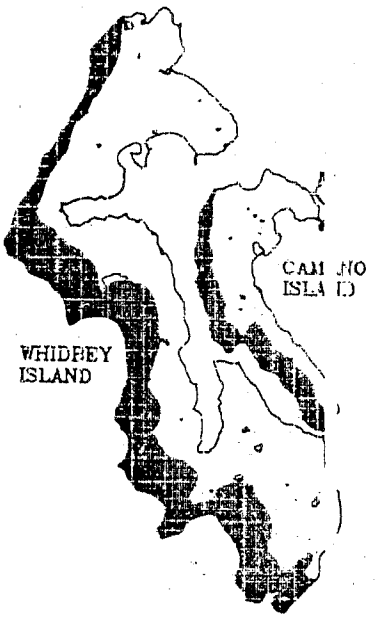
# ISLAND COUNTY
# COORDINATED WATER SYSTEM PLAN
# REGIONAL SUPPLEMENT
# APPENDICES
# VOLUME II




JANUARY 1990

PREPARED FOR THE

ISLAND COUNTY WATER UTILITY COORDINATING COMMITTEE

BY

ECONOMIC AND ENGINEERING SERVICES, INC.

IN ASSOCIATION WITH

HART-CROWSER & ASSOCIATES, INC.

R. W. BECK AND ASSOCIATES, INC.

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# REGIONAL SUPPLEMENT

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January, 1990


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APPENDICES

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# APPENDIX A

## BACKGROUND ORDINANCES AND REGULATIONS

PLANNING DEPT

BEFORE THE
BOARD OF ISLAND COUNTY COMMISSIONERS
ISLAND COUNTY, WASHINGTON

DECLARING ISLAND COUNTY )
CRITICAL WATER SUPPLY )
SERVICE AREA )

STATE OF WASHINGTON
COUNTY OF ISLAND
RESOLUTION NO. PD-85-07

WHEREAS, the Board of County Commissioners of Island County, pursuant to the provisions of the Revised Code of Washington, Section 36.32.120 (6) has substantial responsibility for the appropriate growth and development of Island County; and

WHEREAS, the provision of public water systems is an important element of ensuring appropriate growth and development of Island County; and

WHEREAS, the Island County Commissioners, pursuant to Chapter 70.116.4 (1) RCW has the authority to designate areas as Critical Water Supply Service Areas; and

WHEREAS, Island County concurs with the Preliminary Assessement of water systems issues in Island County, dated January 1985, which addresses problems related to public water supply service; and

WHEREAS, representatives of public water systems in Island County, the Department of Social and Health Services, the Island County Planning Department, and other interested parties attended meetings on Camano and Whidbey Islands to discuss the Preliminary Assessment on April 24, 1985;

WHEREAS, problems related to public water systems are well documented in the Preliminary Assessment which recommends that the Public Water System Coordination Act, RCW 70.116, be used as the planning process to resolve these problems;

NOW, BE IT THEREