protection and mitigation standards
3.4.1.3.3 Water quality					
Obj. 1 Develop water quality monitoring program					
Policy 1.A Identify existing water quality conditions		X			
Policy 1.B Identify unique watersheds requiring protection			X		• Recommend watersheds requiring protection
Policy 1.C Develop water quality monitoring program			X		• Prepare water quality monitoring program

TABLE 4.4.1
RECOMMENDED IMPLEMENTATION PLAN

Corresponding Planning Element Section Number	Year 1	Year 2	Years 3-5	Years 6-20	Phase II Task
Obj. 2 Develop program to improve water quality					
Policy 2.A Develop watershed management plan for impacted surface waters				X	
Policy 2.B Encourage retrofitting and use of BMPs on existing developed sites	X				• Recommend BMPs for existing development
Policy 2.C Encourage repair of failing septic systems					
Policy 2.D Encourage implementa-tion of farm conservation districts	X				
Policy 2.E Require proper disposal of hazardous wastes			X		
Policy 2.F Prevent or reduce industrial or municipal discharges			X		
			X		
Obj. 3 Control runoff water quality in new development					
Policy 3.A Require BMPs for new development		X			• Recommend BMPs for new development
Policy 3.B Require new development to provide sediment and erosion control		X			• Recommend sediment and erosion control standards
Policy 3.C Review forest practice permits for stormwater quality standards	X				
3.4.1.3.4 Fisheries Resources					
Obj. 1 Identify, preserve, and protect fisheries resources					
Policy 1.A Identify significant fisheries resources		X			• Identify significant fisheries resources
Policy 1.B Adopt stream protection standards					
Policy 1.C Adopt stormwater management regulations		X			• Recommend stream protec-tion standards
Policy 1.D Review forest practice permits for erosion control standards		X			• Recommend stormwater management standards
	X				
3.4.1.3.5 Shoreline Resources					
Obj. 1 Continue shoreline protection program					
Policy 1.A Continue shoreline protection measures	X				
Policy 1.B Review land use for shoreline impacts					
Policy 1.C Increase enforcement	X				
			X		

STORM DRAINAGE PLAN

TABLE 4.4.1
RECOMMENDED IMPLEMENTATION PLAN

Corresponding Planning Element Section Number	Year 1	Year 2	Years 3-5	Years 6-20	Phase II Task
3.4.1.4 IMPLEMENTATION					
3.4.1.4.1 Storm Drainage Master Plan					
ADMINISTRATION					
Obj. 1 Establish stormwater program					
Policy 1.A Provide staff for program	X				• Determine staffing needs to implement years 1 and 2 of program
Policy 1.B Establish funding mechanism to support program	X				• Determine costs of implementing program
Policy 1.C Adopt regulations and standards to implement program		X			• Recommend standards and regulations
CAPITAL IMPROVEMENTS PLAN					
Obj. 2 Develop capital improvements plan					
Policy 2.A Develop 5-year work plan		X			• Develop initial 5-year work plan, and include flood problem areas identified
Policy 2.B Prioritize CIP					
Policy 2.C Establish CIP funding		X			• Select funding mechanisms for CIP
Policy 2.D Identify growth areas for basin planning		X	X		
MAINTENANCE					
Obj. 3 Develop maintenance plans					
Policy 3.A Develop maintenance plans			X		
RESOURCE MANAGEMENT					
Obj. 4 Implement resource management program					
Policy 4.A Adopt resource protection standards		X			• Recommend resource protection standards
Policy 4.B Implement monitoring plans			X		
INTERGOVERNMENTAL COORDINATION					
Obj. 5 Establish intergovernmental coordination program					
Policy 5.A Develop interlocal agreements		X			
IMPLEMENTATION					
Obj. 6 Implement the comprehensive plan					
Policy 6.A Adopt plan, provide staff and funding	X				

STORM DRAINAGE PLAN

TABLE 4.4.1
RECOMMENDED IMPLEMENTATION PLAN

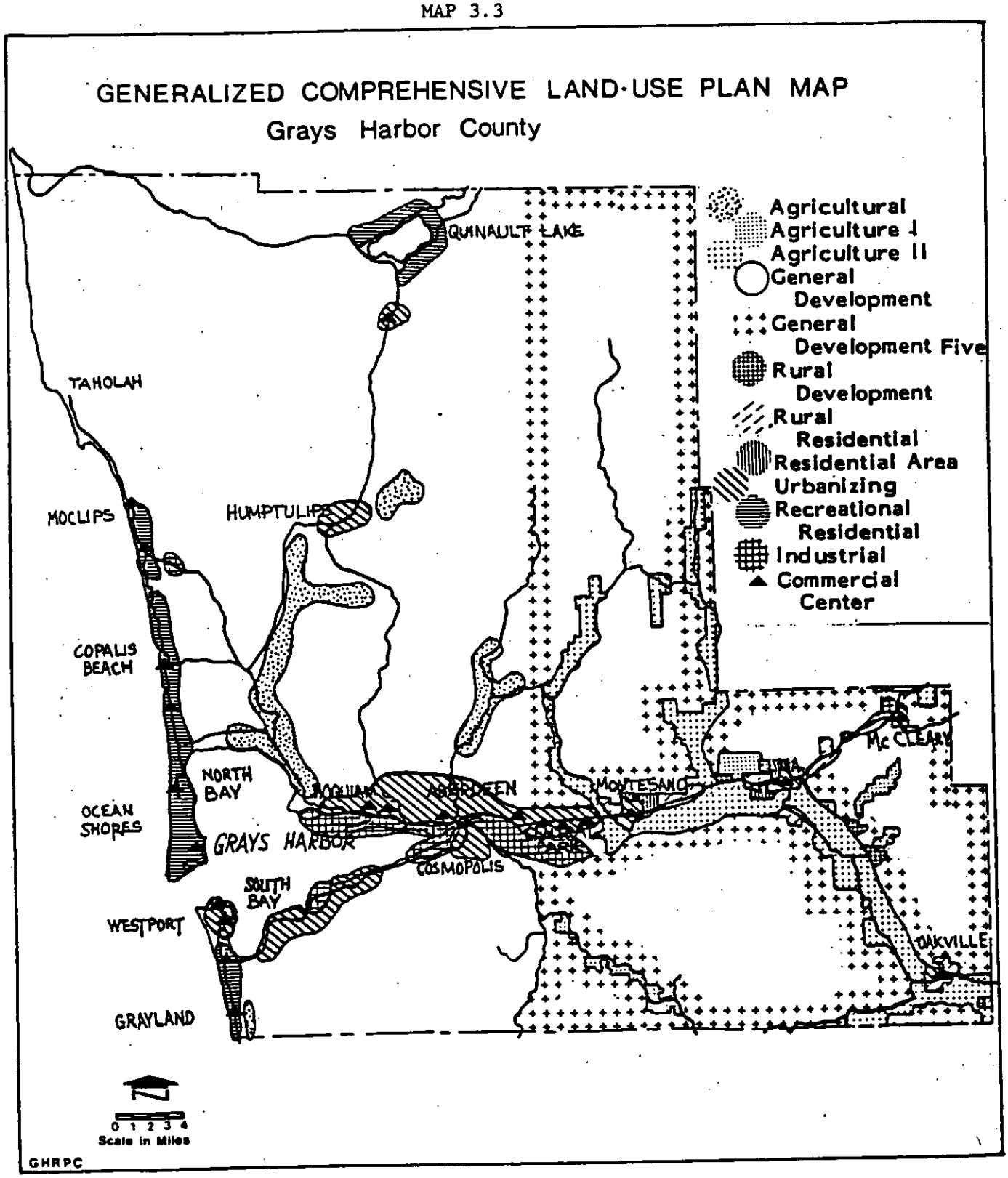
Corresponding Planning Element Section Number	Year 1	Year 2	Years 3-5	Years 6-20	Phase II Task
3.4.1.4.2 Funding					
Obj. 1 Establish permanent funding mechanism					
Policy 1.A Review alternatives for funding	X				• Recommend funding alternatives, set up preferred alternative
Policy 1.B Prepare and adopt annual stormwater program budget	X				• Prepare years 1 and 2 of stormwater program budget
ADDITIONAL TASKS:					• Public participation and meetings • Finalize goals, objectives and policy • Step-by-step implementation plan • Special flood study area detailed analysis

APPENDIX A

BACKGROUND INFORMATION

- Land Use Map
- County Memo, GMA
- Presentation Material
- Public Comments
- Population Statistics
- Hydrogeologic Investigation

MAP 3.3


GENERALIZED COMPREHENSIVE LAND-USE PLAN MAP
Grays Harbor County
Agricultural
Agriculture I
Agriculture II
General Development
General Development Five
Rural Development
Rural Residential
Residential Area Urbanizing
Recreational Residential
Industrial
Commercial Center
QUINAULT LAKE
TAHOLAH
MOCLIPS
HUMPTULIP
COPALIS BEACH
NORTH BAY
OCEAN SHORES
GRAYS HARBOR
ABERDEEN
MONTESANO
Mc CLEARY
COSMOPOLIS
SOUTH BAY
WESTPORT
GRAYLAND
OAKVILLE
0 1 2 3 4
Scale in Miles
GHRPC

Grays Harbor County
Planning and Building Department
P.O. Box 390
Montesano, Washington 98563
Telephone 249-5579

JUN 20 1991

DATE: June 13, 1991

TO: Grays Harbor County Board of Commissioners
FROM: Kenneth Kimura, Planning Director

RE: SHB 2929 Requirements for Grays Harbor County and Status of Designation Requirement

---

GROWTH MANAGEMENT ACT REQUIREMENTS FOR GRAYS HARBOR COUNTY.

Substitute House Bill No. 2929 (The Growth MANAGEMENT Act) requires the following for Grays Harbor:

1. Section 17 specifies that all counties "shall designate where appropriate: (a) Agricultural lands that are not already characterized by urban growth and that have long-term significance for the commercial production of food or other agricultural products; (b) Forest lands that are not already characterized by urban growth and that have long-term significance for the commercial production of timber; (c) Mineral resource lands that are not already characterized by urban growth and that have long-term significance for the extraction of minerals; and (d) Critical areas." These designations are required on or before September 1, 1991. Designations are required to consider guidelines established pursuant to section 5 of the ACT.

2. Section 24 specifies that beginning July 1, 1992, non mandated counties may not have development regulations inconsistent with their comprehensive plan. This section does not require adoption of new development regulations, however, it requires that the existing development regulations must be made to conform to existing comprehensive plans if there is inconsistency between the two.

3. Section 51 adds new language to the State Subdivision laws mandating that county subdivision rules "shall provide that a short plat and short subdivision may be approved only if written findings that are appropriate, as provided in RCW 58.17.110, are made by the administrative personnel, and ...". At section 52, the GMA expands upon subdivision issues that may be examined by administrative personnel and considered in administrative approvals. The new provisions allow greater administrative discretion in short subdivision decisions. This section of the GMA does not require non mandate counties to change their subdivision statutes. It clarifies reasons that can be considered when denying short plat approvals.

4. Section 63 specifies that each applicant for a building permit of a building necessitating potable water shall provide evidence of an

adequate water supply for the intended use of the building. This section does not require the adoption of any new regulations, however, it requires that building permits be withheld until evidence of adequate water supply is provided. The provision will add significant delay to the application process.

STATUS OF PRESENT PLANNING IN GRAYS HARBOR COUNTY.

Designation requirements of the GMA have been addressed by past programs for unincorporated Grays Harbor County. The following is a list of approved plans and programs that satisfy section 17 of SHB 2929:

1. AGRICULTURAL LAND DESIGNATION. The April 1980, Report of the Grays Harbor Agricultural Study Committee to the Grays Harbor county Planning Commission and Board of Commissioners was adopted as an element of the Grays Harbor County Comprehensive Plan. The document defines agricultural lands and it designates two types of farm land. The plan was implemented by adoption of two new zoning districts, A1 and A2, including adoption of new zoning maps illustrating the detailed location of the A1 and A2 districts.

Section 17, SHB 2929 requires each county to designate, where appropriate, agricultural lands that are not already characterized by urban growth and that have long-term significance for the commercial production of food or other agricultural products. Grays Harbor's 1980 agricultural study and 1983 zoning controls satisfy the agricultural lands designation requirement for non-mandated counties. The A1 and A2 zoning maps and regulations satisfy Section 6, SHB 2929 which requires counties that opt into GMA to adopt development regulations to assure the conservation of agricultural lands.

2. FOREST LAND DESIGNATION. Grays Harbor tracks each parcel of land by land use code under its IMS program operating on a Unisys System 80, Mod 8 main-frame computer. Three classes of forest land (classified, designated and open space timber) are coded and tracked by parcel no., acreage, ownership and an assortment of other information. The information is easily mapped by parcel number. Although the designation of these forest lands is for tax purpose, the legislative intent is to promote long term timber production.

The current designation of forest and timber lands satisfy Section 17, SHB 2929 requirement to designate, where appropriate, forest lands that are not already characterized by urban growth and that have long-term significance for the commercial production of timber.

3. MINERAL RESOURCE LAND DESIGNATION. Grays Harbor County Surface Excavation Ordinance 88 classifies minerals by making a distinction based on "removal" and "purposes". The ordinance also regulates the impacts of mining activity as well as the reclamation of surface excavations. The ordinance designates all minerals to be removed and used for commercial, industrial or construction purposes without distinguishing between the type of mineral. The designation scheme is based on performance and does not require an inventory or mapping of

the location, extent and distribution of all minerals. Grays Harbor County maintains data sources on the location, extent and distribution of gravel and basalt. The county also pioneered river bar mining regulations based on a 1986 study of river gravel transport.

4. CRITICAL AREA (WETLANDS) DESIGNATION. Grays Harbor County uses a wetland classification and designation scheme required by two separate regulatory programs. The Shoreline Management Act designates marshes, bogs and swamps (as defined under publication titled Peat Resources of Washington) for purpose of regulation. The 1972 Federal Coastal Zone Management ACT requires consistency between federal requirements and the local shoreline master programs that are a part of the state's CZM approved program. The consistency requirement is used to designate wetlands based on a publication titled Classification of Wetlands and DeepWater Habitats of the United States, from the Fish and Wildlife Service, U.S. Department of the Interior and a second publication titled Federal Manual for Identifying and Delineating Jurisdictional Wetlands, an Interagency Cooperative Publication of four federal agencies. There are several map publications that attempt to illustrate the location and distribution of SMA jurisdiction wetlands and wetlands based on the national wetland inventory, however, the mapping systems rely on written criteria which takes precedence over mapped information. At the present time, the county is developing a comprehensive water, sewer and drainage utility plan that will include a plan for the management of storm water. The plan will designate and classify wetlands as a critical component of the storm water management plan.

5. CRITICAL AREA (AQUIFER RECHARGE) DESIGNATION. The State of Washington asserts ownership over all waters within Washington State. This position required state agencies to regulate the use and withdrawal of water from surface supplies and ground water. For this reason, counties have not been involved with designation of aquifer recharge areas. County permit records, special studies and municipal water supply reports can be used to show the distribution and extent of significant aquifer recharge areas. This information can be compiled for designation purpose. The comprehensive water, sewer and drainage utility plan will designate aquifer recharge areas for important municipal and private water supplies.

6. CRITICAL AREA (FISH & WILDLIFE HABITAT) DESIGNATION. Most HABITAT designation has been provided by various state resource agencies. Streams are classified by type and designated for the Shoreline Master Program and Forest Practices Act. Wildlife HABITAT is classified by Washington State resource agencies. These areas are designated through the SEPA process with mitigation for adverse impacts.

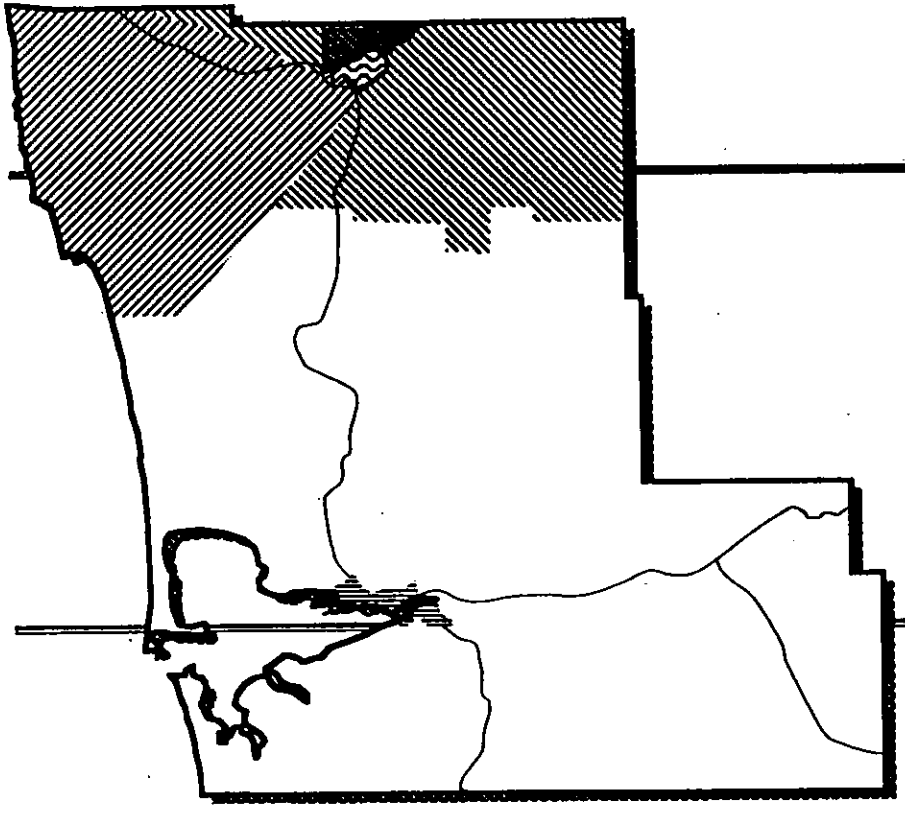
7. CRITICAL AREA (FREQUENTLY FLOODED AREA) DESIGNATION. Grays Harbor County has participated in the National Flood Insurance Program since April 1, 1974. Resolutions 74-12 and 73-13 provided legislative direction for restricting construction in the 100 year flood plain and utilizing known floodplain data including an August 6, 1976 Army Corp of Engineers report titled Suggested Hydraulic Floodway, Chehalis River, Satsop to Porter and Vicinity, Grays Harbor County, Washington.

The county amended the flood regulations (Ordinances 88, 97 and 118) in 1981, 1985 and 1988 to maintain consistency with federal regulations, to designate the 100 year flood plain and the floodway as areas subject to restrictive regulation and to adopt Flood Insurance Rate Maps specifically illustrating the extent of the 100 year flood plain and the floodway.

8. CRITICAL AREA (GEOLOGICALLY HAZARDOUS - RIVER EROSION) DESIGNATION. On June 28, 1974, Norman Associates forwarded the Grays Harbor Erosion Management Study, a report commissioned by the GHRPC for the county and Port of Grays Harbor. The study designated three classes of erosion hazard on the Humptulips River, Hoquiam River, Wishkah River, Wynoochee River, Satsop River, Cloquallum Creek, Wildcat Creek and Chehalis River.

DISCUSSION.

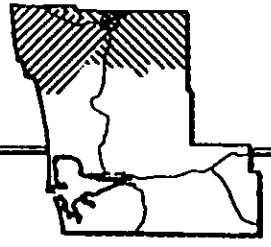
Grays Harbor County has a strong case showing compliance with SHB 2929's designation requirement. "On or before September 1, 1991, each county, and each city, shall *designate where appropriate*:" The test is "where appropriate". SHB 2929 ties designation of resource lands and critical areas to regulation. For non-mandated counties, SHB 2929 only requires designation without a requirement to regulate all types of land areas covered by the designation mandate. At section 22 of SHB 2929, non-mandated counties are required to insure consistency between development regulations and the comprehensive plan. This section helps to define the appropriate level of designation required on September 1, 1991. The appropriate level of designation is to address those resource lands and critical areas covered by the comprehensive plan and our current development regulations. Although the county does not designate all the resource lands and critical areas identified by SHB 2929, resource lands and critical areas covered by the current comprehensive plan are designated, classified and regulated. In addition, the development regulations are consistent with the goals and policies enumerated for those designated resource lands and critical areas.



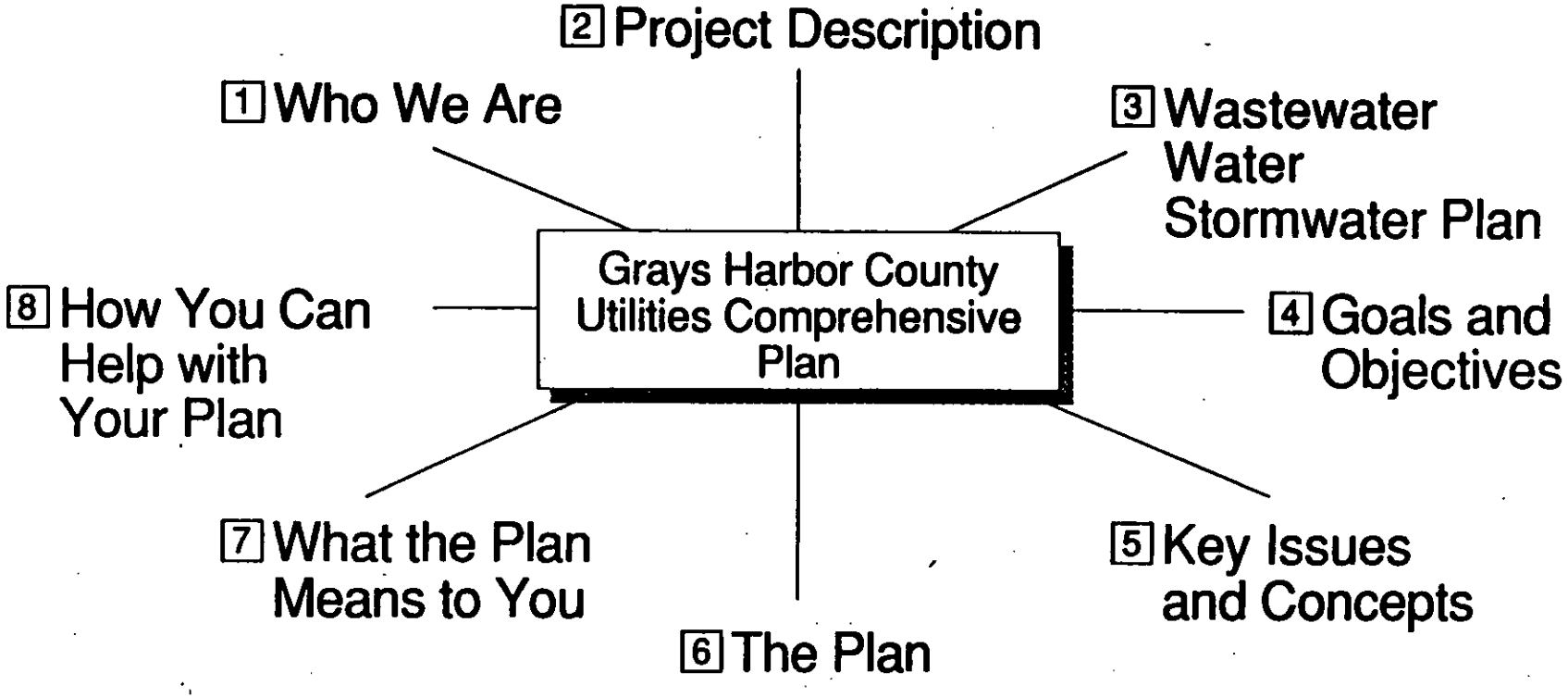
Grays Harbor County

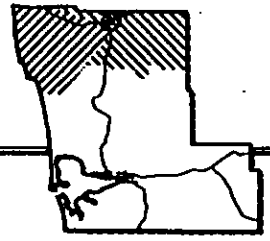
Utilities Comprehensive Plan

Parametrix, Inc.
in association with
Economic and Engineering Services, Inc.
Camp Dresser and McKee Inc.



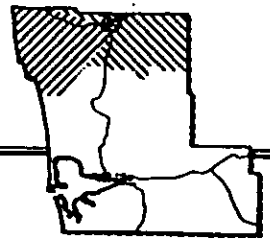
Grays Harbor County
Utilities Comprehensive Plan





Goals and Objectives

- Economic Growth/Diversification
- Orderly Land Use Planning/Development
- Public Health and Environmental Protection



Wastewater

Onsite Waste Disposal
- Existing Problems
- Potential Development

Wastewater Conveyance
- Transmission Main Capacities
- I/I Issues
- Projected Flows

Wastewater Treatment
- Wet/Dry Flow
- Design Capacity
- Limitations

April 15th

Information Received

Kickoff Meetings

Feasibility Analysis

Implementation Analysis

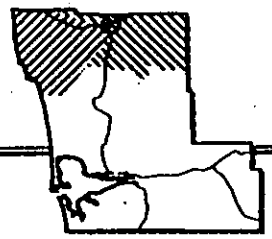
June 30th

Draft Phase I

Presentation Draft Report

Comment Period

Final Phase I

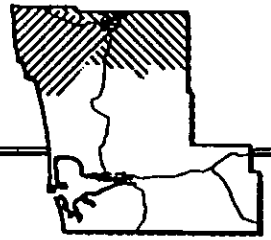


Wastewater

Treatment Facilities Focus of Analysis

- Identify High Capacity/ Low Flow Opportunities
- Identify Potential Opportunities

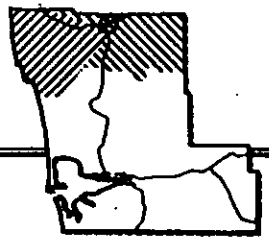
  -Liquid Stream Treatment
  -Sludge Handling



Wastewater

Treatment Facilities Analysis Approach

- Compare Current Flows to Nominal Capacities
- Check Loadings on Major Process Elements
- Identify Capacity Opportunities



Wastewater

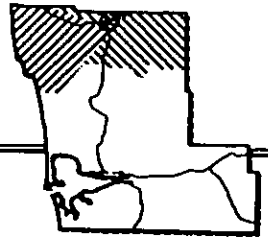
Treatment Facilities Data Needs

- Operating Data

  -Annual Summary
  of 1990 DOE Reporting Data

- Plant Data

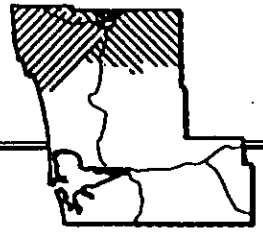
  -Nominal Design Flows and Loads
  -Number and Size
  of Each Major Process Tank



Outside Connections

City Infrastructure Improvements

- City Policies and Procedure
- City Ordinance
- Annexation



Water

Facility Inventory
- Source
- Treatment
- Transmission
- Storage

Planning Criteria
- Population
- Service Areas
- Economic Expansion

April 15th

Information Collected

Kickoff Meetings

Deficiencies Identified
Existing & Future

Supply Alternatives Developed

Feasibility Analysis

Implementation Analysis

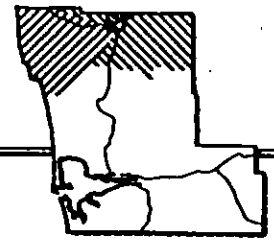
June 30th

Draft Phase I

Final Phase I

Presentation Draft Report

Comment Period



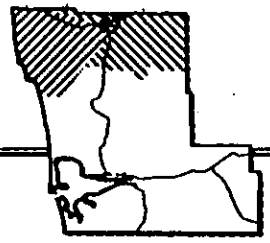
Stormwater

Mission Statement

1. Accommodate New Development

2. Provide Improved Service

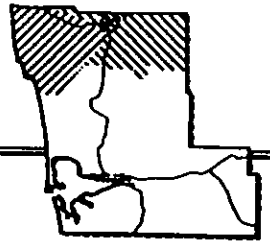
3. Preserve and Enhance the Functions of the Existing System



Stormwater

Comprehensive Plan

- Water Resources
- Facilities
- Implementation



Stormwater

Water Resources

- Flood Plains
- Wetlands
- Water Quality
- Fisheries
- Aquifer Protection
- Shoreline Resources

GRAYLAND COMMUNITY MEETING

COMPREHENSIVE UTILITIES PLAN
April 1, 1991 - 7:00 P.M.
Lions Club Hall

Attendance: 37 plus 3 county staff and 3 consultants
and Commissioner Dixon

COMMENTS AND CONCERNS NOTED:

1) Road Spraying, and impacts from runoff

2) Develop? Just maintain what is already here!

3) Logging on hill, impacts to drainage problem yet to be seen

4) Are Sewage and sewers the driving force to get better drainage?

5) Are any grants available for sewers?

6) Are our wetlands going to be dedicated to be I-5 mitigation areas?

7) Do you need to use a 6-1 ratio for wetlands replacement?

8) You just need to come down and drive from Westport to North Cove after a heavy rain to understand the problems we have.

9) Years ago, Ben(?) Creek use to drain the area, but now is has been dammed up by development. You guys created all these problems and now you are telling us just to wait while you study the problems. You guys are just doing this to make jobs for yourselves.

10) Why not just fix existing problems?

11) What can you do in the meantime to lessen problems or not create new ones while you are studying the problem?

12) What are you going to do for maintenance of the existing ditches?

13) Water doesn't recognise County lines. Will Pacific County be involved?

14) Is County's Jurisdiction just on roads for drainage?

15) The fill requirements for septic tanks are causing drainage problems.

16) Why not have a moratorium on new development until problem is solved?

17) Can't County do culvert installations to insure they are done right?

18) The north end of First Street and Swartz and Hart are a real problem.

19) Water, sewer, and drainage issues are all tied together.

20) They use to have holding ponds on the drainage ditch near the tide gates to hold runoff during storms. What about the beaver dams that are blocking the drainage ditch.

21) Will wetland regulation affect what you are trying to do?

22) We flooded out on Thanksgiving, we appreciate that the county is trying to address the problem.

23) Who should we sue when the County makes a neighbor fill and the fill causes drainage problems?

MONTESANO MEETING

COMPREHENSIVE UTILITIES PLAN
April 2, 1991 - 7:00 P.M.
Courthouse Administration Building

Attendance: 18 plus 4 county staff and 3 consultants and Commissioner Pine

COMMENTS AND CONCERNS NOTED:

1) Garbage plugging up the drainage ditches need maintenance to keep ditches open no matter how good the plan, won't work without maintenance

2) Blow up the freeway and let the water run free

3) Does this plan cover out in the County?

4) Can we get a copy of the Phase 1 report at the Central Office of Elma Schools?

5) We have video's of the flooding, would you like to have them?

6) Is grant money earmarked for study, or can we use it for implementation?

7) What are your time restraints? What about a LID as we have to get something accomplished now.

8) Is wastewater sewage? Is stormwater run-off? Does stormwater include run-off from clearcuts?

9) Will you be taking into consideration agricultural areas impacts and pollution?

10) Will phase 2 summary contain recommendations, costs, etc.?

11) Will you look at regional solutions down highway 12 corridor?

12) Will you be looking at where growth should occur?

13) You should look at bad examples of how not to do things, San Jose, CA is an example not to follow, Bellvue.

14) What would stop developers from Puget Sound using our area for wetlands mitigation?

15) The whole Chehalis Valley could be construed wetlands by plant type.

16) Need to consider if the 100 year flood line needs to be changed.

17) What are the effects of this in regards to zoning? Need to revisit land use.

18) With all the flooding, how much longer will Satsop River Bridge last?

19) How far up river are you going to go?

20) What impact will this plan have on individual wells and septic tanks?

NORTH BEACH MEETING

COMPREHENSIVE UTILITIES PLAN
April 3, 1991 - 7:00 P.M.
North Beach High School

Attendance: 18 - 3 County, 3 Consultants

COMMENTS AND CONCERNS NOTED:

1) Is this going to be for Ocean Shores as well?

2) Is this plan based upon where growth is now or where it is projected?

3) I heard that this plan is an East County plan, shouldn't this area, because of it's growth, be the priority?

4) What are some of the problems in other areas?

5) How can you have a plan by June 30th?

6) Until County has Comprehensive Land Use Plan, you have cart before the horse.

7) Wasn't there a plan before?

8) You need to get the communities to form groups, Aloha, Pacific Beach, etc.

9) I live on Burrows Road, in the drainage district, how does it fit into this? The biggest problem we have is when our road floods.

10) D.O.T. just gives us the run around.

11) In Copalis Crossing, every year or two the road floods. When they took out old bridge they left too little room (width) for stream bed, need to widen it to solve flooding problems.

12) What are wetlands regulations going to do to our existing ditches?

13) If you could do something with wetlands in your plan, it may help solve some problems.

14) Where does the coastal highway impact this plan?

15) A group is also forming to redo Moclips Highway.

16) Are you going to have more presentations around the County when the draft plan comes out?

17) It's too bad that all this work can get shot down during implementation by a vote for LID.

18) What happened to studying of feasibility of Ocean Shores using Humptulips River for source?

19) Ocean Shores is battling over water Supply with fisheries.

20) The cost of these programs is making people worry about the future costs and being able to maintain their property.

21) You are taking away septic tanks and costing a lot of people money.

22) I've heard Ocean Shores treatment plant could handle all the sewage south of Copalis.

ABERDEEN - HOQUIAM MEETING

COMPREHENSIVE UTILITIES PLAN
April 4, 1991 - 7:00 P.M.
Pearsall Building - Aberdeen

Attendance: 4, plus 4 County staff and 3 consultants

COMMENTS AND CONCERNS NOTED:

1) I have a spring, and it is good quality, which is rare for our area. In the early 70's we registered our water rights. Is this plan going to take my rights away?

2) Doesn't the 5 acre zone regulation give us protection?

3) Is this going to be 1 plan or 3 plans?

4) You said there has been no update of the water-sewer plan since 1970. there has been a lot of work done on water and sewage since then.

5) I have a 10 unit water system, I don't want to relinquish control of it. Will this plan call for me to lose control?

6) I want to develop a new water system, will this plan be at odds with it?

7) What about the drainage question, with regards to septic systems?

8) Does this mean the County is going to build sewage treatment plants around the County and force people to hook up?

9) What about cities looking to annex areas outside their limits, it would be great if they wanted to provide us services, but can they force us?

10) What about areas like Issaquah, didn't annexation require a vote?

11) Historically, the cities in this County have not been consistant with service areas and annexation.

12) Have you looked at population and census information?

13) Will this plan help economic development, and find areas that are good?

14) Have you defined wetlands? You can use Infra-red photos.

15) What percentage of County vs wetlands?

16) How much are you going to do inside city limits, such as Aberdeen?

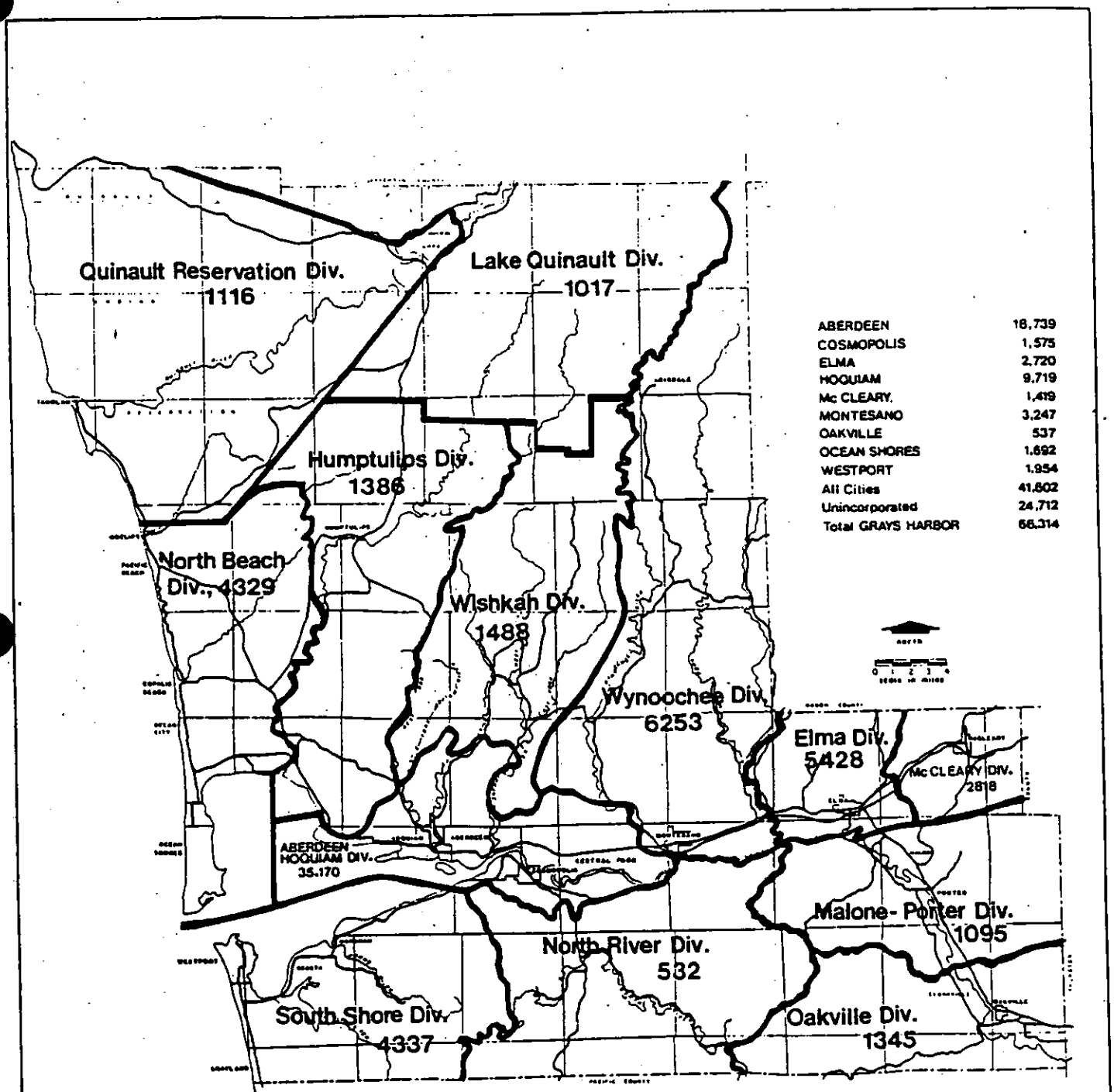
17) You already have preservation and conservation zones for wetlands in North Bay under Shorelines Management Plan.

18) Once you overlay all requirements, you don't have a lot of area left for industrial development, especially in urban area.

19) Is there a downside to having a water comprehensive plan? If you wanted to develop a private water system, would a water plan preclude this if say the property was in Aberdeen or Central Park Water District service area?

20) What about sewer service areas?

21) As hilly as we are, as opposed to shoreline areas, could we use same trunk lines for services, such as natural gas right away? The old rail lines would make good utility right-of-way.



GRAYS HARBOR COUNTY, WASHINGTON

CENSUS MAP

1980 CENSUS DIVISION BOUNDARIES AND POPULATION

HYDROGEOLOGIC INVESTIGATION

GRAYS HARBOR UTILITY COMPREHENSIVE PLAN

FOR

GRAYS HARBOR COUNTY

DEPARTMENT OF PUBLIC WORKS

—

JUNE 1991

Rongey/Associates
Hydrogeology

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HYDROGEOLOGIC INVESTIGATION

GRAYS HARBOR UTILITY COMPREHENSIVE PLAN

PURPOSE, SCOPE AND INVESTIGATIONAL PROCEDURES

This is a summary of a hydrogeologic investigation aimed to generally define the parameters of the principal ground-water reservoirs and aquifers in Grays Harbor County. Geographic subdivisions of the county as illustrated by the location map, plate 1, were evaluated with respect to available quantities and quality of ground water to supply the widely varying needs of industrial, agricultural and municipal users.

Investigational procedures involved the collection and review of all available existing well data. This included approximately 1800 well drilling records from the State Department of Ecology, and 80 chemical analyses from the State Department of Health and the U. S. Geological Survey. Field locations were established for approximately 175 wells and 60 wells were sampled and tested for water quality. The geological framework of the county as described herein is based primarily on the most recent compilation of mapping published by the State Department of Natural Resources. Additional information was taken from the numerous studies by Rongey/Associates in the county and the files of the various cities and water districts.

METHODS OF DATA ANALYSIS AND DEFINITION OF TERMS

A summary of conclusions reached by the study is outlined by Table 1. This broadly describes the depth requirements and expected yield capability of commercial wells which likely could be constructed in the various study areas. The data are interpreted from the records of existing wells but assumes that future wells

will be drilled to standards capable of obtaining maximum aquifer yield and the best water quality available. It is pointed out that much of the information obtained as regards the yield capability of aquifers comes from domestic wells and abbreviated types of industrial and community wells where water requirements do not warrant state of the art construction. Typically these wells do not use well screens. Most are simple open bottom completions with capabilities of 10 percent or less of a screened well. Many, particularly in the North Beach area, have not adequately explored the aquifers available, typically selecting less productive shallow zones with poor water quality because of the costs of drilling deeper. As a result existing wells must be judged very selectively as a guide to future well capability.

Similarly, in addressing drilling risk Table 1 makes a broad judgement assuming current drilling techniques. The more recent use of air rotary drilling equipment has greatly improved the ability of a driller to evaluate aquifer potential. This is particularly true in areas where the aquifers are "dirty"; i.e., with either thin clay or silt interbeds or interstitial fines. This system has a disadvantage where aquifers have a very low hydrostatic head or where heaving sand is a problem. Here, the conventional cable tool system is advantageous and geologic drilling supervision desirable. Drilling risk in many areas could also be greatly reduced with adequate site evaluations utilizing geophysical techniques. Note also that drilling risk is relative to the quantity of water desired. For example in the McCleary subunit, plate 1, the drilling risk, assumed to average 10 percent, is probably zero for under 5 gpm single home domestic wells, and possibly as high as 80 percent for well yields of more than 300 gpm. Here again, geophysics is useful to predict aquifer position and capability.

With regard to aquifer safe yield Table 1 should be taken cautiously. Only in the case of the shallow aquifer at Ocean Shores has an adequate analysis of safe yield been attempted anywhere in the county. Elsewhere, except possibly at Westport,

withdrawals have not remotely approached likely aquifer safe yield.

Safe yield is broadly defined as the net amount of ground water which can be withdrawn from an aquifer without a progressive annual decline in its static water level. This is modified herein to include the net amount of water which can be withdrawn without influencing the low flow discharge of neighboring streams. This is a concern along the Chehalis River and tributary streams as well as the Humptulips where low summer flows are below State Fisheries recommendations. Within these areas detailed hydrogeologic study should preface any future proposed withdrawal.

Note that in this report net withdrawal is taken as the amount of ground water permanently extracted from an aquifer without opportunity for return flow via percolation or direct discharge to a contiguous stream. Gross withdrawal, sometime described as gross pumpage, is defined as the total water pumped from the aquifer. It all may be immediately returned to the aquifer via percolation or to contiguous surface streams, in which case the net withdrawal is zero.

Finally, note from Table 1 that in item c. bedrock is described as unsuitable for commercial wells. This is probably not universally true. Isolated bedrock wells have been reported in the county with yields in the 10,000 gallon per day range. Typically, however, a bedrock well produces less than a thousand gallons per day and is suitable only for single home domestic use. Water quality is also often a problem. The very slow rate of water movement through the poorly permeable rock can result in a buildup of iron and manganese. Chlorides can also be excessive. Much of the county's bedrock is marine in origin and has retained saline water incorporated at the time of deposition.

HYDROGEOLOGY

Geology

The geological framework of the county can be broadly divided into four formational units. Of least importance from the standpoint of commercial wells is Tertiary bedrock consisting largely of sandstone and shale with some interbedded basalt. This material provides the floor upon which later water bearing sediments have been deposited. As shown by the location map, plate 1, bedrock occurs directly at the surface over a large part of the county north and south of the Chehalis valley. At shallow depths, generally above 200 feet, isolated fractures and shears support small domestic type wells.

Gravels and sands of Pleistocene age deposited by streams draining the Olympics and southwestern Washington are the source of most ground water in deeper wells in areas north and south of Grays Harbor. North of the Harbor the Hoquiam, Humptulips and Quinault Rivers were the principal agents of deposition. Accumulations of sediments ranging from less than 50 feet along the easterly bedrock margins increase to 1200 feet or more along the ocean front between Moclips and Ocean Shores. Typically aquifers within this alluvial pile are narrow,channel like accumulations of sand and fine gravel interspersed in thick sections of clay and silt.

Under the Ocean Shores peninsula and along the southern rim of the Harbor to Grayland, Olympic Mountain materials merge with those of Chehalis River and Willapa Hills origin. Drilling records indicate the thickness of these deposits decline from 1200 feet under Ocean Shores to an irrigular 150 to 700 feet plus under Grayland. Aquifers are similar to those north of the Harbor, occurring as channel like accumulations in a predominant section of clay and silt.

In the central and eastern parts of the county significant water bearing aquifers are largely restricted to geologically Recent deposits within the present river valleys.

The Chehalis River valley is floored with the most consistently permeable gravel accumulation of any river system in Western Washington including the Columbia. The valley, which is carved through Tertiary bedrock, typically has at its greatest thickness 200 feet of highly permeable gravel which originated largely as outwash carried by glacial meltwater from the Puget Sound basin. The gravels maintain a consistently high permeability from the south county line to beyond Aberdeen.

The Cloquallum drainage is similarly blanketed with highly permeable glacial gravel as a result of meltwater spill through low passes in the hills between McCleary and Shelton. Highly productive wells around McCleary produce from these gravels.

The valleys of the Satsop, Wynoochee and Humptulips Rivers have similar but somewhat less permeable gravel accumulations to depths of 100 feet or so. Glaciation in the Olympics likely has contributed much of this material.

Finally, the geologically youngest aquifers of significance in the county are comprised of dune and ocean shelf sand extending from Grayland to Westport and Ocean Shores to Copalis. These deposits,averaging 100 feet in thickness, are the principal source of water for the City of Westport. They are currently being developed as a supplemental water source for the City of Ocean Shores. The material consists largely of fine sand carried by longshore currents northward from the Columbia River. The Chehalis and Humptulips Rivers locally contribute interspersed gravel.

Hydrology

Ground-water recharge to the county's aquifers occurs largely from the deep percolation of precipitation directly within the county. Remote sources of recharge as the Olympic Mountains and core areas of the Black Hills and Willapa Hills are not of apparent importance. The Chehalis River valley is an exception, receiving significant volumes of recharge moving down-gradient from the Thurston and Lewis County prairies.

The major rivers in the county all appear to be gaining streams; i.e., receiving ground water from the surrounding valley fill. Stream flow losses probably occur where irrigation wells are in close proximity to the channels but phreatophyte use and evaporation likely are far greater consumers of stream flow. Indirect dry season losses of ground water inflow to the trunk streams as a result of well water withdrawals around the perimeters of the valleys appear to be small and far less than the normal seasonal draindown due to natural ground-water discharge. Observations for this study indicate that in the vicinity of Elma ground-water inflow to the Chehalis River during the spring months is on the order of 200 to 300 cfs. This is an equivalent loss of ground water from the reservoir nearly 100 times greater than the municipal pumpage of Elma. Except for isolated locations at specific wells, net ground-water withdrawals for the county's aquifers are minute compared with quantities available. The City of Ocean Shores has experienced some decline in static water levels and well yields but this appears related more to aquifer compaction directly at the well sites rather than ground-water overdraft. The Cities of McCleary, Elma, Montesano and Westport as well as the water districts all appear to be maintaining withdrawals within aquifer capabilities.

Salt water intrusion to date has not been a problem anywhere in the county. Freshwater is maintained in the Chehalis valley at least to Aberdeen. At Cosmopolis the Weyerhaeuser Company pumps a million gallons per day of fresh water for cooling from gravels 200 feet below intermittently brackish water in the river channel. Similarly the Hoquiam School District pumps large quantities of cooling water from gravels 175 feet below sea level immediately adjacent to the tidal Bowerman basin. Around both the north and south margins of Grays Harbor wells 200 feet and deeper produce fresh water at locations immediately adjacent to tidewater. The deep wells at Ocean Shores (520') produce from aquifers which likely pass under the Harbor with hydraulic continuity into the Humptulips River drainage basin. These wells

have produced for more than twenty five years with peak withdrawals in the 2 mgd range.

The City of Westport has pumped for more than 40 years with nearly 1 mgd withdrawals from wells 60 to 90 feet deep in close proximity to tidewater.

In all the aforementioned aquifer areas except at Westport excessive salinity does occur in materials overlying the producing zones. Typically these are less permeable fine sands and silts which retain various degrees of brackish water residual from the time of deposition. In these areas wells completed at too shallow a depth will produce water with excessive salinity.

Salt water is also encountered in bedrock. Here, aquifers as such do not exist. Water is conducted via fractures and shears. Again, most of these materials were deposited in a marine environment and various amounts of salt water were retained from the time of deposition. Only at very shallow depths where weathering has opened the fractures to surface water entry is non saline water likely to be obtainable.

Water Quality

The quality of ground water in the county's wells has been evaluated based on approximately 80 chemical analyses obtained from the records of the State Department of Health and the U. S. Geological Survey. An additional 60 wells were sampled for this study, with in-house testing for iron, nitrates, chlorides and pH. Manganese was checked where iron exceeded 0.3 mg/l.

The water quality in the major aquifers, very generally, is good. All the principal cities and water districts except Ocean Shores obtain water suitable for use without treatment. McCleary's water meets federal standards but a sequestering agent is added to control iron and manganese buildup in low volume lines. Ocean Shores removes about 1.3 mg/l iron and 0.3 mg/l manganese with permanganate oxidation and pressure filtration.

Excessive iron, manganese and organic color is common in shallow beach sand aquifers, Ocean Shores to Copalis and Westport to Grayland. Westport is unique in obtaining water of excellent quality from these materials. High chlorides are rarely a problem except where periodic tidal flooding breaches the dunes.

Generally, the deeper and most productive Pleistocene aquifers both north and south of Grays Harbor yield good water. In the case of Ocean Shores, water quality with respect to iron and manganese has declined through the years with use, as poor water has been drawn into the aquifer from over and underlying less permeable material. Whether this is typical for such aquifers is not known. To date no wells with comparable demand requirements have been completed in Pleistocene aquifers. Note that in these same areas shallower wells (200 feet and less) show an erratic distribution of iron and manganese. Here, drilling supervision and on site water testing as drilling progresses is recommended.

Nitrates apparently are not a significant problem in the county. Of 65 chemical analyses obtained from the State Department of Health only one well exceeded federal limits of 5 mg/l NO_3. Only 6 wells had levels of 1 mg/l or greater. Of the 60 wells tested by Rongey/Associates only one exceeded 5 mg/l. All the remainder were less than the detection limit of 0.5 mg/l.

Chlorides which are discussed in greater detail under Hydrology are similarly low in the majority of the county's wells. With the exception of domestic wells in bedrock chlorides rarely exceed 30 mg/l.

Table 1, Hydrogeologic Study Area Summary

I. East County Area

A. McCleary subunit

1. Well and reservoir parameters

a. Required well depths: 50 to 175 feet.

b. Well yields: 50 to 150 gpm.

c. Water quality: good, sporadic excess iron in very shallow wells.

d. Drilling risk: less than 10%.

e. Reservoir safe yield: available for gross withdrawal, possibly in excess of 2 mgd. Dry season net withdrawals assumed to be restricted to locations having little or no hydraulic continuity with Wildcat Creek. Detailed hydrogeologic study required.

B. Chehalis Valley

1. Well and reservoir parameters

a. Required well depths: 50 to 175 feet.

B. Well yields: 100 to 1000+ gpm.

c. Water quality: good, localized pockets of high iron near bedrock boundaries along valley margins.

d. Drilling risk: none.

e. Reservoir safe yield: nearly unlimited ground water available for gross withdrawal, Large dry season net withdrawals likely available at locations remote from surface water channels. Detailed individual well site study required.

C. Peripheral bedrock uplands: not suitable for commercial wells. Sustained yields are normally under several gpm. The water quality is typically poor with high iron, manganese and areas of excess salinity.

II. Central Area

A. Montesano - Central Park terraces (hachured ////)

1. Well and reservoir parameters

a. Required well depths: 30 to 100 feet.

b. Well yields: less than 5 to 200 gpm.

c. Water quality: fair to good.

d. Drilling risk: 25% for wells with yields in excess of 20 gpm.

e. Reservoir safe yield: possible gross and net withdrawals in excess of 200 acre feet/sq. mile. Individual well site studies required.

Table 1, - - Continued

B. Chehalis Valley

1. Well and reservoir specifications

a. Well depths: 75 to 200 feet.

b. Well yields: 100 to 1000+ gpm.

c. Water quality: Satsop valley east to subdivision boundary, good. Satsop valley west to Cosmopolis, good where wells can be drilled deeper along the axis of the valley. Poor with high iron and manganese along valley margins where alluvial fill is thinner and wells induce inflow from shallow organic rich surface deposits.

d. Drilling risk: none.

e. Reservoir safe yield: nearly unlimited ground water available for gross withdrawal. Net dry season withdrawals likely to be restricted to deep wells having poor hydraulic continuity with surface water channels. Individual well site analysis required.

C. Wynoochee Valley

1. Well and reservoir parameters

a. Well depths: 30 to 75 feet.

b. Well yields: 50 to 200 gpm.

c. Water quality: good within valley alluvium. Poor with excess iron and manganese where wells penetrate into underlying bedrock.

d. Drilling risk: less than 10% along valley axis. 50% plus near valley margins where alluvium is thin. Specific site studies required.

e. Reservoir safe yield: nearly unlimited gross withdrawals where water can immediately be recycled to the ground-water reservoir. No significant dry season withdrawals likely available.

D. North bay uplands (hachured)

1. Well and reservoir parameters

a. Required well depths: 100 to 400 feet.

b. Well yields: 50 to 500+ gpm.

c. Water quality: fair to good with occasional wells with moderate iron and manganese.

d. Drilling risk: less than 10%, specific well site geophysics recommended for higher yielding wells.

e. Reservoir safe yield: probably on the order of 300 acre feet per square mile. A hydrogeologic analysis recommended.

E. Peripheral bedrock uplands and Lower Hoquiam and Wishkah River valleys: not suitable for commercial wells, inadequate yields and poor water quality.

III. South Beach Area

A. Cosmopolis - Bay City

1. Well and reservoir parameters

a. Required well depths: 50 to 300 feet (principal depth range).

b. Well yields: 25 to 200 gpm.

c. Water quality: fair to good, spotty excess iron.

d. Drilling risk: less than 10%.

e. Reservoir safe yield: probably in excess of 0.5 mgd/sq. mile. Detailed hydrogeologic study required.

B. Grayland - Westport

1. Well and reservoir parameters

a. Required well depths: two reservoirs; upper 40 to 100 ft., lower 100 to 300+ feet.

b. Well yields: upper reservoir 25 to 150 gpm, lower reservoir 25 to 300+ gpm.

c. Water quality: upper reservoir high iron to 40 feet, low to moderate iron 40 to 100 feet. Lower reservoir good.

d. Drilling risk: upper reservoir none, lower reservoir 50%. Hachured area probably has no deep well capability.

e. Reservoir safe yield: upper reservoir possibly 500 acre feet per square mile, lower reservoir unknown. Detailed hydrogeologic study required.

IV. North Central Area

A. Humptulips floodplain (hachured)

1. Well and reservoir parameters

a. Required well depths: 50 to 100 feet.

b. Well yields: 50 to 200+ gpm.

c. Water quality: good.

d. Drilling risk: none.

e. Reservoir safe yield: unlimited gross withdrawals. Net dry season withdrawals restricted by low river flows. Detailed individual well site study required.

Table 1, - - Continued

B. Humptulips - Chenois Creek uplands

1. Well and reservoir parameters

a. Required well depths: 100 to 300 feet.

b. Well yields: 25 to 200+ gpm.

c. Water quality: good, localized excess iron near the bedrock perimeter and at very shallow depths in the stream valleys.

d. Drilling risk: less than 10% for well yields less than 50 gpm.

e. Reservoir safe yield: unknown, but probably in the 0.3 to 0.5 mgd/sq. mile range. Hydrogeologic study required.

C. Peripheral bedrock uplands: not suitable for commercial wells. inadequate yields and poor water quality.

V. North Beach Area

A. Ocean Shores Peninsula

1. Well and reservoir parameters

a. Required well depths: upper reservoir 80 to 90 feet, lower reservoir 520 feet.

b. Well yields: upper reservoir 200 to 300 gpm, lower reservoir 500 to 1500 gpm.

c. Water quality: upper reservoir excess iron and color, lower reservoir excess iron and manganese. Treatment of water from both reservoirs is required.

d. Drilling risk: none.

e. Reservoir safe yield: upper reservoir 1000 acre feet per square mile, lower reservoir 400 to 500 acre feet per year.

B. Hogans Corner - Moclips

1. Well and reservoir parameters

a. Required well depths: upper reservoir (hachured ◇) 40 to 100 feet, lower reservoir 75 to 400 feet.

b. Well yields: upper reservoir 50 to 100 gpm, lower reservoir 20 to 300+ gpm.

c. Water quality: upper reservoir poor to fair with high iron manganese and color, lower reservoir fair to good with sporadic excess iron and manganese. Long term heavy pumping from deeper aquifers likely results in increasing iron and manganese.

d. Drilling risk: upper reservoir none, lower reservoir 20%. Geophysics for site locations recommended.

e. Reservoir safe yield: upper reservoir estimated at 1 acre foot per acre, lower reservoir unknown but probably in excess of 500 acre feet per sq. mile.

VI. North Area

A. Upper valley

1. Well and reservoir parameters

a. Required well depths: 30 to 100 feet.

b. Well yields: 50 to 300+ gpm.

c. Water quality: good in central valley locations, increasing iron along valley margins and at very shallow depths in hand dug wells.

d. Drilling risk: none.

e. Reservoir safe yield: unknown, significant net withdrawals likely to interfere with river flows.

B. North side of lake

1. Well and reservoir parameters

a. Required well depths: 50 to 250 feet.

b. well yields: 20 to 100+ gpm.

c. Water quality: good, increasing iron near bedrock outcrops and near sidestream drainages off bedrock.

d. Drilling risk: none.

e. Reservoir safe yield: unknown.

C. Amanda Park, south shore and south Hwy. 101 corridor

1. Well and reservoir parameters

a. Required well depths: 40 to 200 feet.

b. Well yields: 50 to 200+ gpm.

c. Water quality: good, increasing iron near bedrock contacts.

d. Drilling risk: none.

e. Reservoir safe yield: unknown, hydrogeologic study required.

D. Bedrock uplands: not suitable for commercial wells, inadequate formation permeability.

Table 2, Well Summary[1/]

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
15/11-5N1	G.H. Co.	30	652	flowing					12	75		L, aband., low yield, poor water
8N1	G.H.W.D. #1	40	570	32	<.1							L, perf. 79'-82', aband. poor water
17F1	Furford	20	285	flowing	10+	.16			32	64		1000+ gpm capability
17F2	"	20	79	1	1+							53 gpm yield, rpt. low iron
17L1	G.H.W.D.#1	20	397	flowing	2+	.05	.01	<.2	20	88		Screen 343'-353',370'-373',377'-386'
17L2	" " "	20	397	"	2+							" " " " " " "
18A3	Pride	12	200		1.0				414	255		50' casing, 150' open hole
15/4- 3H1	Chehalis Tribe	90	50	27	16+							L, open bottom
3L1	" "	90	93	30	4.2	<.1		<.5	12		8.4	L, screen 81'-91'
3L2	" "	90	95	27	39							L, " " "
16/4- 31B1	Oakville	90	95			<.1	<.01	1.1	5	50	6.9	
32N1	Sea Fresh Co.	90	100	26	85							L, screen 78'-98'
32N2	" " "	90	110	26		<.1		<.5	8		7.0	L, " 88'-108'
32N3	" " "	90	110	26								L, " 80'-100'
16/5-*11P1	Hartley	40	100	26	0.6	1.2				5	9.0	L, open hole in bedrock 29'-100'
*14N1	Greedy	40	73	33	30+							L, open bottom
*24L1	Doerge	120	223	8	0.2							L, perf. 30'-45' in bedrock

1/ see end of table, page 25 for Key to letter-number designations and abbreviations.

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
16/11-1E1	Ocean Spray	10	145	1		.03	.01	.5		36		225 gpm installed pump capacity
1E2	" "	10	160									200 " " " "
2J1	Assoc. Seafoods	10	123	1								Rpt. low iron, no treatment
*9J1	Fleming	20	150		1							L, open bottom in gravel
*10D1	Weibel	10	114	0	17							" " " " "
*11M1	Howell	60	138	40	15							" " " " "
12B1,2,3	Westport	20±	90±	17	10±							L, 350 - 1000 gpm capability
*16B1	Beste	30	135	29	7.5							L, open bottom in gravel
18N1,2,3,4	Westport	35±	75±	23±	5-10							L, 175 - 350 gpm installed pump capacity
19D1	Ocosta Sch.Dist.	20	267	3	18.3							L, screen 227' - 253'
*21D1	Bay City prop.	20	590			.05	.033	.2	15	70		Equip. w/ 80 gpm pump
*21D2	Ocosta Grange	20	171	15	1							L, open bottom in gravel
*29N1	Anderson & Middleton		316	5	3.2							L, Screen 261'-271'
*30E1	Halper	17	404	14	.25							L, open bottom in sand
16/12-24J3	State of Wash.	15	700	2		.42	.2		18	84		
25R1	Mobil Home Dev.	20	363	2								Rpt. H_2S, some iron
17/5-*3C1	Peek	240	140	28	.04							Bedrock production, 5 similar wells in area
*6N1	Haney	40	72	28	.8							Open bottom in gravel
7D1	Smiley's Dairy	40	46	15	6	<.1		<.5	8		6.5	Perf. 35'-46' in gravel, L
7G1	Gordon Farms	50	132	45	120							Rpt. high iron, perf. 100'-130', L
7J1	" "	50	61	5	33	<.1		<.5	9		7.1	L, perf. 17'-60'
*9R1	Lake	60	150									Aband. dry hole, bedrock @ 29', L
12D1	Porter Creek Camp	280	100		.1							L,bedrock production

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
17/5- 17J1,2	Malone system	50	80	35	6	.1	.023	1.4	20	80	7.2	Perf. in gravel, 2 wells 12' apart
19J1	Rupe	40	38	12	50							L, perf. 28'-38'
20P1-5	Briggs Nursery	40	100	10	200+	<.1		<.5	7		6.9	L, 3 irrig., 2 dom. wells similar const.
21N1	DeAguliar Farm	40	85	30	30	.28		.5	14		6.8	L, perf. 60'-84' in gravel
21R1	Porter Tavern	50	43									
28A1	Porter Grocery	50	62	25	5							L, perf. 42'-59' in gravel, 100 gpm test
*32H1	Brown	60	48	23	12+							L, open bottom in gravel
*33P1	Wentworth	60	57	16	150							L, perf. 40'-54' in gravel
17/6- *1B1	Evergreen Village		90		1±	<.1	<.01	1.0	5	20		
*1L1	Greenwood Pk.	30	111		.5±	<.1	<.01	2.2	5	50		
*1L2	" "	30	110		.5±							
3E1	Gold Beach Aviat.	30	84	15	2	<.1		<.5	10		7.0	L, open bottom in gravel, bedrock @ 68'
*4C1	Assoc. Sand & Grav.		48		106							L, perf. 20'-45', 2 addit. wells on site
4E1	Elma (city #2)	30	42									Rpt. 1000 gpm capability
6P1	WPPS	25	80		5±							Well No. 1, domestic supply
*7L1	Zepp	280	235	1	.001							L, Bedrock @ 20'
10A1	Union Pac. RR.	40	60	8	1							L, Screen 55'-60', Bedrock @ 57'
17/7- 1L1	Bohren	20	31	10	130							L, open bottom in gravel
1R1	Collete	20	41	14.5	85							L, perf. 34'-42'
*3D1	Chandler syst.	40	70		.3							
*3N1	Leitz	25	280	15								L, aband. in salt water, bedrock @ 38'

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
17/7- 4N1	Newcomb	22	21	3								Sandstone bedrock @ 17'
4Q1	Salvaggi	22	85	9	.2							" " " 24'
11H1	Newcomb	20	65	4	100							L, perf. 31'-60'
*11J1	Twidwell	20	59	15	150							L, perf. 36'-55'
11K1	Meyer	20	45	5	75							L,
12L1	Roberts	30	42			<.1	<.5		5		6.6	
15B1	WPPS	20	132	3	511							L, Ranney collector, bedrock @ 131'
15C1	"	20	169	8.5	438							L, " " " " 169'
18F1	Schurr	20	55			.15	<.5		36		7.3	
17/8- 2F1	Graystone	50	60	12	75							L, perf. 22'-48'
2M1	Rabey	75	33	18	4	<.1	<.5		8		7.4	
8L1	G.H.W.D.#2	190	48	25	8.5							L, perf. 36'-48', aband., declining yield
10H1	State DNR	150	265	50	1							L, perf. 55'-75'
10H2	Crawford Trl.Pk.	130	100	58	15	.1	<.01	2.6	5	40		L, perf 64'-86', bedrock @ 87'
10G1s	Monte View Water Co.					<.1	<.01	.8	5	30		40 gpm spring flow
11M1	Country Estates	140				.14	.05	1.2	5	10	6.6	
12L1	Montesano	20	165	12	48	<.1	.2	<.2	10	3		Well No.1, bedrock @ 147', screen 135-145'
14G1	G.H.W.D.#2	20	181	5	130							L, screen 116'-136',148'-159',br. @ 181'
14G2	" "	20	154	5	500							L, adjacent standby well
14H1	Montesano	20	166		110							L, screen 128'-149'
15D1	G.H.W.D.#2	20	95	9	125							L, bedrock @ 93', aband., high iron
15D2	" " "	20	100	7	170							L, " @ 100' " " "

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
17/9- 14Q1	Weyerhaeuser Co.	10	200	10	10							Rpt. good qual., 1 mgd cooling water
17E1	Port, Grays Hbr.	10	127	10	12.5							L, open bottom in gravel, aband.
*19R1	Taylor	20	76	5	2.4							L, " " " sandstone @ 51'
*19F1	Cumlander	15	68	30	.3							L, " " " bedrock @ 39'
20A1	Aberdeen Auto	15	137	10	.5							L, open bottom in gravel, high iron
*22F1	Harbor Homes	120	180									Perf. in gravel, no iron, not treated
*23C1	Highland Golf	80	220	42	2							L, perf. 45-55' in gravel, bedrock @ 61'
17/10- 3Q1	Hoquiam Sch. Dist.	15	198	7	20	<.1		<.5	253		7.2	L, screen 173'-198'
3Q2	" " "	15	190	8	209							L, perf. 178'-188'
5K1	Renville	240	250			<.1		<.5	10		6.9	Rpt. low iron, adquate dom. supply
*24Q1	Supple	120	147	87	7							L, perf. 137'-138'
*31K1	Degner	80	174	64	1							L, open bottom in gravel
*31E2	Johnson	80	160	65	9							L, " " " "
17/11-*1D1	Hilyard		115	52	1.2							L, Perf. 103'-105' in gravel
*1A1	Liebe		109	0	.15							L, " 99'-100' " "
*2J1	Dahlstrom		55	12	.75							L, open bottom
17/12- 3R1	Ocean Shores	12	512	10	15±	1.3	.3	.2	20			L,
3R2	" "	12	520	10	15±							L,
3R3	" "	12	518	10	15±							L,
3R4	" "	12	95	10	9							L,

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
18/5- 2H1	Pit Water Co.	330	104		1.5	.04	<.01	<.2	3	120		
2H2	McConkey	330	50			<.1		<.5	7		7.5	Adequate domestic
11A1	McCleary	295	90		10±	.28	.13	<.2	15	110		Well No. 1, rpt. 700 gpm capability
11A2	"	295	90			<.1		<.5	16		7.4	Anal. of combined water A1,2
11A3	"	295	75	3	6.9							L, aband., perf. 33'-38'
11C1	Siler Pole Co.	310	162	10	.3							L, perf. 58'-83'
*14R1	Heslep Estates	360	375	85	.1	.03	.1	<.2				L, open hole in bedrock
15A1	Feesers Groc.	235	76	11	2							Open bottom in gravel
15F1	Forest View Pk.	190	80	20	1.5	<.1		<.5	10		7.5	Analysis of combined well water
15F2	" " "	190	80	20	1.5							
*19Q1	Medoland Water	125	135		1±							
19Q2	" "	125	240		11	.03	.02	1.1	11	55	7.0	
20B1	Whites system	165	95			.44	.9	1.0	5	50	7.6	Treated
29L1	State Rest area	130	60	13	6.3	.26	.05	.4	5	70	7.5	L, Screen 50'-60'
18/6- *24N1	Karins Berry Farm	320	215		.1							Open hole in bedrock
*25H1	Vikings West	115	550			<.1	<.01	<.2	5	210		
25R1	Ginny Lane syst.	100	82			<.1	.04	.19	9			
27P1	Elma	35	60		300±							Rpt. 1000 gpm capability
31G1	Satsop DinnerHouse					<.1		<.5	6		7.2	
31G2	Satsop School	40	60									Rpt. good water
32J1	Oakridge Golf	35	80			<.1		<.5	6		7.4	
32K1	" "	25	80		10+							Rpt. good irrigation supply
33J1	Elma	35	60		300±							Rpt. 1000 gpm capability
32D1	Assoc. Sand & Gravel	102		15	250±							L, screen 60'-81.5

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
18/8- 28C1	Wynoochee Wildwood		43	15	40	<.1		<.5	10		6.9	L, perf. 33'-43'
28F1	City of Aberdeen	50	122	20	.02±	.37		10±	190		8.0	L, perf. 102'-122'
27P1	Dagnen Farms	15	48	12	50							L, perf. 22'-46'
34F1	Schmidt	45	220	15	.017							L, uncased in bedrock
*34A1	Pekola	40	30	18	7.5							L, open bottom in gravel
18/9- 4M1	Randolph	50	120	10	.01							L, uncased in bedrock
8C1	Stover	40	20±									Hand dug, rpt. high iron, filtered
11F1	Lentz	40	38	11	1							L, not hooked up yet
11F2	"	40	140		.4							Aband., dry hole in bedrock
15H1	Clark	30	18	5	.1							L, hand dug in bedrock, rpt. high iron
*21D1	Talevich	50	70	8								L, open bottom in gravel @ 63'
*33A1	Wilson	50	60	5	.6							L, " " " bedrock @ 60'
18/10- *8P1	McFadden	50	80	20	.4							L, perf, 50'-52' in gravel
*9F1	Ganser	35	110	30	.8							L, perf, 95'-105' in gravel
13J1	Levering	40										Rpt. high iron, filtered
13J2	Smith	45										Rpt. moderate iron, water filtered
*17R1	Jarnowiske	60	130	69	.3							L, open bottom in gravel
*18F1	Itt Rayonier	200	143	15	1.5							L, open bottom in gravel
25K1	Case	30	200	18	.01							L, open hole 50-200' in bedrock
18/11- *3Q1	Gehrke	20	40	22	10							L, open bottom in gravel
*4B1	Graham	20	96	9	7							L, open bottom in gravel

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
18/11-*11G1	Krebbs	80	169	6	1.2							L, open bottom in gravel
16Q1	Brooks	10	158	8	.4	<.1		<.5	15		8.1	L, " " " "
17E1	Coppin	10	25		20							L, perf. 241'-250', rpt. low iron
17K1	Stearns	10	50			.15		<.5	20		7.9	Rpt. adequate domestic
17L1	"	10	70	4	4.8							L, perf. 49'-66'
22H1	Seahorse Ranch	10	368	12		<.1		<.5	10		7.9	L, open bottom in gravel, Tested @ 100gpm
36E1	Andrews Ranch	20	50-60			<.1		<.5	9		6.4	
36M1	Pickell	30	200	flowing		<.1		<.5	6		8.1	1700'oil test plugged and perf. above 200'
18/12- 3P1	Ocean City Dev.	15	469	0	1.0	.19		<.5	26		7.5	L, screen 459'-469'
3N1	State Park	10	50±			.24	.03	<.2	135	50	8.4	
10C1	North Beach Motel		300			<.1		<.5	40		7.6	Screened
10C2,3	" "	"15	35									Screened in beach sand, rpt. high iron
15R1	Catholic Church	45	110	41	1.7							L, perf. 54'-56', 87'-88', high iron rpt.
15R2	Loomis store	40	550	40±								Screened in fine sand, tested @ 100 gpm
15R3	Texaco Sta.	20	75	15	1.0	.15		<.5	17		7.5	L, perf. 40'-41'(15 similar wells this area)
22A1	Hogans Cor. comm.		217			.21	.055	<.2	10	50	7.9	screened, 35 gpm installed capability
22K1	State Park	10	630	flowing								L, aband., low yield & high iron
22K2	" "	10	40			7±			90	245		Screened in sand
20C1	Ocean City water		63			.38	.28	.7	10	55		
26N1	MacMorran	15	438	1	.8							L, open bottom in gravel
27F1	Illahee	15	358	flowing	.4	<.1			30			L, abandoned
27J1	Minard	15	649	10±		<.1						L, rpt. adequate domestic, low iron

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
19/9- 6R1	Everett	140	64	41	4							L, perf. 38'-55'
*12N1	Sangder	150	115	60	.8							L, open bottom
21H1	Scott Grocery	160				.12		<.5	6		8.7	
23E1	Thompson Grocery	136	121			<.1		<.5	8		7.1	
28D1	Fire Dept.	130	70	42	1.1							L, open bottom in gravel
*33N1	Winterhalter	100	110	35	.15							L, open bottom in bedrock
*33N2	"	100	120	29	.06							L, perf. 43'-48' in gravel
35E1	Wishkah Ranch	40	95	15	.15							L, perf. 31'-30', bedrock @ 31'
19/11- 6Q1	Williamson	90	78	20	.8	.15		<.5	8		7.7	L, open bottom in gravel
15M1	Bethel Temple	80	56	28	2.2	<.1		<.5	8		6.9	L, " " " "
15M2	" "	80	52			<.1		<.5	9		7.0	
18C1	Ayers Lbr.	85	15	5	18	.19		<.5	7		7.9	L, perf. 95'-124'
19N1	Langley Hill Mob.Homes	79										38 gpm pump capability
*29H1	Barnshake	60	78	45	3.4							L, perf. 50'-55', 61'-67'
29H2	G.H. Co. Shop	60	40			<.1		<.5	7		7.3	L, open bottom in gravel
33D1	Shye	20	213		.5	<.1		<.5	12			L, " " " " H_2S
19/12- 9C1	Iron Springs Resort		169	75	.8	<.1	.01	.2	4			L, open bottom in gravel
9C2	" " "		200	125	35							L, perf. 137'-150'
9C3	" " "		161	134								L, " 134'-143', 156'-159'
24Q1	Timberline Estates	140	280	53	.17	<.1		.5	5		6.7	L, Screen 260'-280'
24Q2	" "	170	500									Old well, backup supply
28A1	State Park	15	100			.13	.18	.5	20		7.6	
28A2	Sunrise Resort	10	164	11	3.3	.18		.5	20		7.7	L, perf.145'-153'

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	Water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
19/12-*28R1	Whipple	12	184	1	2.9							L, perf. 158'-163'
*28H1	Claphan	12	119	12	4.5							L, perf. 105'-111',114'-118'
34D1	Rod	10	220	1	4.1	<.1		<.5	14		8.0	
34N1	Surfcrest	10	138	5	1.5							L, open bottom in gravel
20/10- 8E1	Potter	180	115			<.1	<.01	<.2	5	40		82 gpm installed capacity
8H1	Oxbow Tavern	207				<.1		<.5	8		7.4	
8N1	Humptulips Groc.	143	37			<.1		<.5	10		7.2	40 gpm " "
29G1	Rainbow Cafe	150	180			<.1		<.5	10		7.2	
29Q1	Takhoma Mfg. Co.	150	120	48	3.8							L, perf. 113'-119'
36L1	Polson Logging	200	300	60	100+							100 gpm installed capacity, Rpt. low Fe,Mn
20/11- 12Q1	State Fisheries	125	83	23	.9							L, perf. 68'-73',in gravel
12Q2	" "	125	267									L, aband. dry hole, bedrock @ 250'
12Q3	" "	125	246									L, " " " " " 130'
*23C1	Wells	120	38	12	15							L, perf. 25'-30'
*23K1	Pickett	90	30	12	100							L, perf. 20'-30'
26B1	Moody	90	35	12	20	<.1		<.5	10		6.9	L, open bottom in gravel
*36A1	Burlingame	140	130	65	2							L, " " " "
20/12- 8L1	G.H.W.D.#7	50	175	24	4.5							L, installed 350 gpm cap., rpt. good qual.
*17P1	Moclips Ocean Tracts	110	470									L, aband. dry hole
*17R1	" " "	110	117	45	4.7							L, screen 92'-117'
20G1	U.S. Navy	120	194	100								L, screen 163'-168', rpt. high iron

Table 2, - - Continued

Well No.	Owner	Elev.	Depth	water Level	Specific Capacity	Water Quality Fe	Mn	NO_3	Cl	Hard.	pH	Remarks
20/12-21E1	G.H.W.D.#7	100	260	2	6.2							L, screen 235'-250', rpt. good water qual.
*21E2	" " "	100	194	7	3.1							L, perf. 179'-183', rpt. good water qual.
*21R1	" " "	60	99	27	1.5							L, perf.?
27D1	Aloha Mill	60				<.1		<.5	16		7.3	
32A1	Sandpiper Resort	80	160		1							Rpt. excessive Fe and Mn
23/9- 4Q1	U.S. Park Service	200				1+	.8	<.5	5		6.7	Dug well, not used for drinking
7J1	" " "	220	50	21		<.1		<.5	20		7.4	
9B1	" " "	200	45	12	200							L, open bot. in gravel, rpt. excess Fe,Mn
10K1	Edwards	200	14			<.1		<.5	8		7.6	Dug well, excess Fe rpt.
10N1	Hanson	200	46	12	30+							L, perf.40-46', typical of 12 wells in area
21D1	Quinault Water Assoc.	230	80			<.1	<.01	<.2	5		10	L, no const. data avail.
23/10-22H1	State Hwy. Dept.	400	124	79	54	<.1		<.5	6		7.8	L, perf. in gravel
23E1	D.N.R.	420	101	75	120	<.1		<.5	8		7.3	L, perf. 92'-100' in gravel
25B1	Amanda Mobil Pk.	240				<.1		<.5	6		7.5	
25B2	Texaco Sta.	260				<.11		<.5	15		8.1	
25K1	Amanda Pk. Church	260	185	150	1							L, perf 145'-165'

Key: Well No. lists in order, Township, Range and Section with USGS lettering system designating the 40 acre subdivision within the Section, followed by the well No. in this subdivision. Elevations taken from USGS quadrangles to the nearest 10 feet. Water level is depth of water from the surface. An asterix prefacing the Section refers to wells located only to the nearest 40 acre subdivision as per the driller's description on the Department of Ecology drill record sheet. Specific capacity is gallons per minute per foot of drawdown. Abbreviations: aband., abandoned; anal., analysis; cap., capacity; comm., community; const., construction; dom., domestic; gpm, gallons per minute; mgd, millions of gallons per day; irrig., irrigation; L, driller's log available; perf., perforated; rpt., reported; qual., quality

COMM. DIST 1

COMM. DIST 2

COMM. DIST 3

COMM. DIST 4

COMM. DIST 5

LEGEND

- WELLS LISTED IN TABLE 2
- STUDY AREA PERIMETER
- SUBAREA BOUNDARIES
- AREAS UNDERLAIN BY SHALLOW BEDROCK, GENERALLY UNSUITABLE FOR COMMERCIAL WELLS
- SUBUNITS WITHIN REGIONAL SUBAREAS (DESCRIBED IN TEXT AND TABLES)

HYDROGEOLOGICAL INVESTIGATIONS

GRAYS HARBOR COUNTY

RONGEY/ASSOCIATES

APPENDIX B

WATER

- WAC 173-522

Chapter 173–522 WAC
WATER RESOURCES PROGRAM IN THE CHEHALIS RIVER BASIN, WRIA–22 AND 23

WAC

173–522–010	General provision.
173–522–020	Establishment of base flows.
173–522–030	Future allocation of surface water for beneficial uses.
173–522–040	Priority of future rights during times of water shortage.
173–522–050	Streams closed to further consumptive appropriations.
173–522–060	Effect on prior rights.
173–522–070	Enforcement.
173–522–080	Appeals.
173–522–090	Regulation review.

WAC 173–522–010 General provision. These rules, including any subsequent additions and amendments, apply to waters within and contributing to the Chehalis River basin, WRIA–22 and 23 (see WAC 173–500–040). Chapter 173–500 WAC, the general rules of the department of ecology for the implementation of the comprehensive water resources program, applies to this chapter 173–522 WAC. [Order 75–31, § 173–522–010, filed 3/10/76.]

WAC 173–522–020 Establishment of base flows. (1) Base flows are established for stream management units with monitoring to take place at certain control stations as follows:

STREAM MANAGEMENT UNIT INFORMATION

Control Station No. Stream Management Unit Name	Control Station by River Mile and Section, Township and Range	Affected Stream Reach Including Tributaries
12.0200.00 Chehalis River Conf. w/Elk Creek	101.8 14–13–5W	From confluence with Elk Creek to headwaters except Elk Cr.
12.0205.00 Elk Creek	2.5 18–13–5W	From confluence with Chehalis River to headwaters.
12.0216.30 So. Fork Chehalis R.	0.3 24–13–4W	From mouth to headwaters.
12.0235.00 Chehalis River	77.6 2–13–3W	From confluence with Newaukum River to confluence with Elk Cr., excluding Elk Creek, and Newaukum Rivers.
12.0240.00 S. Fork Newaukum R.	22.8 28–13–1E	From confluence with Lost Creek to headwaters, excluding Lost Creek.
12.0245.00 N. Fork Newaukum River	6.6 35–14–1W	From mouth to headwaters.
12.0250.00 Newaukum River	4.1 9–13–2W	From mouth to confluence with Lost Cr. on S. Fork Newaukum River, excluding N. Fork Newaukum River.
12.0253.00 Salzer Creek	3.8 22–14–2W	From mouth to headwaters.
12.0264.00 Skookumchuck River	6.4 12–15–2W	From mouth to headwaters.
12.0275.00 Chehalis River at Grand Mound	59.9 22–15–3W	From confluence with Newaukum River to confluence with Prairie Creek.
12.0292.00 Black River	4.1 33–16–4W	From mouth to headwaters.
12.0305.00 Cedar Creek	1.1 14–16–5W	From mouth to headwaters.
12.0309.00 Porter Creek	1.3 22–17–5W	From mouth to headwaters.
12.0310.00 Chehalis River at Porter	33.3 28–17–5W	From confluence with Prairie Creek near Grand Mound to confluence with Porter Creek including Prairie Creek.
12.0325.00 Cloquallum Creek	1.9 36–18–6W	From mouth to headwaters.
12.0342.00 East Fk. Satsop R.	15.9 15–19–6W	From confluence with Dry Run Cr. to headwaters excluding Dry Run Cr.
12.0343.00 Decker Creek	0.3 31–19–6W	From mouth to headwaters.
12.0345.00 Middle Fk. Satsop R.	0.4 36–19–7W	From mouth to headwaters.
12.0350.00 Satsop River	2.3 36–18–7W	From mouth to confl. with Dry Run Cr. on East Fk. Satsop R.
12.0350.02 Chehalis R. below confl. w/Satsop R.	20.0 7–17–6W	From confluence with Porter Ck. to just below confl. with Satsop River.
12.0374.00 Wynoochee River	5.9 27–18–8W	From mouth to headwaters.

Control Station No. Stream Management Unit Name	Control Station by River Mile and Section, Township and Range	Affected Stream Reach Including Tributaries
12.0380.00 Wishkah River	16.2 22-19-9W	From influence of mean annual high tide at low base flow levels to headwaters. Excluding E. Fk. Wishkah River.
12.0382.90 E. Fk., Wishkah R.	0.9 36-19-9W	From mouth to headwaters.
12.0385.00 W. Fk. Hoquiam River	9.4 14-18-10W	From mouth to headwaters.
12.0385.80 Middle Fk. Hoquiam R.	1.6 4-18-10W	From mouth to headwaters.
12.0386.60 East Fork Hoquiam	7.1 8-18-9W	From mouth to headwaters.
12.0390.00 Humptulips River	24.8 17-20-10W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0174.00 Elk River	3.0 3-16-11W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0175.00 Johns River	6.0 21-16-10W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0180.00 Newskah Creek	3.5 32-17-9W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0185.00 Charley Creek	2.0 21-17-9W	From influence of mean annual high tide at low base flow levels to headwaters.

(2) Base flows established for the stream management units in WAC 173-522-020(1) are as follows:

BASE FLOWS IN THE CHEHALIS RIVER BASIN
(In Cubic Feet per Second)

Month	Day	12.0200.00 Chehalis R. nr. Elk Cr.	12.0205.00 Elk Cr.	12.0216.30 So. Fk. Chehalis R.	12.0235.00 Chehalis R.
Jan.	1	260	100	200	700
	15	260	100	200	700
Feb.	1	260	100	200	700
	15	260	100	200	700
Mar.	1	260	100	200	700
	15	260	100	200	700
Apr.	1	260	100	200	700
	15	260	100	200	700
May	1	195	76	145	525
	15	146	57	105	400
June	1	108	43	75	300
	15	82	32	55	230
July	1	62	25	40	175
	15	46	19	29	130
Aug.	1	37	16	21	98
	15	31	14	15	75
Sep.	1	31	14	15	75
	15	31	14	15	75
Oct.	1	39	15	21	92
	15	49	17	28	115
Nov.	1	88	31	56	215
	15	150	56	105	390
Dec.	1	260	100	200	700
	15	260	100	200	700

Month	Day	12.0240.00 Newaukum R. S. Fork	12.0245.00 Newaukum R. N. Fork	12.0250.00 Newaukum R.	12.0253.00 Salzer Cr.
Jan.	1	125	62	250	11
	15	125	62	250	11
Feb.	1	125	62	250	11
	15	125	62	250	11
Mar.	1	125	62	250	11
	15	125	62	250	11
Apr.	1	125	62	250	11
	15	125	62	250	11
May	1	110	47	210	5.8
	15	88	36	160	2.8
June	1	70	27	118	1.4
	15	56	21	90	.73
July	1	45	16	68	.38
	15	36	12	52	.20
Aug.	1	29	9	38	.10
	15	27	7	35	.05
Sep.	1	27	7	35	.05
	15	27	7	35	.05
Oct.	1	33	8.4	43	.14
	15	40	10	54	.40
Nov.	1	58	19	91	1.35
	15	85	34	150	3.9
Dec.	1	125	62	250	11
	15	125	62	250	11

Month	Day	12.0264.00 Skookumchuck River	12.0275.00 Chehalis R. at Grand M.	12.0292.00 Black R.	12.0305.00 Cedar Cr.
Jan.	1	160	1300	200	90
	15	160	1300	200	90
Feb.	1	160	1300	200	90
	15	160	1300	200	90
Mar.	1	160	1300	200	90
	15	160	1300	200	90
Apr.	1	160	1300	200	90
	15	160	1300	200	90
May	1	160	1000	170	70
	15	130	780	145	54
June	1	103	600	120	40
	15	83	460	104	31
July	1	67	355	88	24
	15	54	275	75	19
Aug.	1	43	210	70	14
	15	35	165	66	11
Sep.	1	35	165	66	11
	15	35	165	66	11
Oct.	1	35	200	68	13.8
	15	35	250	70	17
Nov.	1	59	440	100	30
	15	96	760	140	52
Dec.	1	160	1300	200	90
	15	160	1300	200	90

Month	Day	12.0309.00 Porter Cr.	12.0310.00 Chehalis R. at Porter	12.0325.00 Cloquallum Creek	12.0342.00 Satsop R. E. Fork
Jan.	1	90	2500	150	280
	15	90	2500	150	280
Feb.	1	90	2500	150	280
	15	90	2500	150	280
Mar.	1	90	2500	150	280
	15	90	2500	150	280
Apr.	1	90	2500	150	280
	15	90	2500	150	280
May	1	56	1900	118	240
	15	35	1420	92	210
June	1	29	1060	70	175
	15	24	800	55	152
July	1	21	610	43	130
	15	17	460	34	112
Aug.	1	14.2	340	29	104
	15	12	260	24	95
Sep.	1	12	260	24	86
	15	12	260	24	80
Oct.	1	13.3	320	27	80
	15	15	400	30	80
Nov.	1	28	760	52	125
	15	50	1380	88	185
Dec.	1	90	2500	150	280
	15	90	2500	150	280

Month	Day	12.0343.00 Decker Cr.	12.0345.00 Satsop R. M. Fork	12.0350.00 Satsop R. nr.	12.0350.02 Chehalis R. Satsop
Jan.	1	130	260	1100	3800
	15	130	260	1100	3800
Feb.	1	130	260	1100	3800
	15	130	260	1100	3800
Mar.	1	130	260	1100	3800
	15	130	260	1100	3800
Apr.	1	130	260	1100	3800
	15	130	260	1100	3800
May	1	115	203	910	2910
	15	103	160	750	2300
June	1	91	125	600	1750
	15	81	98	500	1360
July	1	72	78	425	1085
	15	64	61	360	860
Aug.	1	56	48	300	680
	15	50	38	260	550
Sep.	1	50	38	260	550
	15	50	38	260	550
Oct.	1	54	41	280	640
	15	58	45	300	750
Nov.	1	77	83	475	1305
	15	100	145	720	2220
Dec.	1	130	260	1100	3800
	15	130	260	1100	3800

Month	Day	12-0374.00 Wynoochee River	12-0380.00 Wishkah R.	12-0382.90 Wishkah R. E. Fk.	12-0385.00 Hoquiam R. W. Fk.
Jan.	1	560	135	33	32
	15	560	135	33	32
Feb.	1	560	135	33	32
	15	560	135	33	32
Mar.	1	560	135	33	32
	15	560	135	33	32
Apr.	1	560	135	33	32
	15	560	135	33	32
May	1	560	135	33	32
	15	560	113	27	26
June	1	450	95	21	20
	15	360	80	17	16

Month	Day	12-0374.00 Wynoochee River	12-0380.00 Wishkah R.	12-0382.90 Wishkah R. E. Fk.	12-0385.00 Hoquiam R. W. Fk.
July	1	290	68	14	12.8
	15	230	57	11.3	10
Aug.	1	185	47	9	8
	15	150	47	9	8
Sep.	1	150	47	9	8
	15	150	47	9	8
Oct.	1	150	53	10.4	9.4
	15	230	60	12	11
Nov.	1	360	91	20	19
	15	560	135	33	32
Dec.	1	560	135	33	32
	15	560	135	33	32

Month	Day	12-0385.80 Hoquiam R. M. Fk.	12-0386.60 Hoquiam R. E. Fk.	12-0390.00 Humptulips River	12-0174.00 Elk River
Jan.	1	27	44	600	50
	15	27	44	600	50
Feb.	1	27	44	600	50
	15	27	44	600	50
Mar.	1	27	44	600	50
	15	27	44	600	50
Apr.	1	27	44	600	50
	15	27	44	600	50
May	1	27	44	600	43
	15	21	38	500	37
June	1	16	33	400	31
	15	12.2	29	325	26
July	1	9.5	25	265	22
	15	7.4	22	215	19
Aug.	1	5.6	19	170	16
	15	5.6	19	170	16
Sep.	1	5.6	19	170	16
	15	5.6	19	170	16
Oct.	1	6.7	19	205	20
	15	8.0	25	250	25
Nov.	1	15	34	390	32
	15	27	44	600	40
Dec.	1	27	44	600	50
	15	27	44	600	50

Month	Day	12-0175.00 Johns River	12-0180.00 Newskah Creek	12-0185.00 Charley Creek
Jan.	1	70	17	14
	15	70	17	14
Feb.	1	70	17	14
	15	70	17	14
Mar.	1	70	17	14
	15	70	17	14
Apr.	1	70	17	14
	15	50	17	14
May	1	50	13.4	11
	15	42	10.7	8.6
June	1	35	8.3	6.7
	15	29	6.5	5.4
July	1	24	5.2	4.2
	15	21	4.1	3.3
Aug.	1	17	3.2	2.5
	15	17	2.5	2
Sep.	1	17	2.5	2
	15	17	2.5	2
Oct.	1	17	3.2	2.6
	15	24	4	3.5
Nov.	1	35	8.4	7.1
	15	49	17	14
Dec.	1	70	17	14
	15	70	17	14

(3) Base flow hydrographs, Appendix 1, pages 19-23 in the document entitled "water resources management program in the Chehalis River basin" dated November, 1975 shall be used for definition of base flows on those days not specifically identified in WAC 173-522-020(2).

(4) All rights hereafter established shall be expressly subject to the base flows established in WAC 173-522-020 (1) through (3).

(5) At such time as the departments of fisheries and/or wildlife provide specific information substantiating the need for flows higher than the flows set forth in WAC 173-522-020(2), the department of ecology agrees to proceed with setting minimum flows as provided under chapter 90.22 RCW within one year from the time of said request, unless agreement to another time frame is reached between parties. [Statutory Authority: Chapters 43.21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-020, filed 6/9/88; Order 75-31, § 173-522-020, filed 3/10/76.]

WAC 173-522-030 Future allocation of surface water for beneficial uses. The department has determined that there are public waters available, subject to base flow, for allocation to beneficial uses from all streams within the Chehalis basin; except for those streams and times declared closed in WAC 173-522-050. The department shall maintain a current tabulation of the amount of water that is available for appropriation at each stream management unit specified under WAC 173-522-020(1). [Order 75-31, § 173-522-030, filed 3/10/76.]

WAC 173-522-040 Priority of future rights during times of water shortage. (1) Rights established in the future pertaining to waters available for allocation in WAC 173-522-030 shall be subject to a priority of use. Rights for domestic use, including irrigation of lawn and noncommercial garden not to exceed one-half acre, and livestock use excluding feedlot operation, shall be superior to all other consumptive and nonconsumptive uses.

(2) As between rights established in the future within a priority of use, the date of priority shall control with an earlier-dated right being superior to those rights with later dates.

(3) Additional water use priorities may be promulgated, when required, in the future. [Order 75-31, § 173-522-040, filed 3/10/76.]

WAC 173-522-050 Streams closed to further consumptive appropriations. The department, having determined there are no waters available for further appropriation through the establishment of rights to use water consumptively, closes the following streams to further consumptive appropriation. An exception is made for domestic and normal stockwatering where there is no alternative source of water supply.

Surface Water Closures

STREAM	DATE OF CLOSURE	PERIOD OF CLOSURE
Beaver Creek, tributary to S. Fk., Newaukum River	12-5-52	1 May 31 Oct.
Beaver Creek, tributary to Black River	10-28-52	" "
Bunker Creek	1-17-50	" "
Dempsey Creek	11-15-74	" "
Dillenbaugh Creek	8-21-72	" "
Hanaford Creek	5-7-52	" "
Hope Creek & Garrard Creek	8-28-73	" "
Kearney Creek	10-27-52	" "
Lincoln Creek	11-5-48	" "
Middle Fork, Newaukum R.	4-7-50	" "
Mill Creek	3-21-52	" "
Mox Chehalis	4-25-57	" "
Salmon Creek	12-18-56	" "
Rock Creek	4-11-73	" "
Scatter Creek	7-20-50	" "
Stearns Creek	4-28-53	" "
Wildcat Creek	10-28-52	" "
Williams Creek	5-6-52	" "
Wynoochee River	3-9-62	" "
Black River	Date of Adoption	1 July 30 Sept.
Skookumchuck River	" "	" "
S. Fk. Chehalis River	" "	" "
Salzer Creek	" "	1 June-30 Sept.

Note: Affected reach is from mouth to headwaters and includes all tributaries in the contributing drainage area unless specifically excluded.

[Order 75-31, § 173-522-050, filed 3/10/76.]

WAC 173-522-060 Effect on prior rights. Nothing in this chapter shall be construed to lessen, enlarge, or modify the existing rights acquired by appropriation or otherwise. [Order 75-31, § 173-522-060, filed 3/10/76.]

WAC 173-522-070 Enforcement. In enforcement of this chapter, the department of ecology may impose such sanctions as are appropriate under authorities vested in it, including but not limited to the issuance of regulatory orders under RCW 43.27A.190 and civil penalties under RCW 90.03.600. [Statutory Authority: Chapters 43-.21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-070, filed 6/9/88.]

WAC 173-522-080 Appeals. All final written decisions of the department of ecology pertaining to permits, regulatory orders, and related decisions made pursuant to this chapter shall be subject to review by the pollution control hearings board in accordance with chapter 43-.21B RCW. [Statutory Authority: Chapters 43.21B, 43-.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-080, filed 6/9/88.]

WAC 173-522-090 Regulation review. The department of ecology shall initiate a review of the rules established in this chapter whenever new information, changing conditions, or statutory modifications make it necessary to consider revisions. [Statutory Authority: Chapters 43.21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-090, filed 6/9/88.]

APPENDIX C

WASTEWATER

- Memo Well and Ditch Survey
- Memo On-Site Concerns
- WAC 248-96-070(4) On-Site Management Information
- Wastewater Treatment Plant Operating Date & Plant Schematic

COUNTY COURTHOUSE
Broadway & Main
Montesano, WA 98563

MAILING ADDRESS:
P.O. Box 391
Montesano, WA 98563
Phone: (206) 249-4413

GRAYS HARBOR COUNTY

DEPARTMENT OF HUMAN SERVICES

ENVIRONMENTAL HEALTH DIVISION

MEMO

TO: Kevin Varness

FROM: Ella Seely

RE: Well and ditch surveys conducted in Grays Harbor County, summer 1990

Enclosed please find the results of the sanitary surveys conducted during the summer of 1990. Included in this survey:

1. Central Park - ditches and wells
   - the ditches were tested for Fecal Coliform
   - the wells were tested for Total Coliform

2. Grayland - ditches and wells
   - the ditches were tested for Fecal Coliforms and Nitrate
   - the wells were tested for Total Coliforms

3. Ocean Shores - ditches
   - the ditches were tested for Fecal Coliforms, Nitrate and Phosphate.

4. East County - wells
   - the wells were tested for Total Coliforms and Nitrate.

East County well survey

LAB #	NAME & ADDRESS	DATE COLLECTED	MPN-COLIFORM TUBES +	NITRATE NO3/l	DEPTH
	TOWNSHIP 16N - RANGE 4 W				
7001045	Elizabeth Mitchell 55 Campion Rd., Oakville	6-20-90	0/5	5.7	29
7001215	Rebecca Hunter 402 Hwy. 12 E., Oakville	7-11-90	0/5	4.0	33
7001248	Rick Pritchard 404 Hwy. 12 E. Oakville	7-18-90	0/5	4.4	33
7001102	Ellen Palmer 415 Hwy. 12 E., Oakville	6-26-90	0/5	2.2	34
	TOWNSHIP 16N - RANGE 5 W				
7001093	Linda Waltenberg 635 S. Bank Rd., Oakville	6-26-90	0/5	2.6	15
7001316	Nancy Graham 136 Norton Rd., Oakville	7-3-90	0/5		22
7001225	Craig Tessier 331 Elma-Gate Rd.E, Oakville	7-16-90	0/5	6.6	25
7001228	Ken Reitz 876 S. Bank Rd., Oakville	7-16-90	0/5	4.4	15
7001092	Marie Schramm 1099 S. Bank Rd., Oakville	6-26-90	1/5	2.2	15
7001220	Bill Brockman 93 Lanberg Rd., Oakville	7-16-90	1/5	5.7	16
7001114	Naomi McDougall 9 Craftsdale Rd., Oakville	6-27-90	0/5	1.8	15
	TOWNSHIP 17N- RANGE 5W				

			MPN		NO3/l	Section
7001221	Lloyd Rexford 664 S. Bank Rd., Elma	7-16-90	0/5			
7001319	Vessey Cook 30 Oak Meadows Rd. Oakville	7-25-90	0/5		3.1	33
7001229	Charolette Peek 1010 St.Hwy 12 S Oakville	7-16-90	0/5		6.6	28
7001217	Morris Boyer 68 Butler Mill Rd. Porter	7-11-90	0/5		2.6	27
7001103	Rich Whitesel 31 Butler Mill Rd. Porter	6-26-90	0/5			27
7001134	Robert Mowe P.O. Box 936, Malone	7-2-90	2/5			16
7001133	Ruth Watson 242 Mox-Chehalis Rd. Malone	7-2-90	5/5/			16
7001130	Karen Starks 500 S. Bank Rd. Elma	7-2-90	5/5			16
7001214	Kenny Koch 426 Mox-Chehalis Rd. Malone	7-11-90	5/5	2.2		4
7001042	Vern Downey 130 Mox-Chehalis Rd. Elma	6-20-90	4/5	3.5		16
7001224	Donald Fillmore 131 Mox-Chehalis Rd. Elma	7-16-90	0/5	4.4		16
7001046	Walter Gordon 136 Mox-Chehalis Rd. Elma	6-20-90	0/5	4.3		16
7001048	Linda Bednarik 144 Mox-Chehalis Rd. Elma	6-20-90	0/5	3.5		9

TOWNSHIP 17N - RANGE 6W

			MPN	NO_3/l	Section
7001110	Joyce Keller 181 Delezene Rd. Elma	6-26-90	0/5	2.6	24
7001091	Glenn Ford Elma-Malone Rd. Elma	6-27-90	0/5	2.6	1
7001044	Melvin Henderson 198 Lambert Rd. Elma	6-20-90	1/5	4.4	9
7001132	Nan Ostrom 109 S. Bank Rd. Elma	7-2-90	0/5		11

TOWNSHIP 17N - RANGE 7W

7001047	Norman Willis 77 Willis Rd. Brady	6-20-90	0/5	3.5	12
7001079	Jody Sauer 4 Monte-Brady Rd. Brady	6-25-90	0/5	1.8	4
7001216	Donna Hagen 354 Monte-Brady Rd. Brady	7-11-90	0/5	2.2	2
7001139	Everett Glenn 673 Monte-Elma Rd., Brady	7-2-90	0/5		24
7001073	Robin Skillin 96 Monte-Brady Rd. Brady	6-25-90	0/5	2.2	3
7001072	Richard Narrance 413 Monte-Elma Rd., Montesano	6-25-90	0/5	.88	2
7001278	David Karr 391 Monte-Elma Rd. Montesano	7-18-90	0/5	6.6	2
7001254	John Brighton 77 Glenn Rd. Montesano	7-17-90	4/5	3.5	3

TOWNSHIP 18N - RANGE 4W

			MPN	NO3/L	Section
7001111	William Wood 298-11 E. Mox-Chehalis Rd. McCleary	6-27-90	0/5	3.1	8
		TOWNSHIP 18N - RANGE 5W			
7001245	Jay McDonald 92 N. Sand Creek Rd. McCleary	7-18-90	5/5	4.0	14
7001155	Jane Palmer Sand Creek Rd. S. McCleary	7-9-90	0/5		27
7001318	Dan Ryan 178 Elma-McCleary Rd. Elma	7-25-90	0/5	1.8	30
7001113	Karen Smith 21 Heise Rd. Elma	6-27-90	0/5	2.6	29
7001252	John Brown 135-47 Bush Creek Rd., Elma	7-17-90	0/5	1.3	7
7001064	John Niels, Sr. 15 Heise Rd., Elma	6-25-90	5/5	2.2	29
7001078	Lois Butcher 95 Heise Rd., Elma	6-25-90	0/5	3.5	29
7001253 7001257	Andrew Himes 76 Hicklin Rd., Elma	7-17-90	0/5	1.8	19
7001251	Elda Brophy 144-22 Elma- McCleary Rd., Elma	7-17-90	0/5	4.0	30
		TOWNSHIP 18N - RANGE 6W			
7001084	Ron Roberts Box 7, Satsop	6-27-90	0/5	2.6	8
7001043	Bernard Loertscher 18 Newman Creek Rd. Elma	6-20-90	0/5	4.4	32
7001156	Patty Husko 83 Newman Creek Rd.	7-9-90	0/5		29

			MPN	NO3/l	Section
	Elma				
7001250	Ron Anderson 112-1 Moore Rd. Satsop	7-17-90	0/5	4.0	30
7001054	Pat Cullers 172 Moore Rd. Elma	6-25-90	5/5	2.2	30
7001157	Judy Cota 69-8 Hot Dog Lane Elma	7-9-90	0/5		25
		TOWNSHIP 18N - RANGE 7W			
7001076	Nancy Green 498 Elma-Monte Rd Satsop	6-25-90	1.8		36

CENTRAL PARK WELL SURVEY

LAB NUMBER	NAME	ADDRESS	DATE COLLECTED	MPN-COLIFORM
7000990	*Peter Czerniski	5616 Olympic Hwy.	6/13/90	1/5 tubes positive
7000995	*Linda Brasche	1012 Haek, Apt. A	6/12/90	0/5 tubes positive
7000993	Ron McDougall	6018 Central Park Dr.	6/13/90	0/5 tubes positive
7000991	Wilhow Timmila	318 Maple Lane	6/13/90	2/5 tubes positive
7000989	James B. Ellis	7022 Sunset Road	6/13/90	0/5 tubes positive
7001000	Jim Winthrop	710 Fairway Park Rd.	6/13/90	0/5 tubes positive
7000988	Mike Hubbard	6915 Olympic Hwy.	6/13/90	0/5 tubes positive
7000997	Carol Durham	1102 Haek Dr.	6/13/90	0/5 tubes positive
7000994	Glen cooper	301 Pioneer Road	6/13/90	0/5 tubes positive

*Renter

GRAYLAND DITCH RESULTS

LAB #	LOCATION	DATE	MPN	NITRATE
7009129	1st Ave.	6/11/90	23/100ml	0
7009130	Chehalis St. (Near Aberdeen St.)	6/11/90	2800/100ml	-
7009131	Grange	6/11/90	70/100ml	0
7009132	Blake (Near Turkey)	6/11/90	23/100ml	-
7009133	Holland Lane	6/11/90	50/100ml	-
7009136	County Line Road	6/11/90	8/100ml	low-.005/mg/l
7009137	Blake (Between Grange and Turkey)	6/11/90	2/100ml	low-.017mg/l high- 2mg/l
7009138	Melbourne St.	6/11/90	80/100ml	0
7009139	Olympia St.	6/11/90	500/100ml	0

GRAYLAND WELL RESULTS

	LAB. NO	NAME/ADDRESS	DATE COLLECTED	MPN
1.	781329	Ernest Rowley 1007 Chester Ave.	7-30-90	0/5
2.	7001338	Robert Arnold 1019 Chester Ave	7-30-90	0/5
3.	7001340	Ernest Kline 110 Chester Ave	7-30-90	0/5
4.	7001350	Lemoine Erhart 1105 Chester Ave	7-30-90	0/5
5.	7001339	Ernest Rowley 1007 Ocean Dr.	7-30-90	5/5
6.	7001326	Lennard Slazyk 1277 Holand	7-30-90	5/5
7.	7001336	Brent Bryan 999 Seamore Lane	7-30-90	1/5
8.	7001341	Gordon Jones 617 Lough Rd.	7-30-90	0/5
9.	7001337	Edith Hodgins 747 Hwy. 105 S.	7-30-90	0/5
10.	7001365	Joy Spooner Lenard MacKenzie 1152 Chester Ave.	8-6-90	0/5

CENTRAL PARK DITCH SAMPLE RESULTS

Lab Number	Location	Date Collected	Fecal Coliform MPN
7009118	Bonnieview Lane	5-30-90	50/100ml
7000892	Central Park Dr. (in front of C.C.)	5-29-90	9.2/100ml
7009116	Central Park Dr. (near Lk. Ab.)	5-30-90	80/100ml
7009123	Central Park Dr. (near Lk. Ab.)	6-4-90	30/100ml
7009108	Central Park Dr. (near Fairway Pk.)	5-29-90	130/100ml
7009112	Hill Rd. & Karjala	5-29-90	500/100ml
7009111	Joann Lane	5-29-90	>1600/100ml
7009122 Recount	Joann Lane	6-4-90	40/100ml
7009121	Karjala Rd. (next to trlr.ct)	6-4-90	110/100ml
7009117	North Bank Rd.	5-30-90	500/100ml
7009109	School Rd. & Philmark Dr.	5-29-90	50/100ml
7009110	Solki Rd (near Olympic Hwy)	5-29-90	>1600/100ml
7009120	Solki Rd. (near Olympic Hwy)	6-4-90	90,000/100ml
7009171	Solki Rd	7-3-90	160,000/100ml
7009115	York Dr.	5-30-90	300/100ml

OCEAN SHORES DITCH SAMPLES

TAKEN JUNE 19, 1990

LAB #	LOCATION	FECAL COLIFORM	NITRATE NO3 (mg/L)	PHOSPHATE PO4 (mg/L)
7009156	Shoal St.	240/100ml	2.20	2.8
7009158	JK Lewis Dr.	redo sample	2.64	2.5
7009154	Discovery Ave	7/100ml	4.84	2.8
7009148	Oyehut Rd.	22/100ml	0	1.4
7009147	Razor Clam St	4/100ml	4.84	3.6
7009149	Chance Ala Mer	4/100ml	3.52	.88
7009150	Overlake Dr.	7/100ml	4.40	1.47
7009146	Bass Ave.	22/100ml	2.20	1.25
7009153	Ocean Lk. Way	8/100ml	2.20	3.2
7009155	Albatross St.	4/100ml	2.64	.22
7009157	Pt.Brown Ave	11/100ml	2.64	3.8
7009152	Duck Lake Dr.	13/100ml	5.28	.75
7009151	Olympus Ave.	17/100ml	4.40	2.44

NOTES: mg/L (NO3) was expressed by multiplying the mg/L nitrate nitrogen (N) by 4.4.
mg/L phosphorus can be expressed by dividing the final scale reading by 3 or as mg/L phosphorus pentoxide (P_2O_5) by multiplying the final reading by 0.75.

COUNTY COURTHOUSE
Broadway & Main
Montesano, WA 98563

MAILING ADDRESS:
P.O. Box 391
Montesano, WA 98563
Phone: (206) 249-4413

GRAYS HARBOR COUNTY

DEPARTMENT OF HUMAN SERVICES

ENVIRONMENTAL HEALTH DIVISION

MEMO-TO KEVIN
FROM DOUG
DATE 4-10-91
RE: SEWAGE SURVEY OF ROUND TREE ADD. TO PACIFIC BEACH

On April 10, 1991 this office conducted a sewage survey of the Round Tree addition at pacific Beach. In addition to the field survey, department records were reviewed for this area.

FINDINGS:

There are 14 dwellings on 4th street. Of these, 3 are vacant. A vacant church is also on the west side of 4th street. Two dwellings have burned in the last few years. Of the 11 occupied dwellings, 5 are in some state of failure. 3 on the west side of 4th street empty into the roadside ditch. 2 on the east side of 4th street empty into cess pools in the back of the dwellings. At least one of the vacant dwellings has dad sewage problems and I would suspect that the other 2 have had them too.

There are 8 dwellings on 3rd. street and one vacant building. Of the 8 dwellings, 6 are experiencing sewage problems including 5 of which have discharges to the roadside ditch. 3 of these dwellings are on the same sewage system.

There are 5 dwellings on 2nd. street. 2 of these are in failure. One of these has had a designed repair permit approved but declined to fix the problem. The sewage currently dumps into a large hole in the back yard.

There are 8 residences on 1 st street. 2 failing systems were observed with sewage running into the roadside ditch. One owner stated that he had illegally added drainfield as his had been running slow.

Overall of the 32 occupied dwellings, 15 were in obvious failure. Of the 17 remaining dwellings, most have cess pools which may or may not be working. Because of the springs in the area their discharge points may be elsewhere.

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GRAYS HARBOR COUNTY

DEPARTMENT OF HUMAN SERVICES

ENVIRONMENTAL HEALTH DIVISION

RE: Round Tree Addition-Pacific Beach/Grays Harbor County

The Round Tree Addition consists of 38 houses, five of these are vacant. One house has been vacated due to sewage problems.

The homes at Round Tree probably average 50 years in age. Two new homes were constructed in 1971. They shared a common drainfield and pump system. The pump system is now in failure. No new or repair permits have been issued since 1980. Three mobiles have been added to existing systems in the last 20 years. Two were added, without approval, to an existing house system and are now failing to the roadside ditch.

The average lot is 50 feet by 100 feet. some dwellings have more than one lot. Since no repair permits are being issued, several people have constructed make-shift disposal systems in alleys and roadside ditches. The soil is classified by the SCS as Halbert Muck. This soil is described as having iron pan ranges from 20 to 40 inches below the surface of muck. Permeability is moderately slow above the iron pan and very slow through it.

Effective rooting depth is limited by a seasonal high water table that ranges from a depth of 6" to above the surface from October to May.

The Round Tree addition has been surveyed 3 times since 1964 (reports enclosed).

Ditch samples were analyzed for fecal contamination in March 1991. The samples showed ranges of fecal contamination from <20 organisms/100 mils to > 16,000 organisms per 100 in a direct discharge.

At the present 5 applications for repair or existing system utilization have been put on hold or denied.

GUIDELINES FOR THE FORMATION AND OPERATION OF ON-SITE MANAGEMENT SYSTEMS

In accordance with the provisions of WAC 248-96-070(4) the following Guidelines set forth the minimum provisions to be incorporated into any On-site Waste Management System established in satisfaction of the requirements of WAC 248-96-070(3). Unless authorized by the Washington State Department of Ecology, these guidelines shall not apply to facilities constructed or operated in accordance with a waste discharge permit issued by that Department.

****

A. Definitions: In addition to those definitions set forth in WAC 248-96-020, and by this reference made a part hereof, the following terms shall have the meaning indicated:

(1) "Developer" - Any person, or the heirs, successors, or assigns of such person, who owns and/or proposes or intends to develop a subdivision or multiple housing unit project designed to exceed the unit or population densities or flows set forth in WAC 248-96-070(1).

(2) "Purchaser" - Any person, or the heirs, successors or assigns of such person, who purchases and/or leases one or more units in a subdivision or multiple housing unit project from developer as herein defined.

(3) "Management" - Any person who forms and operates an on-site waste management system for the purposes of and under the provisions of these guidelines, or the heirs successors or assigns of such person.

B. Management - Eligible Persons: Management systems may be formed by a metropolitan municipal corporation operating a sewage utility; by an incorporated city or town operating a sewage utility; by a county government through the County Area Services Act (Chapter 36.94 RCW) or through any appropriate agency or department of county government; by a sewer district; or by a water or public utility district operating a sewer district. If no municipal agency is able or willing to operate such a management corporation, a special management corporation may be organized to serve as a management system subject to the special provisions of these guidelines.

C. Continuity: Once established, the management system must continue to function until all on-site sewage systems under its management have been abandoned and the dwelling units or other buildings served by such on-site systems have been connected to an approved sewerage system.

D. Existing Statutes, Rules and Regulations, etc. - Conflicts: The waste management system must be set up in conformance with existing statutes and the rules and regulations of any applicable regulatory agencies. Any portions of these guidelines in conflict with statutes limiting the authority of any management will not be applicable; however, management may be required to find a substitute for the non-applicable requirement.

E. Management System Contract: The management system shall operate through a contract between management and developer. The contract must contain, but need not be limited to, a complete description of all rights, duties, obligations, and commitments of management, developer, and purchaser; a description of all maintenance and operations requirements; and, otherwise, all of the elements set forth in these guidelines.

The contract must provide:

(1) Agreement by management to provide maintenance and operation of on-site sewerage systems, provide surveillance of functioning of on-site sewerage systems, keep records, collect fees, disburse funds, and perform all other duties set forth in these guidelines as are assigned to management.

(2) Agreement by developer that, when selling or leasing property, as a condition of sale or lease he will require the contract of sale, property deed or lease to include a clause wherein the purchaser agrees to conform to the provisions of the management system contract.

(3) That developer shall agree to provide each purchaser a full and complete copy of the management system contract prior to purchaser's signing of purchase contract.

(4) That, in the event the developer retains possession of individual lots which contribute sewage to an on-site sewerage system, the developer's obligations will include those of a purchaser with respect to those individual lots.

(5) Means of making amendments, additions, or deletions by mutual agreement of management, developer, and purchaser, and as approved by the local health officer and other applicable regulatory agencies.

(6) The right of management to contract with public or private agencies for labor and other services.

(7) That management shall employ competent personnel, as determined by the local health officer and other applicable regulatory agencies, familiar with the maintenance and operation of the types of on-site sewerage systems under its management.

(8) An identification of the portion of the sewerage system for which management shall exercise responsibility (e.g., "commencing at the first point of connection to a treatment device, or, at a point two feet outside the structure being served").

(9) A complete identification and definition of all rights of purchaser, management, and developer; and compliance with regulations of applicable regulatory agencies.

(10) Establish a method for the transfer of authority to another entity, acceptable to the regulatory agencies in the event that such transfer is necessary.

(11) Provision for allocation of restoration costs as required in Section I, Restoration.

(12) Provision for purchaser's right to perform work, if such work is permitted by management.

(13) The contract shall clearly state that in the event the properties are connected to an alternate sewage disposal system, the costs of such connection, if any, shall be the obligation of the property owner.

F. Financial Solvency: Management shall assure financial solvency of its management responsibilities. Financial arrangements shall include, but not be limited to the following considerations:

(1) An accounting and audit system in accordance with any applicable statutes.

(2) A standard maintenance and operation fee.

(3) Fees for initial installation of on-site sewerage systems.

(4) Establishment of an emergency fund.

(5) Preparation of a rate structure for various services that may be entailed beyond routine operation and maintenance due to variations in on-site sewerage systems being serviced.

(6) Permit billing purchaser for any routine repair work, replacement, emergency work or modifications undertaken on behalf of purchaser's installation to cover costs of materials and labor, and other valid associated costs.

(7) Establishment of a method of rate adjustment to maintain adequate funds. Rates shall be reviewed annually and adjusted accordingly.

(8) Provide for the collection of delinquent payments through property lien or other acceptable method.

(9) Establishment of a method of final disbursement of funds on hand and collectable at such time as the management system is dissolved.

(10) Establishment of a method of transfer of funds at such time as the management responsibilities are transferred.

(11) Assurance that adequate operation and maintenance funds are available from the initiation of sewage system operation.

G. Maintenance and Operation - Management and Purchaser: A maintenance and operation manual, specifically suited to the nature of the on-site sewerage system for which management will be responsible, shall be prepared. A copy of the manual shall be submitted to the local health officer and other applicable regulatory agencies. The manual shall include, but need not be limited to, schedules and/or procedures for the following items.

(1) Periodic inspection of facilities to ascertain efficiency of operation and general condition of equipment.

(2) Record keeping of inspections, monitoring, work done, conditions found, etc. Records shall be available for inspection by the regulatory agencies.

(3) Periodic pumping of septic tanks or other storage tanks by licensed septic tank pumpers.

(4) Periodic maintenance of motors, pumps, etc.

(5) Replacement or repair of worn or damaged equipment.

(6) Responding to emergencies. Emergency procedures shall include provisions for:

(a) Notifying users and applicable regulatory agencies of the emergency.

(b) Determining cause of any major breakdown or of any essentially complete failure of any on-site sewerage system to function as designed. The findings shall be submitted in writing to the applicable regulatory agencies.

(c) Making repairs or replacements or modifications of design as required to restore functioning of system.

(d) Working with purchaser and regulatory agency to prepare and install substitute system, in the event of irreparable failure of system to meet design requirements.

(7) Annual reporting of system maintenance and operation to applicable regulatory agencies.

H. Right to Enter on Purchaser's Property: Management shall have the right to enter upon purchaser's property to perform routine inspections or work and to respond to emergency conditions.

I. Restoration: Whenever work is performed by management on purchaser's property, management shall restore all paving, planting, and other features of purchaser's property to its original condition as nearly as possible. Provision for allocation of restoration costs shall be included in the management contract.

J. Purchaser's Right to Perform Work: Except in the event of an emergency that demands immediate action, upon notification to the management by the puchaser, management may permit purchaser to perform repairs, replacements, and other work other than routine maintenance and operation on those portions of the sewerage system located on purchaser's property. If management permits such work by purchaser, it shall be provided for in the management contract, and shall be performed under the following conditions:

(1) Design, materials, work to be performed, and time for completion shall be as directed by management, and shall comply with local health department and other applicable local regulations.

(2) Cost of labor and materials shall be borne by purchaser.

(3) Completed work shall be inspected and approved in writing by management before being placed in service.

(4) Management may correct any improper construction performed by purchaser or require purchaser to make such corrections, and may complete any work not finished by purchaser within the time limit set by management, and may bill purchaser for all labor and materials.

(5) Management shall enter such work into the maintenance and operation record.

K. Special Management Corporation: In the event no municipal corporation, as identified in Section B., is able or willing to serve in a management capacity and has indicated this decision in writing, a special private corporation may be established to serve this purpose.

(1) Structure and Criteria - In addition to meeting the foregoing criteria and requirements, such a corporation must meet the following conditions:

(a) It must be incorporated.

(b) It must have elected officers.

(c) It must have a constitution and by-laws.

(d) There must be financial solvency on a continuous basis through a method of financing construction, maintenance, operation and emergency work related to the sewerage system to the exclusion or whatever other obligations the corporation may assume in other fields. Rates must be set at a level which will provide ample funds for all sewerage operation and maintenance costs and cover emergencies as they occur.

(e) There must be permanency; i.e., the corporation must be continuously in operation with regard to its sewerage activities so long as there is a need for such management service. There must be built into the organization a provision to eventually transfer its sewerage responsibilities to a municipal corporation, as identified in Section B, should such a transfer become feasible.

(f) There must be a municipal corporation, as identified in Section B., to whom control and operation of the management corporation will pass in trusteeship in the event that no persons are willing to serve as officers of the corporation. In the event that no municipal corporation is able or willing to serve as a trustee,

a private organization, acceptable to the regulatory agencies, may serve in this capacity. The municipal corporation or the private organization shall have the opportunity to review and comment on plans and specifications and perform inspections during construction. They shall also be notified of any future construction or major repairs.

(g) Funds collected for sewerage purposes must be kept in an account to be used for the sole purpose of carrying out the functions of the sewerage management system.

(h) There shall be lien powers to assure the collection of delinquent sewerage debts, and provisions for adjustment of rates from time to time to meet the costs of operation.

(i) In the event the corporation is initially run by a board of trustees, provision should be made for an election of corporate officers at the first annual meeting and transfer of control from the initial trustees to the newly elected board of trustees or corporate officers. Membership of these groups shall be from among the residents of the community served.

(1) Elections may be delayed beyond the first annual meeting until at least some stated number of voters are actually resident in the community.

(2) The intent of this subsection is to assure control of the management system passing to the residents of the community as soon as possible.

(j) There must be assurance of good communication between the corporate leadership and the resident population. There must be adequate notice of meetings, positive service of such notice, and meetings must be held at times and places convenient to the residents and adequate space provided.

(k) A review board shall be established. The responsibilities of the review board shall include mediation and review of appeals regarding disputes arising on any matter relating to the relationship between purchaser and management. Decisions of the review board shall be final and binding on all parties involved.

(2) Implementation - The implementation of the special management corporation shall include, but need not be limited to, the following considerations.

(a) The developer shall assume complete responsibility for financing and managing the operation of the on-site sewage disposal systems during the period of development prior to transfer of the management responsibilities to the special management corporation.

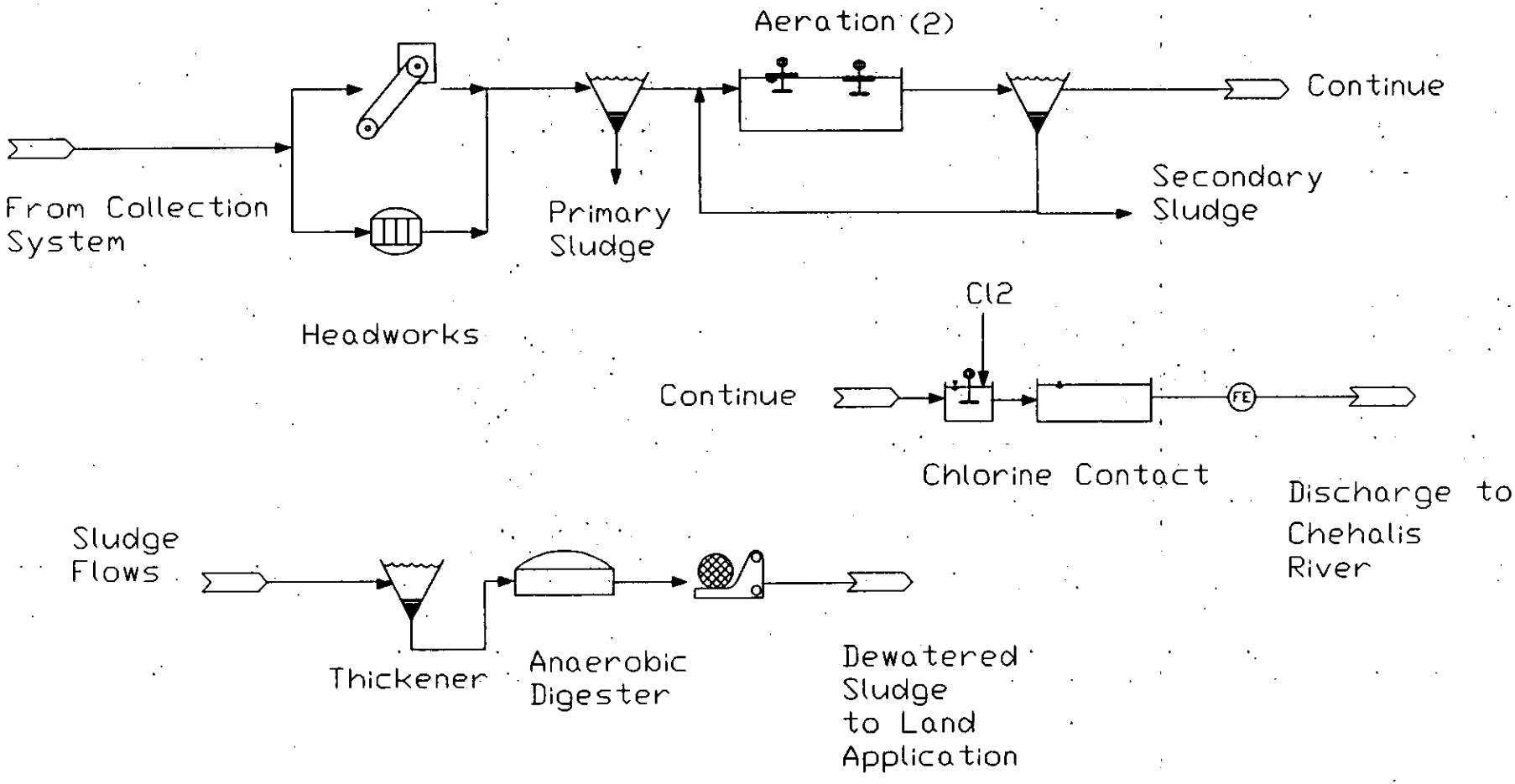
(b) During the period of developer involvement with the on-site sewage disposal systems, there shall be an entity, as defined in subsection 1.f above, to whom control and operation of the systems will pass in trusteeship in the event that the developer becomes unable to meet his responsibilities.

(c) A two year performance bond, of an amount adequate to provide operation and management for that period, and in favor of the

entity identified in (b) above or another entity acceptable to the regulatory agencies, shall be posted by the developer.

(d) A method of transfer of the management functions from the developer to the special management corporation shall be provided. Transfer of the management functions shall be completed within two years, unless otherwise authorized by the approval authority.

L. Approval of Management Systems: All management systems that are proposed for specific developments must be reviewed and approved by the health officer and where necessary, by the Department of Ecology and/or the Department of Social and Health Services. If special services, such as financial review by a Certified Public Accountant, are required in the review of a management system by the health officer, the cost of such services shall be borne by the developer. Approval will take into consideration the size of the development and the extent to which the management system conforms to the requirements of any existing comprehensive land use plan for the jurisdictional area involved.



CAMP DRESSER & McKEE INC.

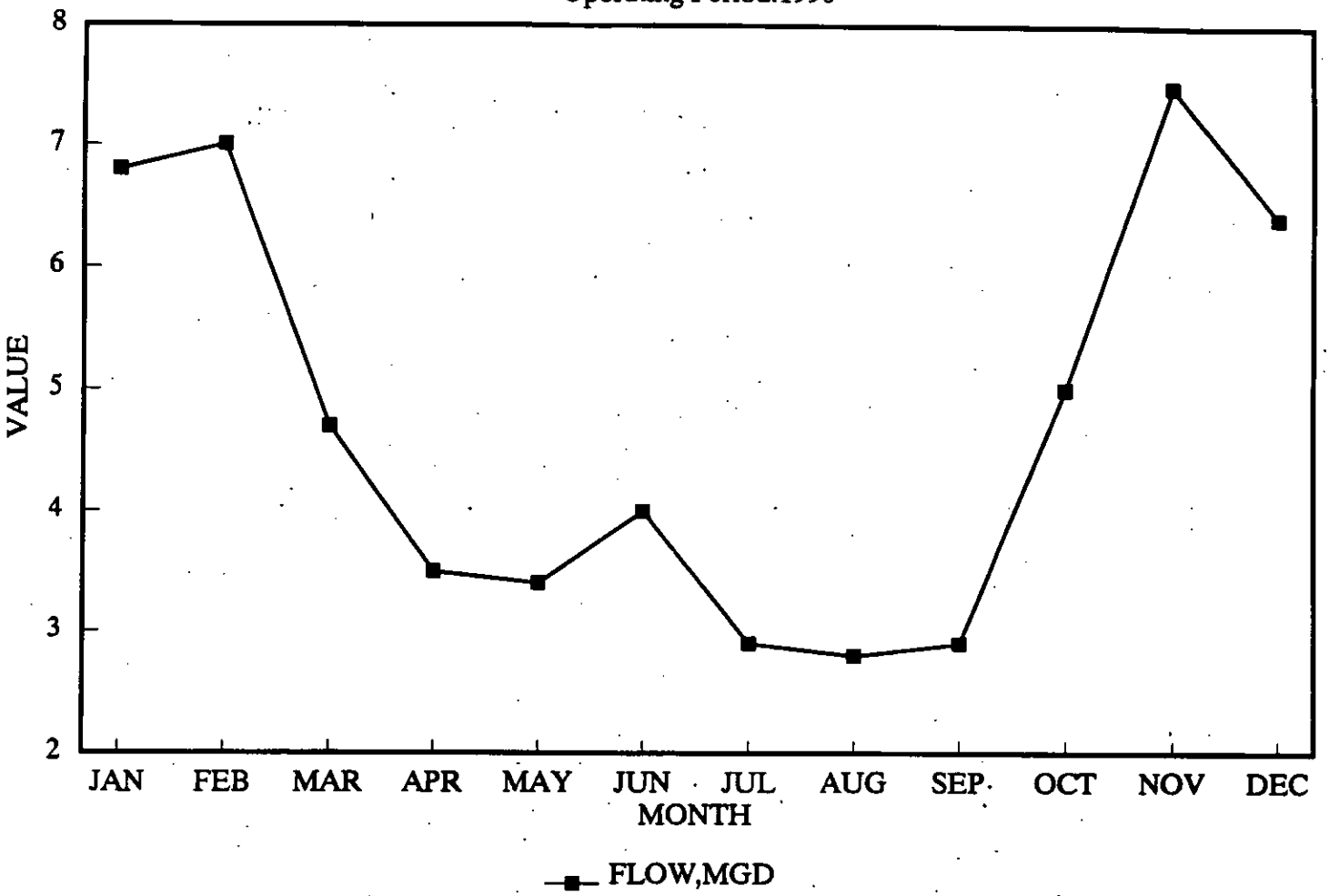
615 Second Avenue, Suite 720
Seattle, Washington 98104
(206) 682-5174

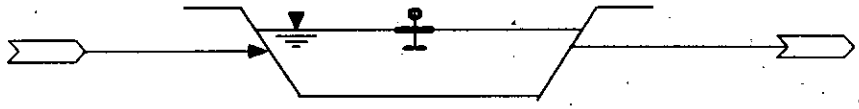
CDM

Aberdeen
Wastewater Treatment Plant
Flow Schematic

City of Aberdeen, WA Operating Data

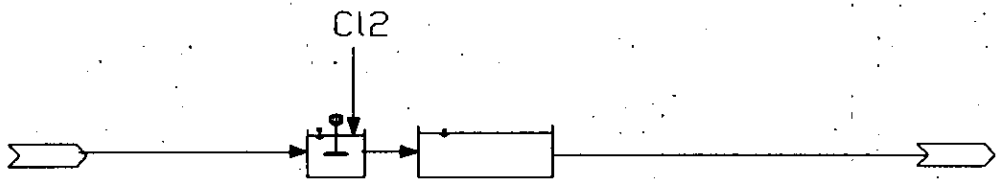
Operating Period:1990





From Collection System

Aerated Lagoons (2)



Chlorine Contact

Discharge to Chehalis River

CAMP DRESSER & McKEE, INC.

615 Second Avenue, Suite 720
Seattle, Washington 98104
(206) 682-5174

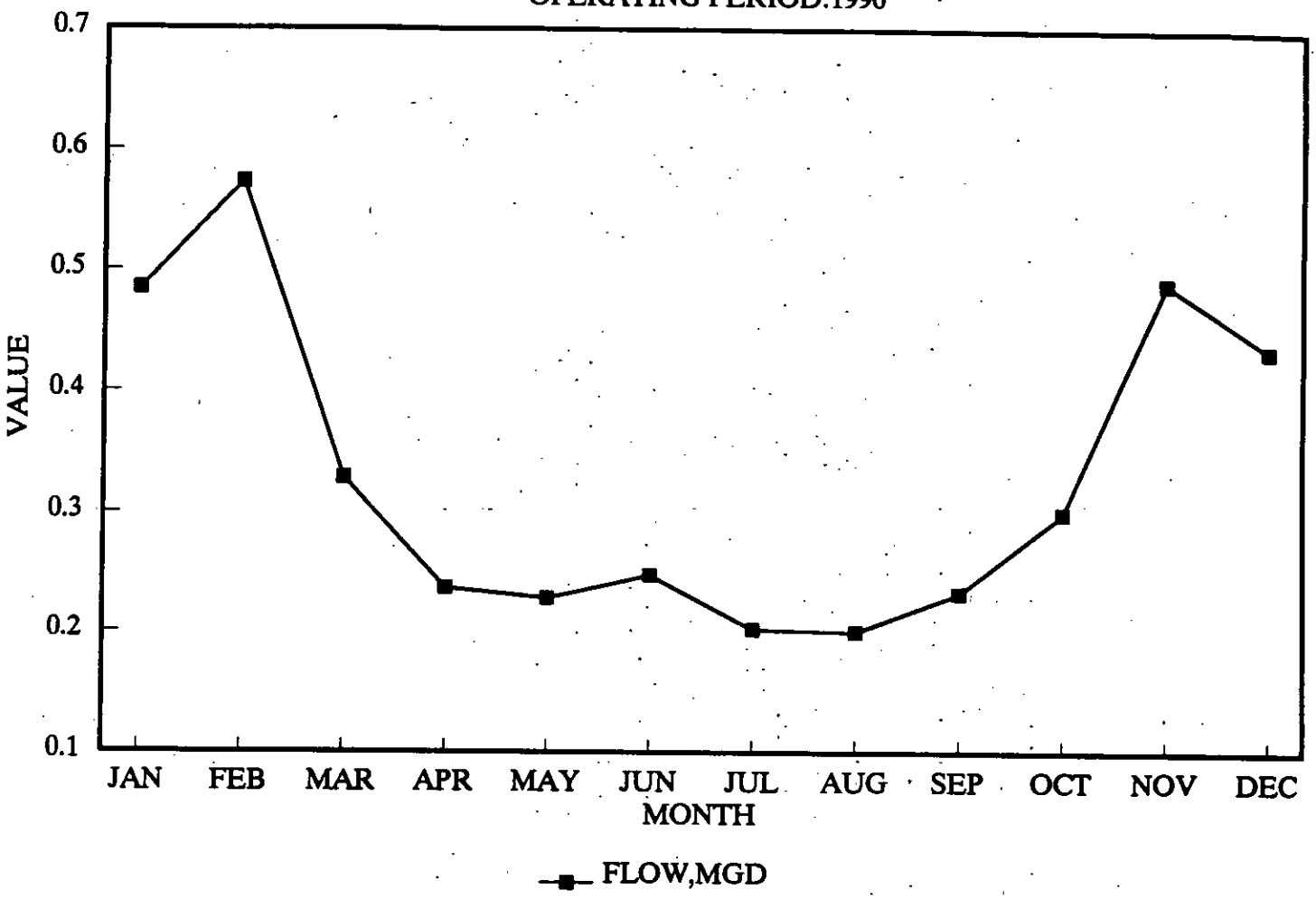
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City of Elma

Wastewater Treatment Plant
Flow Schematic

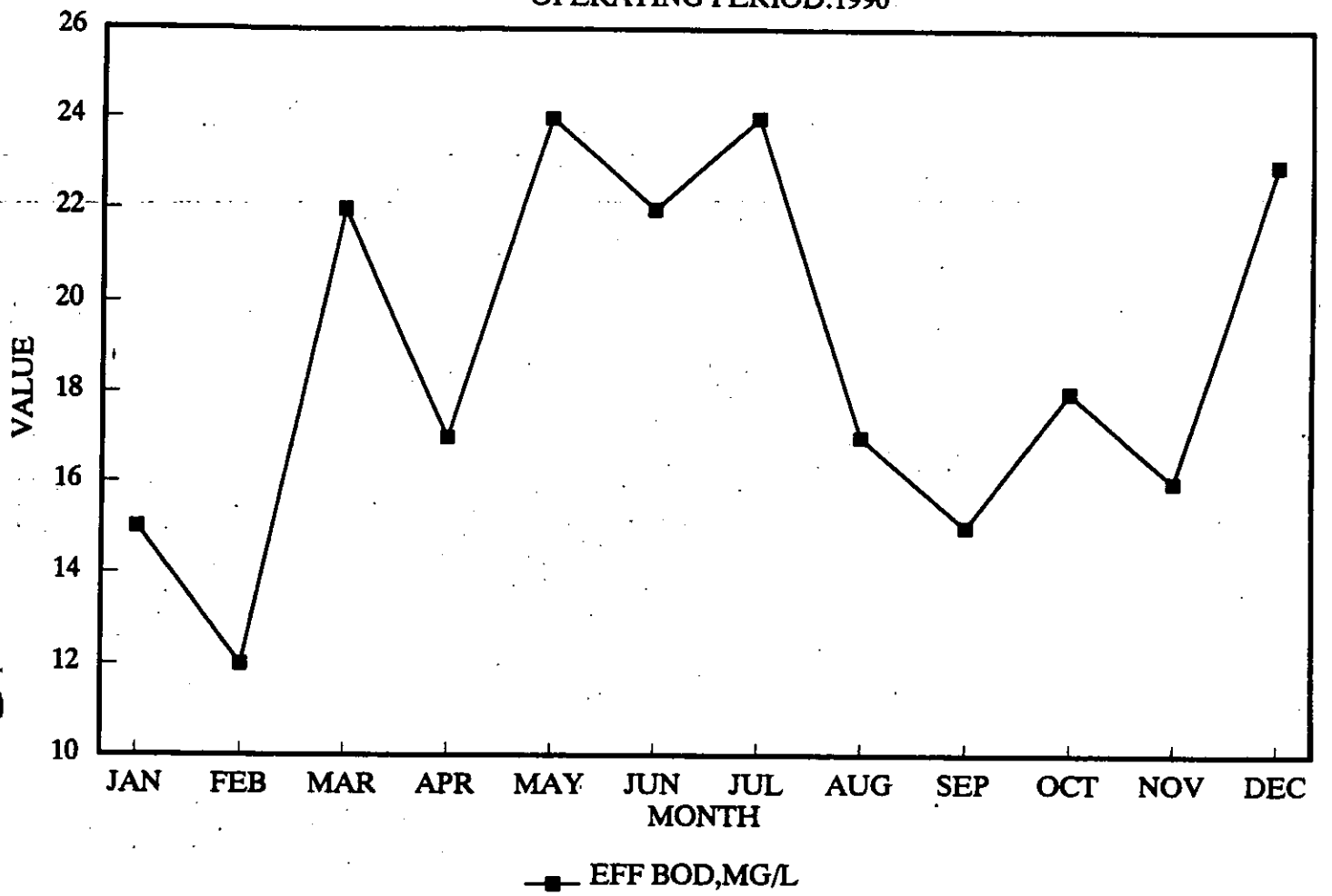
City of Elma, WA OPERATING DATA

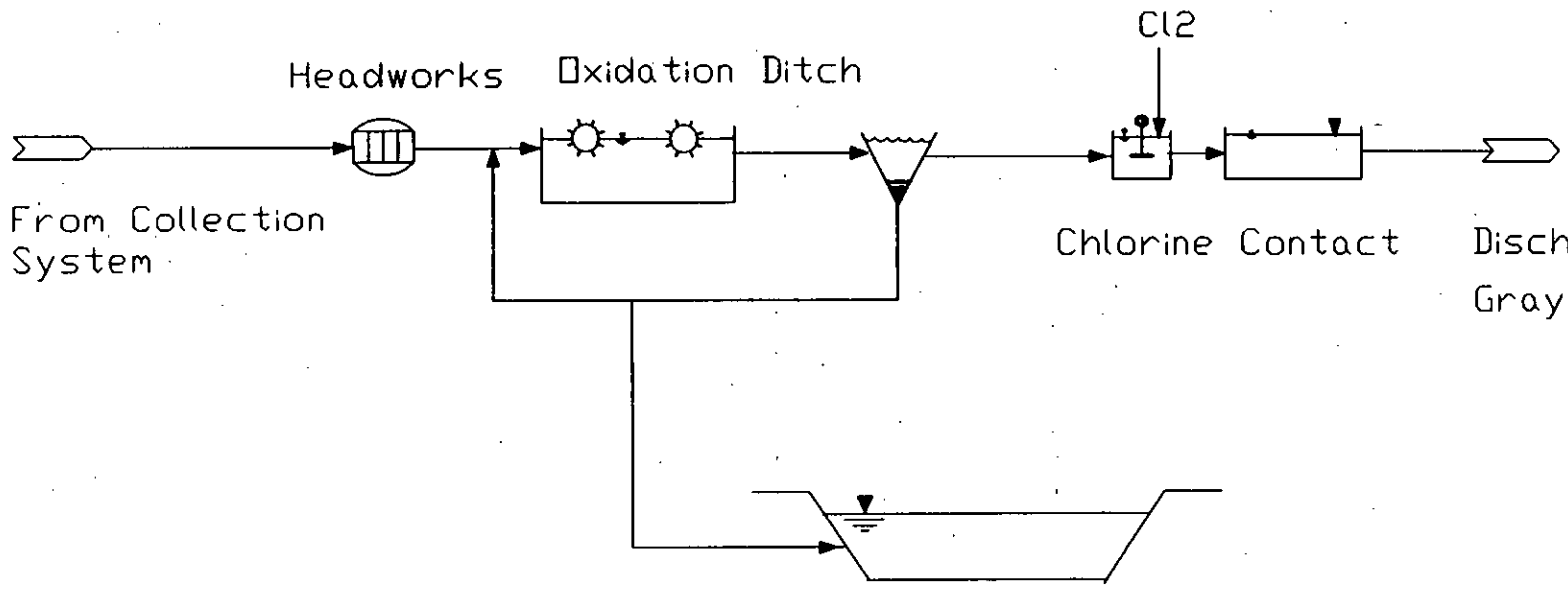
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City of Elma, WA OPERATING DATA

OPERATING PERIOD:1990





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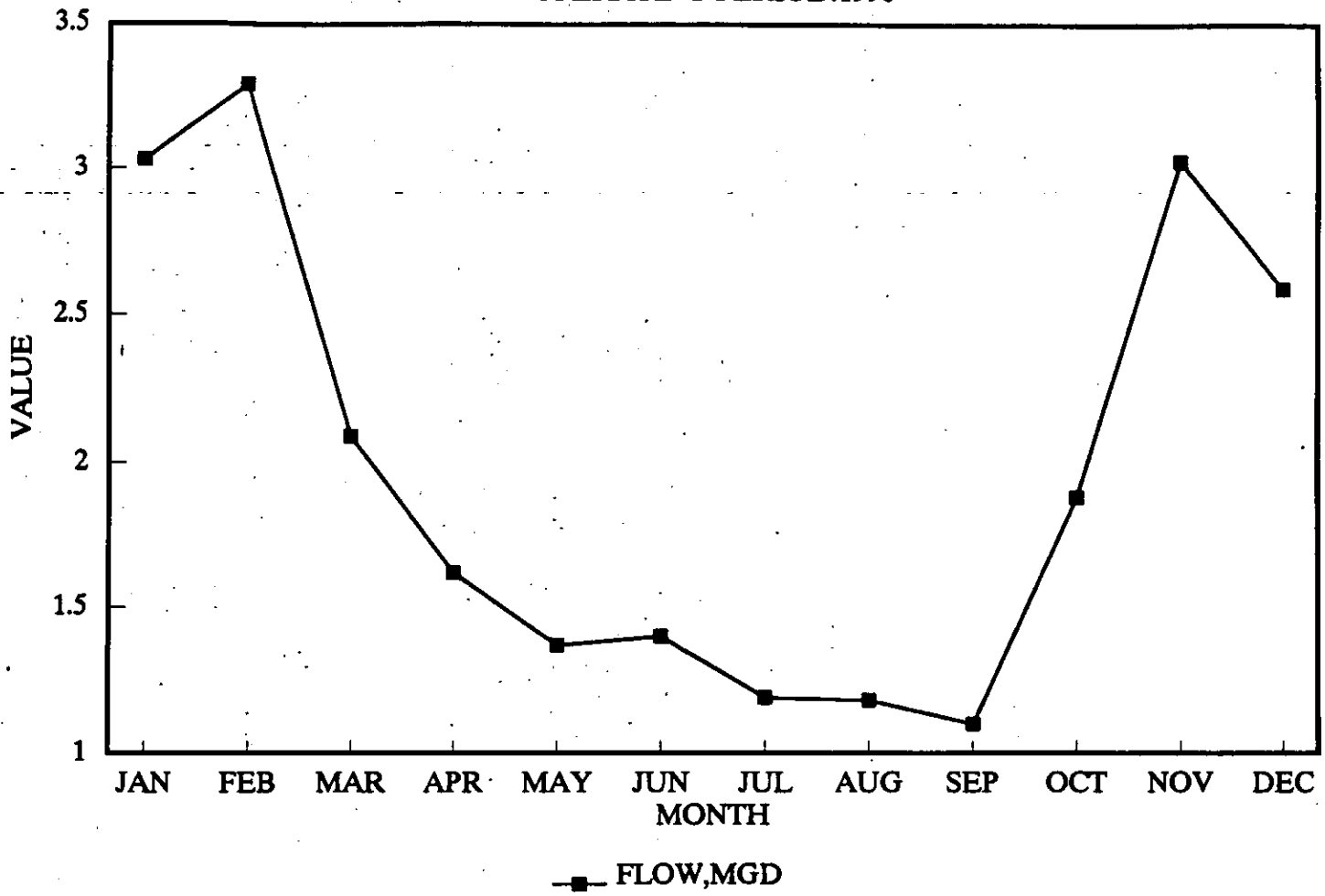
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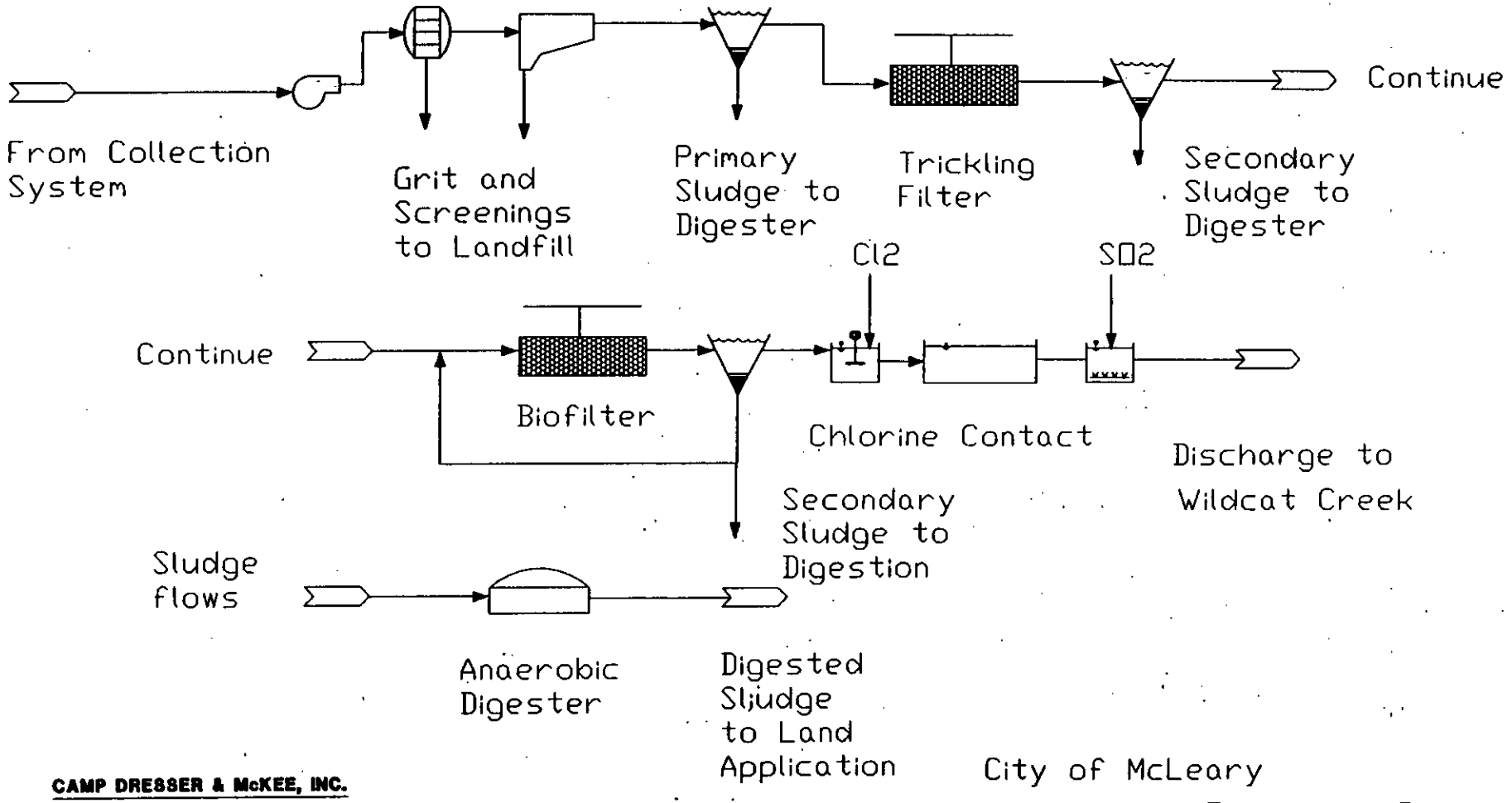
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City of Hoquiam
Wastewater Treatment Plant
Flow Schematic

City of Hoquiam, WA OPERATING DATA

OPERATING PERIOD:1990





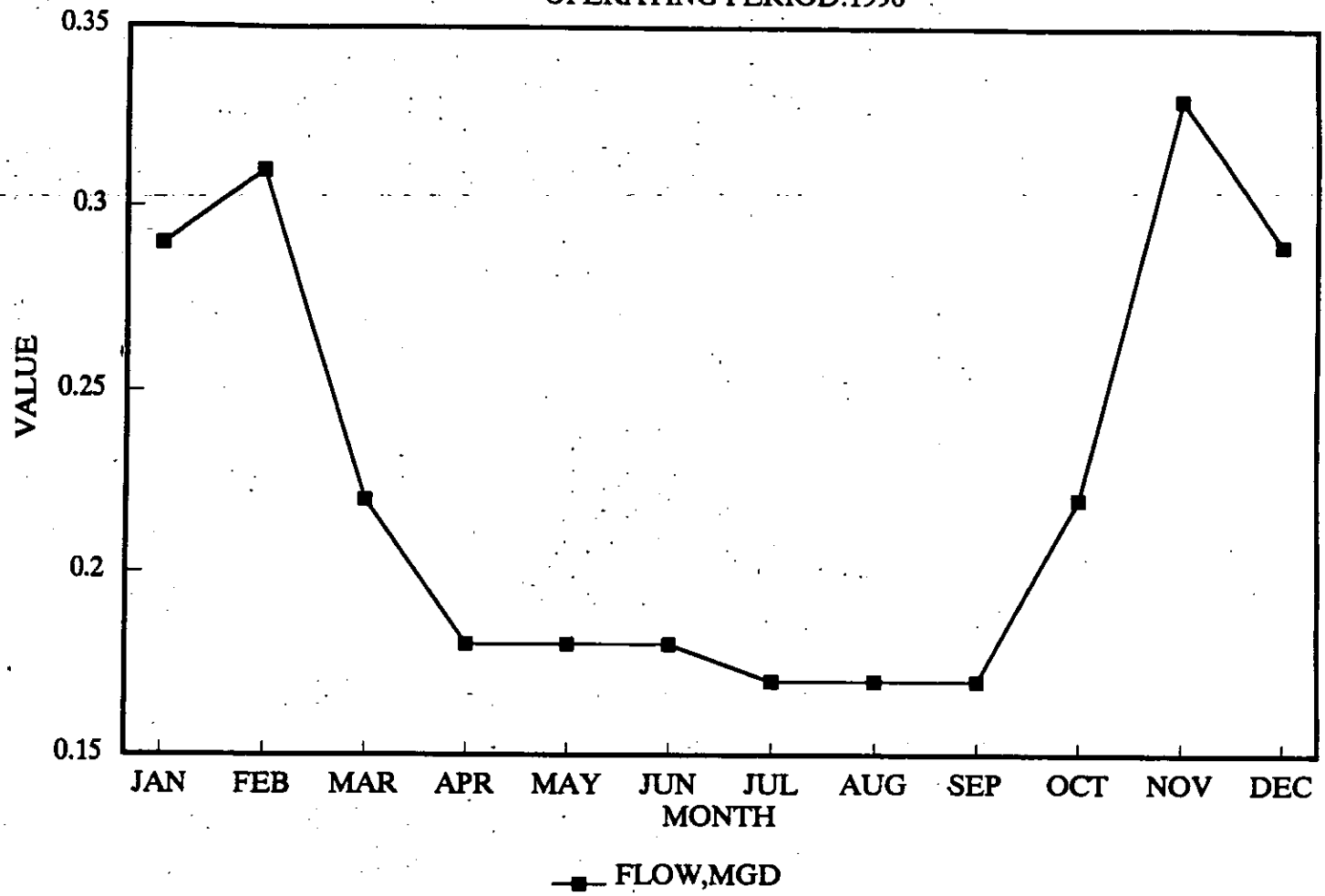
City of McLeary
Wastewater Treatment Plant
Flow Schematic

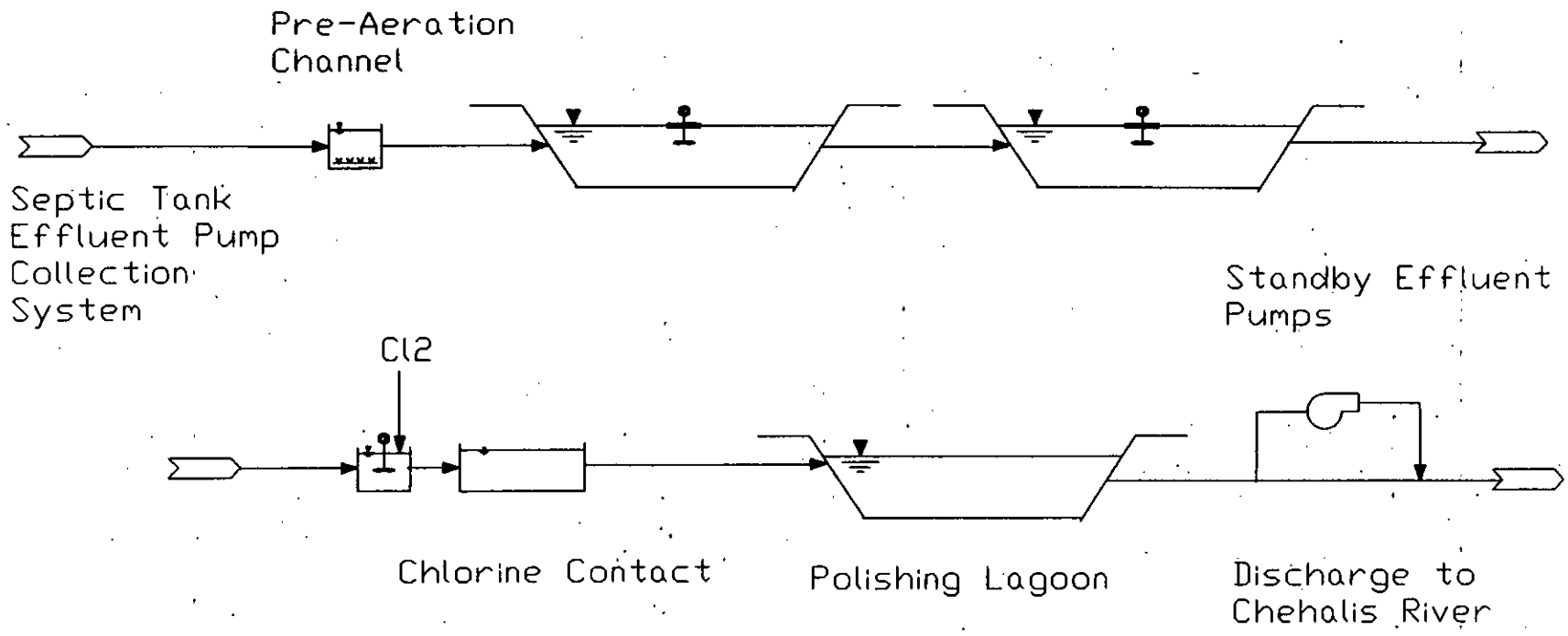
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City of McLeary, WA OPERATING DATA

OPERATING PERIOD:1990



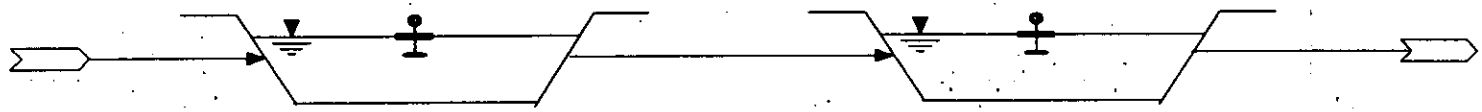


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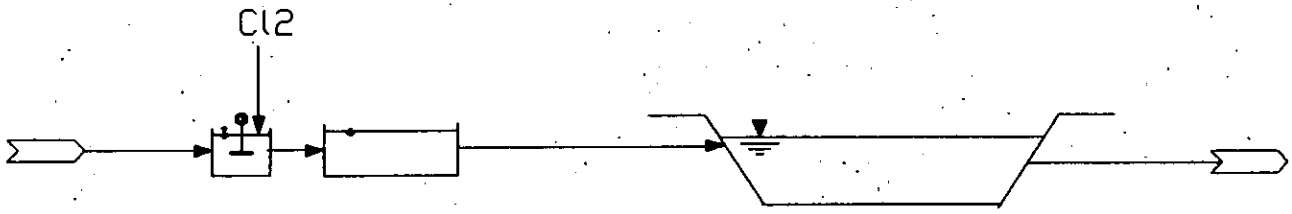
Montesano
Wastewater Treatment Plant
Flow Schematic



From Collection System

Primary Aerated Lagoon

Secondary Aerated Lagoon



Chlorine Contact

Polishing Lagoon

Discharge to Pacific Ocean

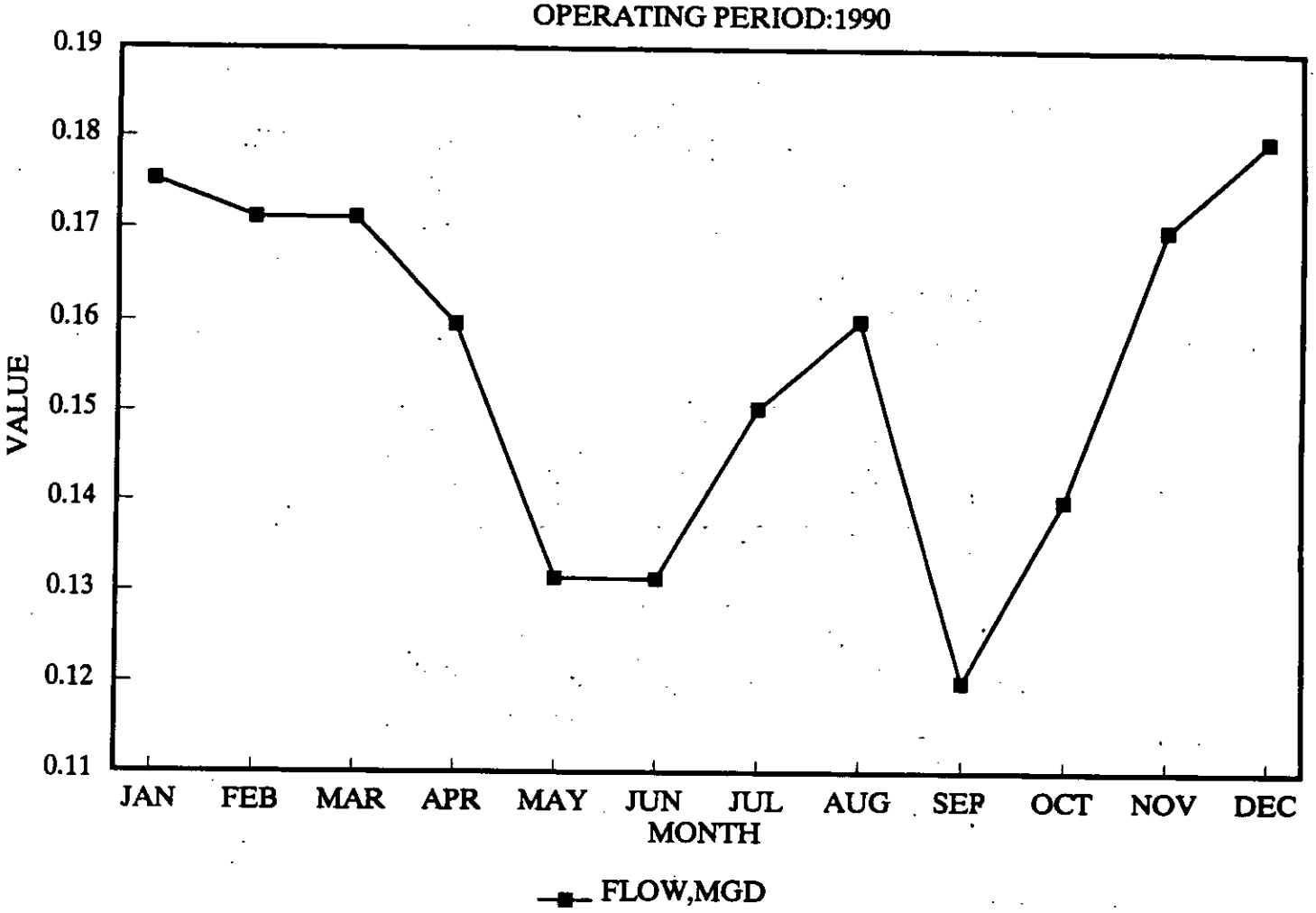
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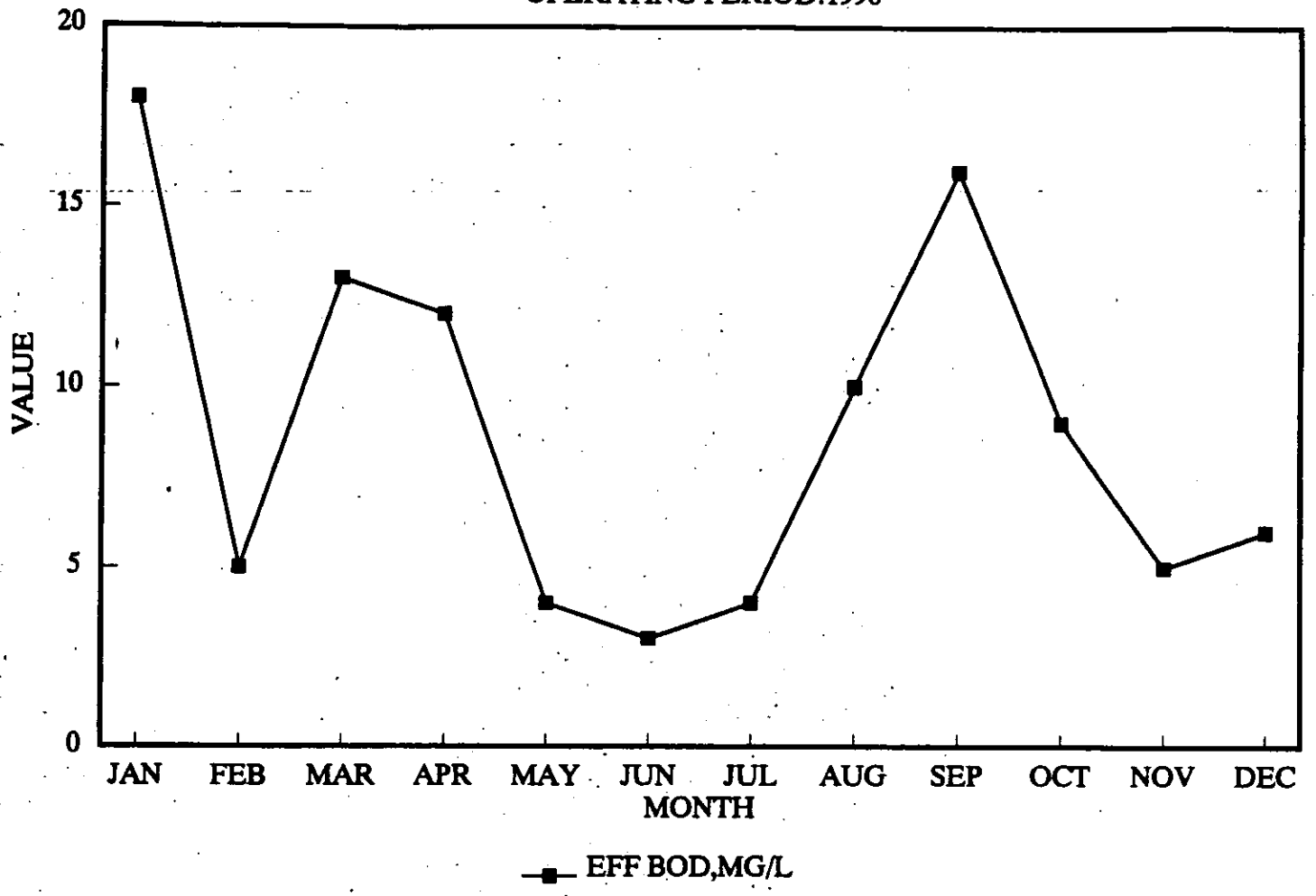
Ocean Shores
Wastewater Treatment Plant
Flow Schematic

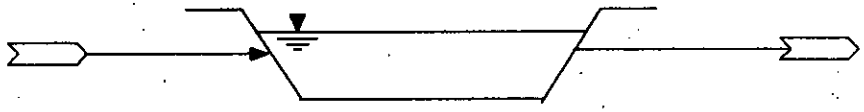
City Ocean Shores, WA OPERATING DATA



Ocean Shores, WA OPERATING DATA

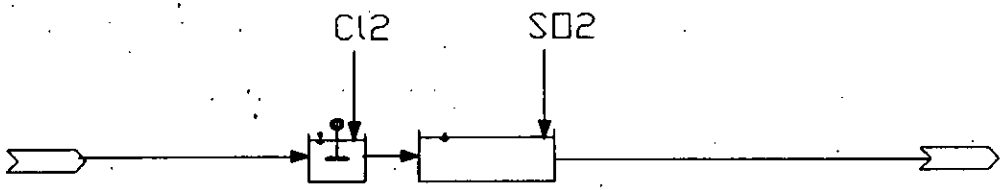
OPERATING PERIOD:1990





From Collection System

Non-aerated Lagoons (2)



Chlorine Contact

Discharge to Joe Creek

CAMP DRESSER & McKEE, INC.

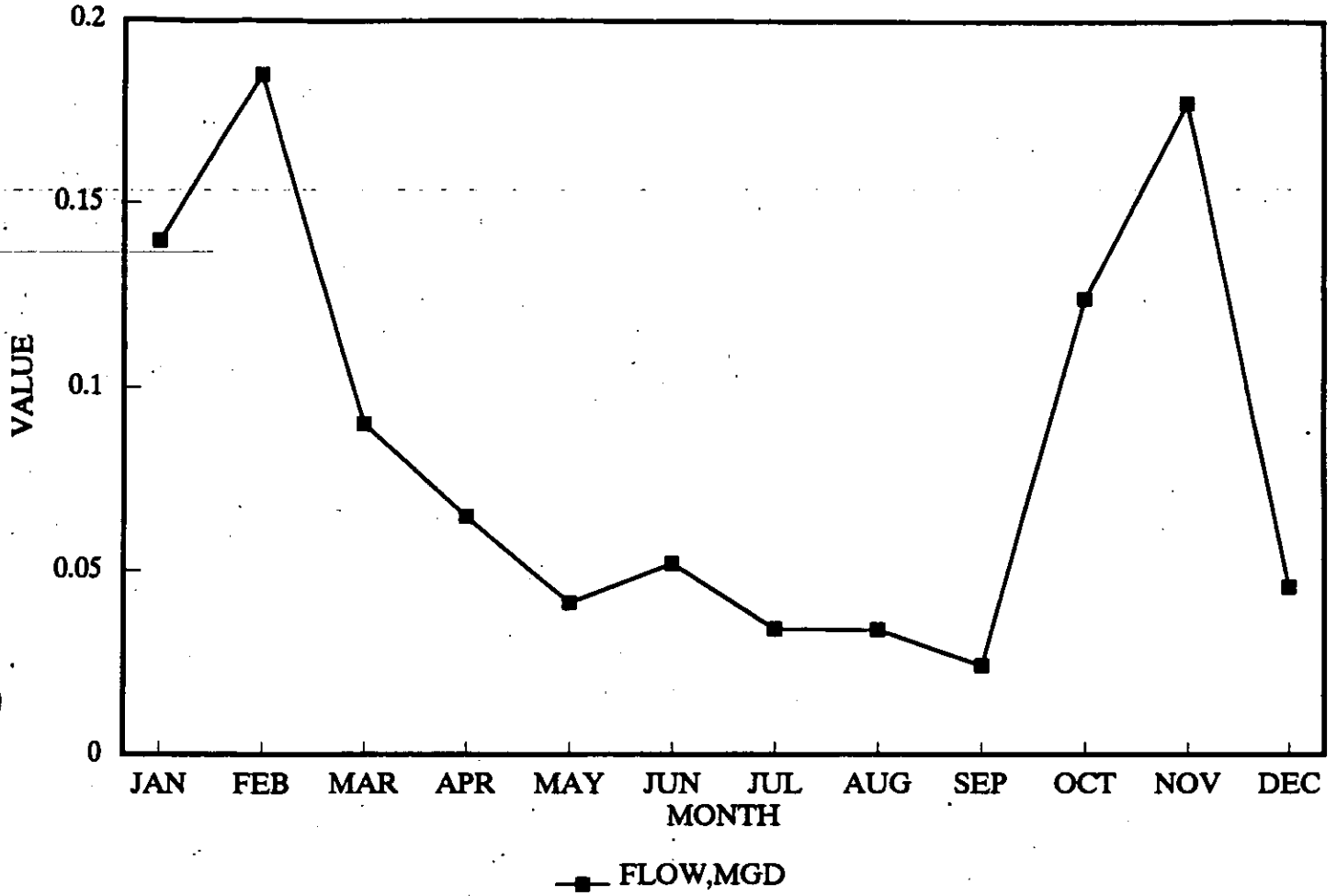
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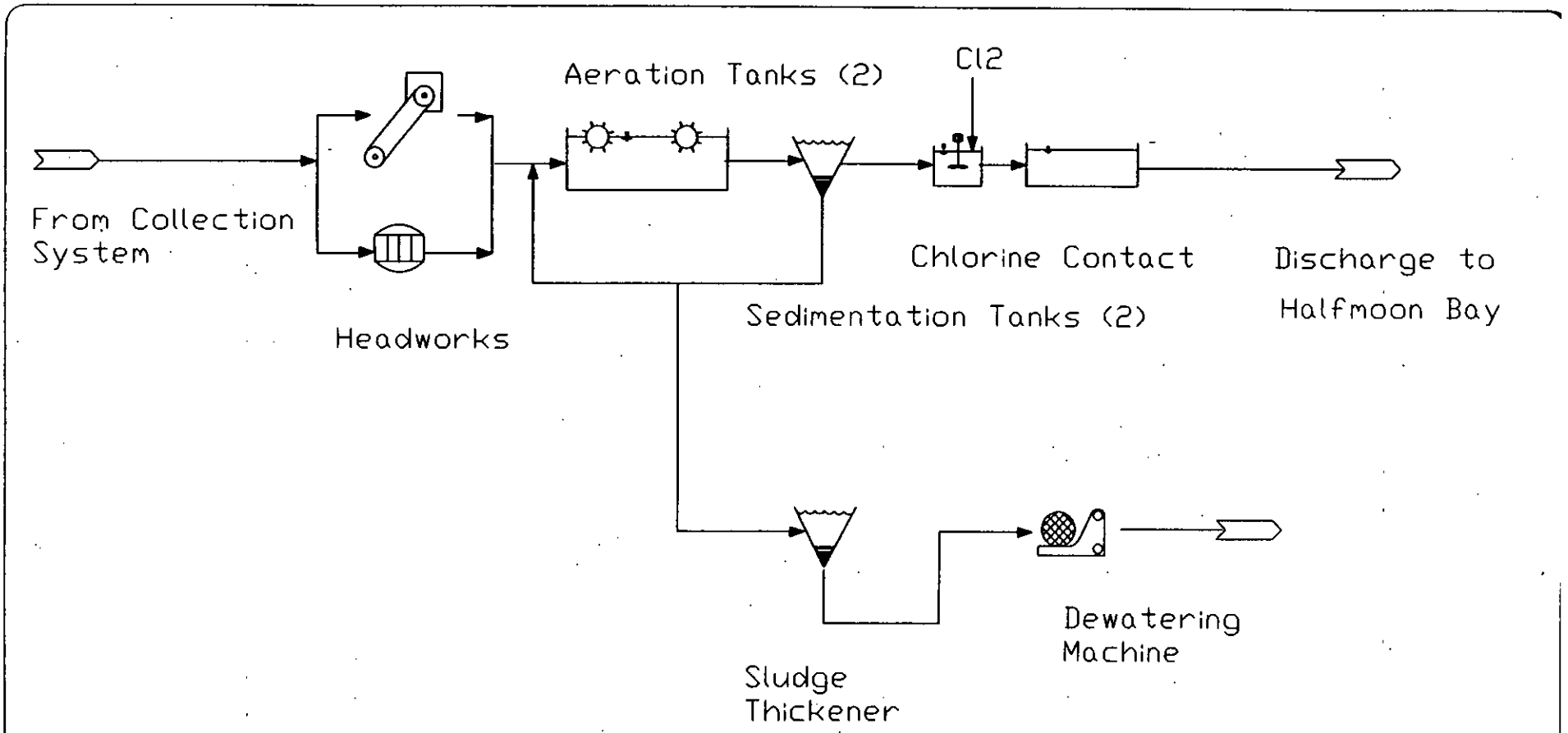
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Pacific Beach
Wastewater Treatment Plant
Flow Schematic

Pacific Beach, WA Operating Data

OPERATING PERIOD:1990





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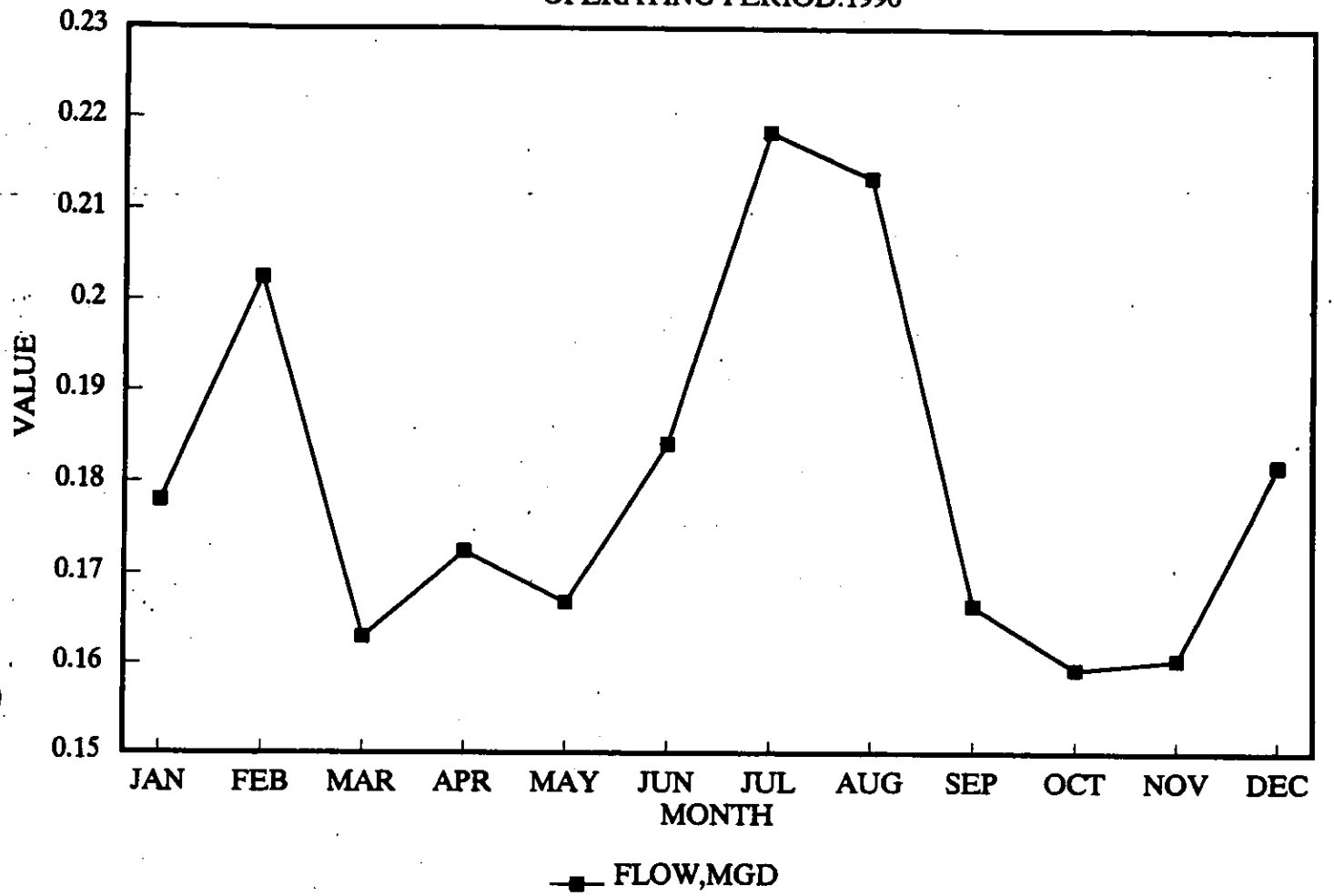
CDM

City of Westport

Wastewater Treatment Plant
Flow Schematic

City of Westport, WA Operating Data

OPERATING PERIOD:1990



APPENDIX D

- Alternative Solutions to Existing Flooding Problems
  - — Vance Creek
  - — Ocean City/Copalis Beach
  - — Grayland Vicinity

ALTERNATIVE SOLUTIONS TO EXISTING FLOODING PROBLEMS

INTRODUCTION

Grays Harbor County has identified three specific areas of persistent flooding: Vance Creek, Ocean City/Copalis Beach, and the Community of Grayland. Each area has unique flooding problems, yet suffers from a common problem—the lack of a comprehensive surface water plan. Presented below is a discussion of each area's flooding problem, existing conditions, possible alternatives to address flooding and a recommended procedure to develop the selected alternative.

1. VANCE CREEK

Location

The Vance Creek drainage basin is located in the eastern part of Grays Harbor County and is adjacent to the City of Elma (Figure 1). The basin is a tributary of the Chehalis River.

Problem

During the November, 1990 storms, Vance Creek overtopped its banks near Calder Road, flowed south through various properties and across Elma Elementary School property (see Figure 2). Flood waters then ran west along the north side of Main Street and flooded a residence before crossing Main Street. Another residence on the south side of Main Street was flooded before the flood waters re-entered the stream bed north of State Route 12. Other properties north of the school had flooded garages, yards and accessory structures. The Elementary School's entrance roads are of particular concern as they were inundated with up to two feet of water during large storms. Access to the school is inhibited, creating a public safety problem. Logging has been taking place within the drainage basin which may be contributing to this increase in storm water runoff.

Existing Conditions

The 2,500-acre Vance Creek basin has five subbasins located in the hills just north of Elma. Four of these subbasins are north of Vance Creek and are parallel to each other. The Fifth subbasin is south of Vance Creek. The five subbasins are primarily hillsides which discharge water into the nearly flat Vance Creek valley (Figure 3) which is between 500 and 1,000 feet wide at the floor and contains two large beaver ponds, a wetland, and the creek channel. Upon leaving the hills, Vance Creek meanders south through west Elma, passes under Highway 12, and eventually flows to the Chehalis River.

Once Vance Creek leaves the hills north of Elma, it passes under Calder Road five times before leaving the City of Elma area. The first culvert through which it passes is a single 8-foot-diameter pipe. The next four crossings consist of three 4-foot-diameter pipes. The creek channel is 5 to 10 feet wide and 3 to 6 feet deep and has been modified by residents over the years.

Flood waters leave Vance Creek about one-quarter mile north of Main Street on the west side of Calder Road near the railroad crossing. The water then flows south and west through the neighborhood and into a large bypass swale on the north side of the Elementary School. The swale continues down the east side of the school property to Main Street where the swale ends. The school site lies in a shallow "bowl," with a low ridge between the school and Vance Creek, causing storm water to fill up the school parking lot and entrance roads. When the water gets high enough on the school site it flows to the west, across Main Street and eventually re-enters Vance Creek north of State Route 12.

A ditch lies opposite the school along the south side of Main Street and slopes toward Vance Creek. The ditch is well maintained and appears to have adequate capacity.

Solution Alternatives

Presented below in the order of increasing cost are a series of six alternatives which will reduce and/or eliminate the flooding problems associated with Vance Creek.

1. Provide a drainage outlet at the Elementary School. Place a culvert under Main Street between the school's east swale and Main Street's south ditch across from the school. The culvert should be sized for at least the 25-year, 24-hour storm. The school entrance ditch should be directed into the swale leading to the culvert. Both the school entrance road culverts and the Main Street south ditch should be analyzed to ensure proper capacity.

2. Enlarge the creek channel at narrow and/or shallow points. Because Vance Creek has been altered due to flooding, and by property owners, it may be undersized along certain reaches. Reconstructing the creek bed would increase capacity, even though additional flooding may continue to alter the stream bed unless further precautions are taken.

3. Enlarge existing culverts under Calder Road roadway. Existing culverts may be undersized due to modifications to hydrologic conditions (logging) in the Vance Creek drainage basin. As a result, water may be backing up, overtopping the creek banks. Although culverts may be properly sized, they have the potential of becoming clogged, thus producing the same overtopping effect.

4. Construct an embankment at the beaver pond to detain and store flood waters. An embankment with a control structure outlet would store excess flood water and slowly release it downstream. The facility would require maintenance of the control structure, the access road and the embankment. The beaver ponds provide a natural location to construct a detention pond; however, it will likely impact wildlife habitat and wetlands. Permits from the state Ecology and Fisheries Departments, as well as the Army Corps of Engineers, may be required.

5. Construct a by-pass system from the existing 8-foot culvert to below Main Street. The by-pass system could either be a pipeline or an open channel along the Calder Road right-of-way. It should be designed for at least the 25-year, 24-hour storm. The system would also pick up local drainage north of Main Street and discharge it into Vance Creek south of Main Street. This system would dissipate the outfall energy and control erosion, however, it may also require enhancement of the downstream channel. This system offers good control of flooding, but will require additional capital expense.

6. Remove Calder Road and Main Street culverts and replace the culverts with bridges. This would enhance the hydraulic condition of the creek but would be substantially more expensive.

It is recommended that Alternative 1 be implemented as an interim measure due to the liability and safety issues associated with the school.

Recommended Action Plan

1. Obtain detailed (2′ contour interval) topography map of flood area between Calder Road and Highway 12.
2. Perform hydrologic analysis to determine flood parameters, extent of flooding, flood routing, and design considerations.
3. Perform culvert analysis, detention facility routing analysis and/or channel analysis.
4. Construct Elma Elementary School flooding solution.
5. Select preferred alternative for remaining flooding problems.
6. Determine funding source through capital improvement plan.
7. Complete engineering design plans and specifications for selected alternative.
8. Construction.
9. Limit additional future runoff from new development and forest operations in the drainage basin.

Problem Area 2

The lower portion of Vance Creek, near U.S. Highway 12, has created flooding problems a number of times in the past several years. Homes on 12th Street South in Elma, accessory structures, and the football stadium have been flooded, causing considerable property damage. Flood waters from the creek apparently back up through culverts under the highway and move in a northerly direction up 12th Street (also known as River Road). Severe flooding usually passes in a number of hours, but flooding in the pastures and low-lying areas can remain for several days. Area residents have said that flooding in the area has become more frequent and persistent in the past five to six years.

Existing Conditions

The upper watershed of Vance Creek is described above. After crossing under Main Street in Elma, the creek continues south, traversing a pasture and flowing under U.S. Highway 12. The creek then takes a sharp turn to the east, flowing parallel to the highway, past the borrow pits in the County recreation area. The creek eventually meanders back to the west and discharges into the Chehalis River.

The flood plain of the Chehalis River, as mapped by the Federal Emergency Management Agency (FEMA), extends to the area north of the highway in the vicinity of the problem study area. However, the area of flooded houses and stadium are not shown on the FEMA flood maps as being in the 100-year flood plain. A detailed flood study, including 100-year flood elevations, was not completed for this segment of the Chehalis.

Flooding in the study area occurs when the Chehalis River floods, thus influencing the flood profile of Vance Creek. Flood waters from the creek back up and spill into the low-lying areas on the south side of the highway. These flood waters flow north under the highway through two concrete culverts. These culverts were designed to equalize water depths on both sides of the highway and to allow flood waters to seek the historical flood plain. However, alterations to the Vance area flood plain on the south side of the highway may be increasing the amount of water flowing north. The gravel pits on the south side of the highway have large berms built around them which exclude flood waters from historical flood plains. A small dirt road across the creek has a set of three culverts in it which appear to be undersized. This road reportedly backs up water several feet, possibly diverting it to the north.

If the flooding problem is due solely to flooding on the Chehalis, it will require massive expenditures and study to resolve the situation. The detailed study for this area will identify whether a local solution will relieve some of the flooding problems.

Solution Alternatives

Presented below are a series of alternatives which will reduce and/or eliminate flooding problems associated with lower Vance Creek.

1. Floodproof the structures and football stadium. This would include permanent berms, pumps and drainage systems to protect the properties from flooding. Raising the land elevations and structures should be considered.

2. Install flood gates on the equalizer culverts under the highway. The gates and operation must consider the impacts of the loss of flood plain storage on the north side of the highway.

3. Remove restrictions or enlarge culverts on the creek south of the highway. This would include a review of all road crossings and encroachments into the flood plain by gravel pit berms.

4. Allow flood waters from Vance Creek to enter the borrow pits. This would require relocation of the creek to run through the pits, or breaches in the berms.

It is recommended that all of the alternatives be considered to provide relief from flooding problems.

Recommended Action Plan

1. Obtain detailed (2' contour interval) topography map of the Vance Creek between Main Street and the Chehalis River.
2. Determine if the property lies in the Chehalis River Flood Plain.

2A. If the problem area lies in the Chehalis River flood plain, implement Alternative 1, and go to Action plan item #5.

2B. If the problem area does not lie in the Chehalis River flood plain, go to Action plan item #3.

3. Perform hydrologic analysis to determine flood parameters, extent of flooding, flood routing, and design considerations.
4. Review and select alternatives(s).
5. Determine a funding source through the capital improvement plan.
6. Complete engineering design plans and specifications for selected alternatives.
7. Construction.
8. Limit additional future runoff from new development and forest operations in the drainage basin. Prohibit further encroachment into the flood plain of Vance Creek.

2. OCEAN CITY/COPALIS BEACH

Location

Ocean City is located on State Route 109 in the northwest quarter of Grays Harbor County approximately 20 miles from Aberdeen. Copalis Beach is 2 miles north of Ocean City. See Figure 1.

Problem

State Route 109 becomes inundated south of Ocean City (Figure 4). Local flooding is a problem for trailer courts and houses along SR 109 starting about two blocks south of the SR 109 bend at Ocean City and continuing south for about 0.5 mile. Water depths on resident and commercial property vary between 2 inches on the east of SR 109 near Ocean City and 2 feet on the west of SR 109 all along the stated flooding area.

Low-lying areas of Copalis Beach also flood during heavy rainfall (Figure 5). These areas include Grover Street, Johnson Mercantile, and associated parking lots. State Route 109 has been raised, forcing local runoff to pond at these areas. Also, the main drain outlet into the Copalis River for this area has a tide gate which does not function, contributing to these localized flooding problems during heavy rains and high tide.

Existing Conditions

Cranberry Creek enters Conner Creek approximately 0.5 mile from the Conner Creek crossing of SR 109 1 mile south of Ocean City (Figure 6). Their combined drainage basin is approximately 9,500 acres. In addition, the dune ridge east of Ocean City drains west and is intercepted by SR 109 and Ocean City. Drainage ditches along SR 109 vary in size and either stop or discharge into lateral ditches sloped to Conner Creek. Conner Creek is influenced both by the tide and local beach roadway crossings. SR 109, south of Ocean City, lies in a low area formed by the dunes. As a result, water from the local area and the east dune ridge collects there. Because the ditches along SR 109 have nowhere to drain, either from tidal influence on Conner Creek or because ditches are improperly constructed, storm water ponds in this area and must slowly infiltrate into the underlying sand.

Conner Creek appears to have only limited flooding problems. These occur north of main beach access road on the west side SR 109. Along this reach several bridges have been built to allow access to the beach, probably altering the creek channel.

Copalis Beach lies along the shores of the Copalis River just before it discharges into the ocean. The main road through Copalis Beach is SR 109 which lies just above the River's base flood elevations. Surrounding the area are small hills that drain into the river either directly or through Copalis Beach. Storm water that flows through the town is cutoff by SR 109 at Grover

Street and Johnson Mercantile. Drains are designed to accept storm water and discharge it through a tide gate into the Copalis River. The tide gate is corroded and no longer functions properly. High water in the Copalis River or high tide causes back ups into the storm sewer which floods Grover Street and the parking lots across from Johnson Mercantile.

Solution Alternatives

Solutions for the Ocean City/Copalis Beach flooding problems have been divided by geographic area into two separate sets of alternatives.

Alternative costs will be relatively similar for many of these alternatives and a more careful analysis will be needed to rank and recommend the preferred alternatives for each area.

Ocean City

1. Reconstruct SR 109 ditches. This construction will include both ditches along SR 109 and the laterals to Conner Creek. Ditches and laterals will need to be properly sized and constructed to account for the relatively flat slope of SR 109 and the tidal influence of Conner Creek.

2. Intercept and channelize runoff to Conner Creek. The initial analysis suggests the drainage from the east dune ridge is contributing much of the water to local flooding problems. Further analysis is required to determine the extent of this contribution and the size and location of a cutoff ditch to Conner Creek.

3. Improve bridge crossings influencing Conner Creek. The main concern is with the bridges over Conner Creek as it flows north along the beach. These bridges need to be reviewed to determine their influence on the obstruction of flood waters. Once this is determined, recommendations can be made, including abutment alteration, bridge reconstruction, and bridge removal.

4. Construct storm water storage ponds. Storage ponds would be constructed along SR 109 to collect and store storm water. This will include ditches and culverts to direct water to the ponds and outlets to Conner Creek. Storage ponds would have to account for tidal influences, infiltration and maintenance.

5. Limit encroachment into Conner Creek floodplain. This will accomplish two goals. First, it limits potential flooding victims to existing parties. Second, it stops additional construction from removing flood water storage within the floodplain. If storage is removed within the floodplain, neighbors receive additional water and new areas not currently flooded may be within the new and expanded floodplain.

6. Require new sites to be floodproofed and have positive drainage. Floodproofing includes raising any structures above the flood level, constructing diversions around

property and structures, and working with the County in developing an overall drainage plan. Raised structures should be on stilts and not a solid foundations. Solid foundations protect the owner from flooding, but also divert the excess onto other property. This is also true with diversions unless they are part of an overall regional analysis and control plan.

7. Work with Washington State Department of Transportation to reconstruct the drainage system and road, if necessary. Agree on selected alternatives for solutions to flooding along SR 109 and share the cost.

A reasonable solution to the flooding problems of Ocean City is likely a combination of a number of the above alternatives. A workable approach would be a combination of alternatives 1, 2, 5 and 6.

Alternatives 1 and 2 solve the existing flooding problems hydraulically. Alternative 5 prevents the problems from getting worse, and Alternative 6 minimizes flood damage to existing residences. Additional drainage analyses are needed to select and scope the most effective set of alternatives.

Copalis Beach

1. Raise roadways and parking lots. Raise Grover Street and associated parking lots to direct storm water under SR 109 and into the Copalis River. In addition, the tide gate should be reconstructed to mitigate tidal influences.

2. Redirect runoff around Copalis Beach. Cutoff ditches would be placed throughout Copalis Beach to redirect runoff into the Copalis River. The ditches would need to be properly sized and require outfalls into the Copalis River.

Alternative 1 is recommended to reduce the flooding problems at Copalis Beach.

Recommended Action Plan

Ocean City

1. Obtain a detailed (2' contour interval) topography map of Ocean City area.
2. Perform hydrologic analysis to determine flooding extent and solution criteria.
3. Analyze area ditches and laterals.
4. Analyze bridge crossings and their influence on Conner Creek.
5. Analyze temporary storm water storage requirements.
6. Select preferred alternative.
7. Determine funding source through capital improvement plan.
8. Cooperative agreement with Washington State Department of Transportation.
9. Prepare engineering plans and specifications.

10. Construction.
11. Limit encroachment into designated flood plains.

Copalis Beach

1. Obtain detailed (2' contour interval) topography of Copalis Beach.
2. Analyze storm drain system.
3. Determine minimum height to raise roadways.
4. Select preferred alternative.
5. Determine funding source through capital improvement plan.
6. Prepare engineering plans and specifications.
7. Construction.

3. GRAYLAND

Location

The Grayland Study Area is located in the southwest portion of Grays Harbor County on State Route 105, approximately 22 miles from Aberdeen. It lies on a relatively flat coastal plain bordered by dunes (see Figure 1).

Problem

There are three separate problems at Grayland: 1) State Route 105 floods during heavy rainfall; 2) the main drainage ditch through the low-lying area floods; and 3) local flooding occurs throughout the community, including Cranberry Road, Countyline Road, Turkey Road and Tingstrom Lane (Figure 7).

Flooding on State Route 105 is typically two to four inches in depth and ranges along Grayland between the 1800 block of SR 105 and the main beach access. Ditches are full, but clogged, have poor drainage to the ocean and are influenced by the tide.

The area's main drainage ditch is located east of SR 105 and floods adjacent houses, roads and properties. The ditch varies in size and is crossed by at least four roads before it leaves the Grayland area. Much of the problem seems to originate from filling in low-lying areas, which removes storm water storage. The ditch is also undersized and logging is taking place within the drainage basin which may be increasing storm water runoff quantities.

The lack of capacity in the main drainage ditch is partially to blame for the local flooding throughout Grayland. However, a poor overall approach to drainage also contributes. Houses along SR 105 experience standing water while property along the main drainage ditch flood during high rainfall. Local ditches are undersized and do not drain to the beach, forcing water to backup onto property, roadways and the highway. Uncontrolled grading on lots platted around the turn of the century has created local arguments over drainage. Filling low areas which have no positive drainage outlet has exacerbated the local flooding problem.

Existing Condition

Grayland and SR 105 are located between the beach dunes, peat bogs and low-lying woods. The main drainage ditch (Figure 7) provides drainage for much of this area and is connected to another ditch south of the County line. The ditch varies from 5 to 10 feet in width and is 3 to 5 feet deep. The ditch passes under numerous bridges and through peat bogs, low-lying woods and cranberry fields. Some houses in Grayland come as close as 50 feet to the ditch and flood regularly. Once past Grayland, the ditch continues north through peat bogs and low-lying woods until it discharges into the South Bay of Grays Harbor.

State Route 105 is fairly flat throughout Grayland and is separated from the beach by dunes. Currently, highway ditches either do not exist, are undersized, or are not properly sloped to discharge into the ocean.

Solution Alternatives

1. Improve SR 105 ditches and their access to provide positive discharge to a saltwater body. Ditches would be properly sized, aligned and sloped to handle the anticipated volume of flood waters. Discharge alternatives should consider ocean or South Bay Grays Harbor discharge using gravity flow or mechanical means for transportation. Tidal influences and maintenance need to be taken into account. Washington State Department of Transportation should cooperate with the County and share costs.

2. Direct excess water from drainage district ditch into retention/detention facilities located in low-lying woods for temporary storage of flood waters, reducing peak flows. This alternative should consider availability of land and impacts to natural drainage courses.

3. Improve drainage capacity of the existing drainage district ditch, culverts and bridge crossings. The drainage basin will need to be analyzed to properly design the ditch and culverts. Bridge crossings may require abutment alterations and upstream channel reconstruction.

4. Redirect peak storm water flows around Grayland area. Reconstruct drainage ditch to cross SR 105 below Grayland and discharge into ocean. This will require a pipeline and outfall and working with a number of Government agencies. This alternative would require a detailed drainage basin analysis to identify negative impacts and their mitigation.

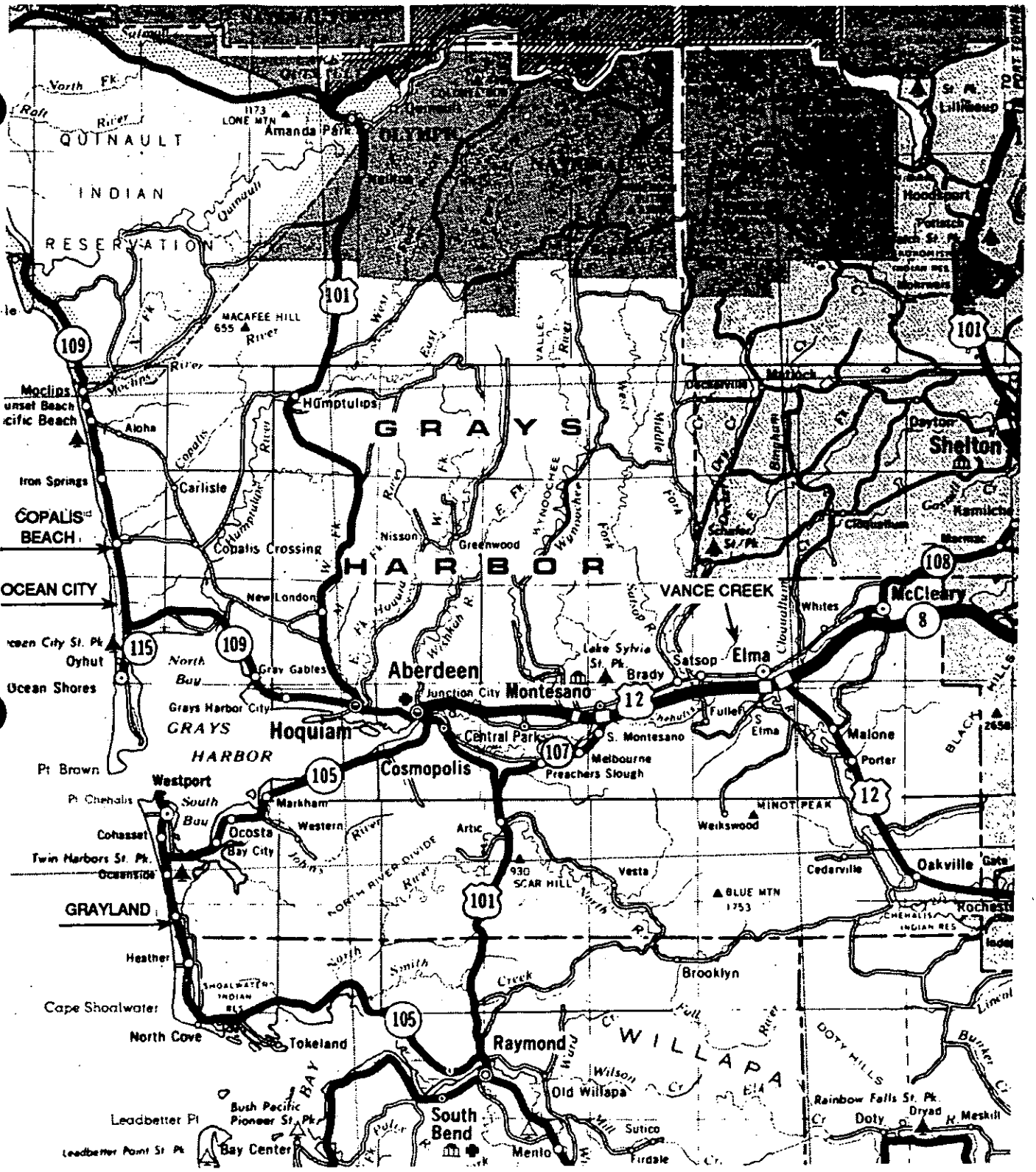
5. Develop new standards for grading in low areas.

Recommended immediate solutions include implementing Alternative 5, and consider improvements to local drainage by cleaning ditches and resizing cross drains. Positive drainage for water standing on the road should be investigated and appears feasible in some locations. All alternatives need to address the roles of the drainage district and the County in implementation of the preferred alternative(s).

Recommended Actions

1. Develop new standards for grading low-lying areas.
2. Obtain detailed (2′ contour interval) topography map of Grayland area.
3. Perform hydrologic analysis to determine flooding extent and solution criteria.
4. Conduct interagency meeting to address solution criteria.
5. Analyze culverts, bridge crossings and ditch capacities.
6. Conduct public meeting to address alternatives.

7. Select preferred alternative.
8. Determine funding source through capital improvement plan.
9. Coordinate with Washington State Department of Transportation.
10. Develop engineering plans and specifications.
11. Construction.



N

NOT TO SCALE

Figure 1.
Site Location Map

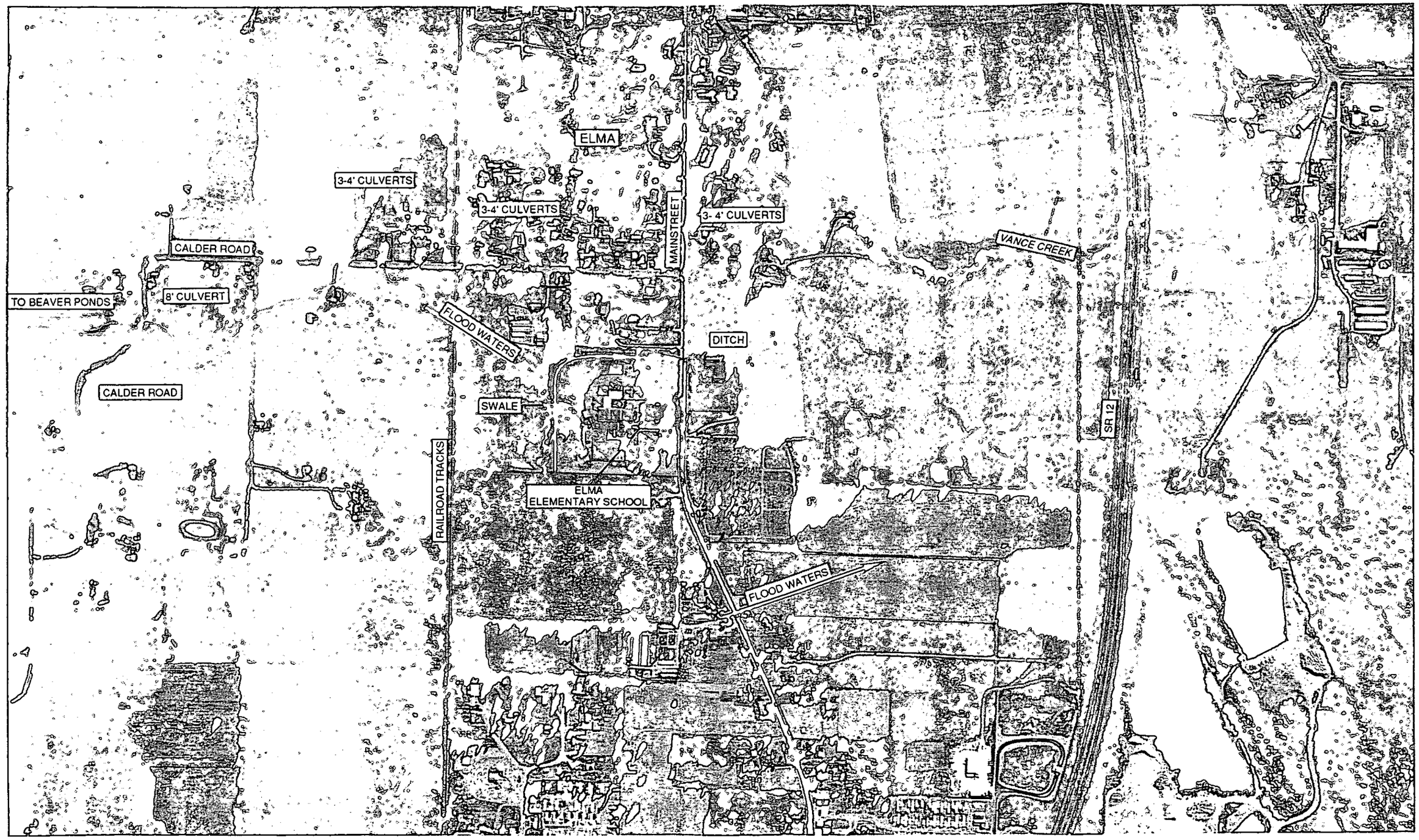
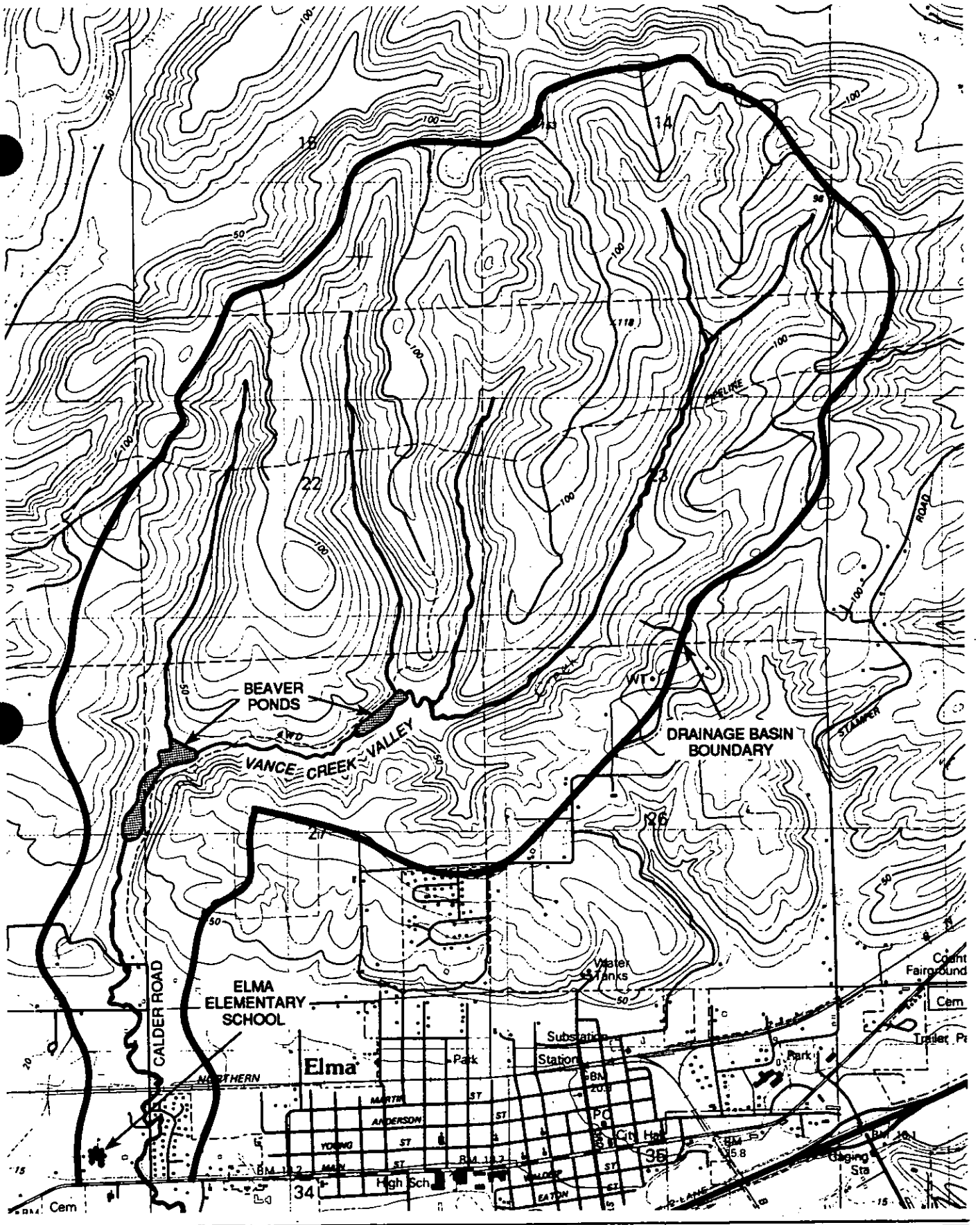


Figure 2.
Vance Creek near Elma



SCALE IN FEET

0 1,000 2,000

N

Figure 3.
Vance Creek Drainage Basin

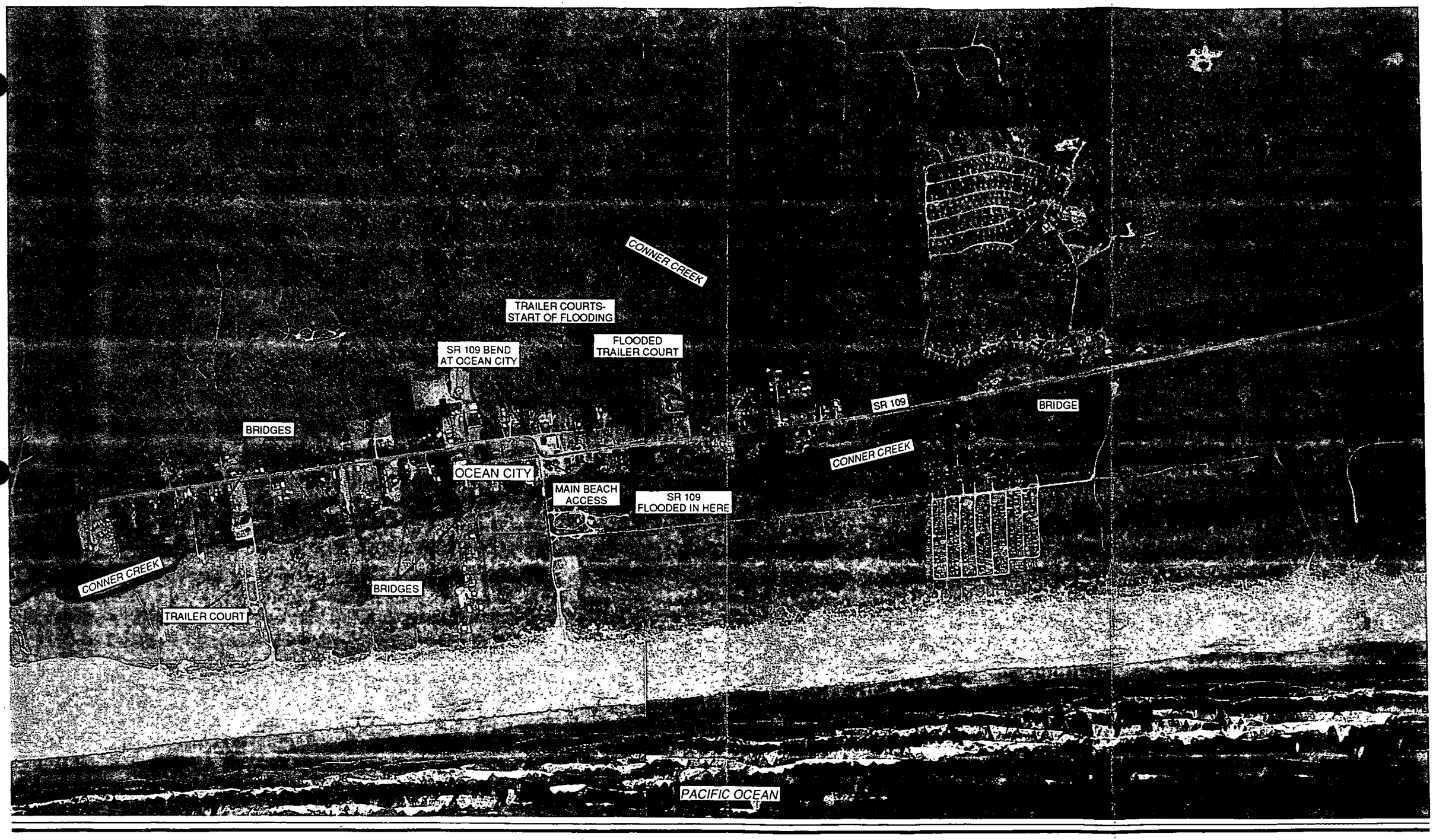


Figure 4.
Ocean City

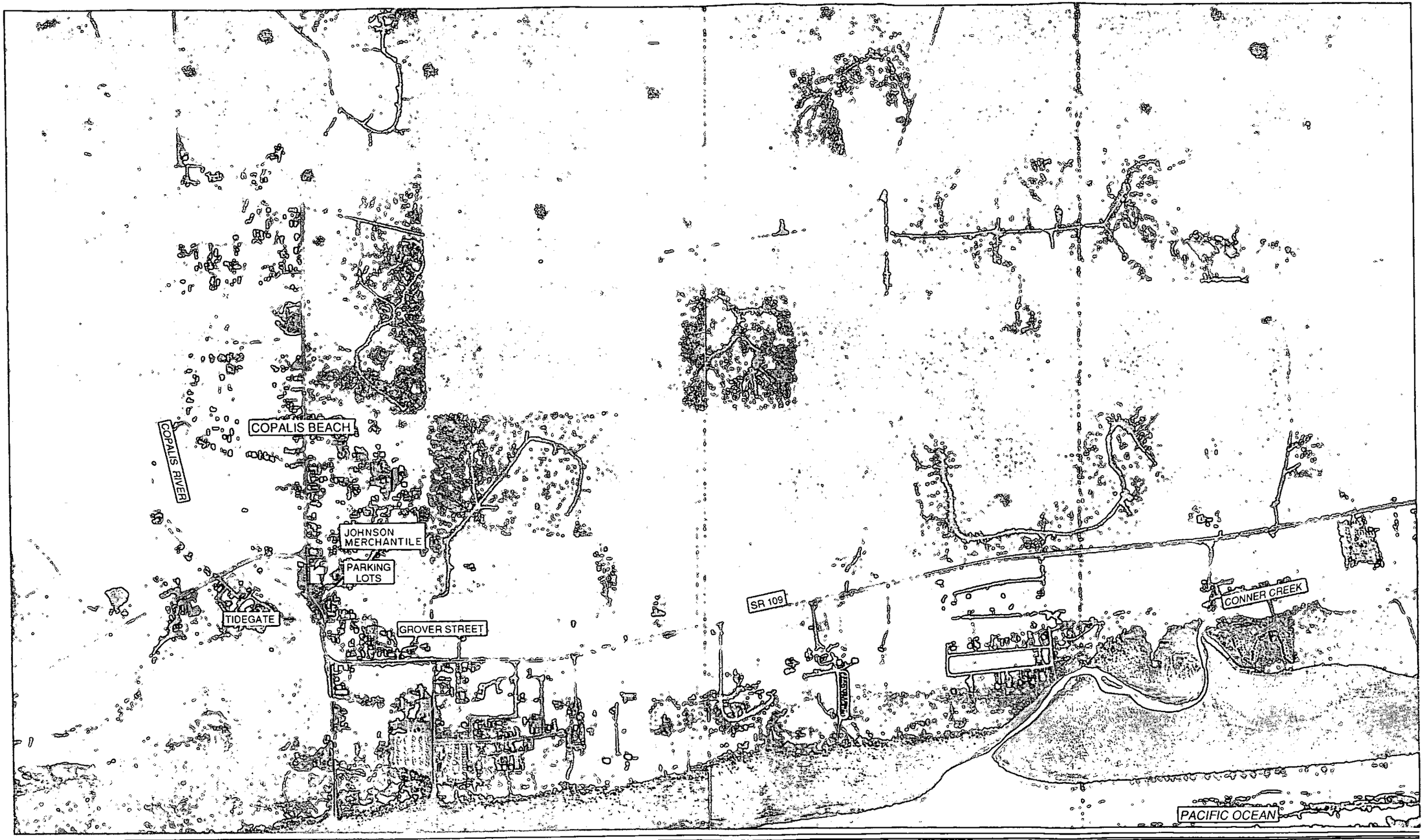


Figure 5.
Copalis Beach

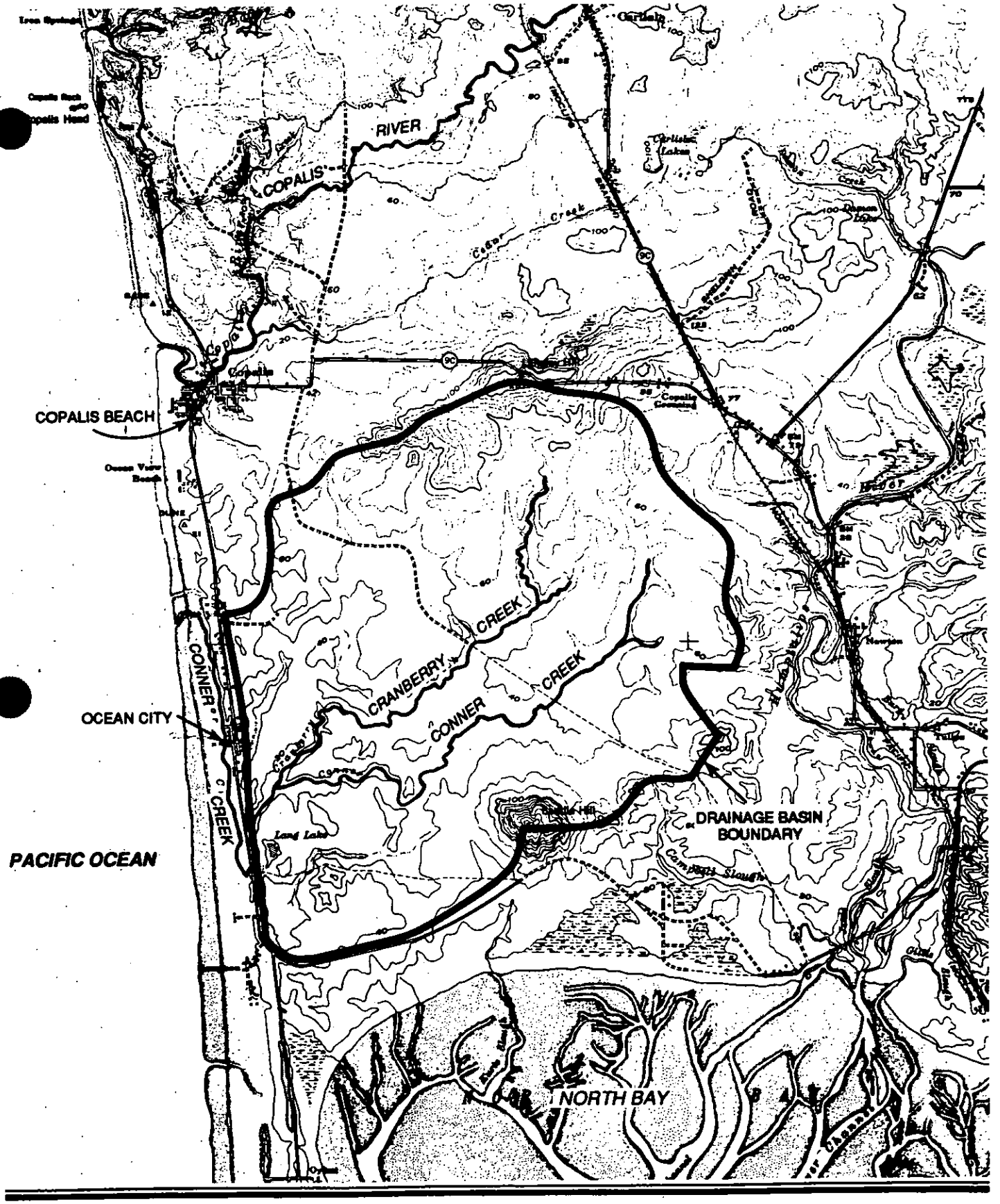


Figure 6.
Conner Creek
Drainage Basin



Figure 7.
Grayland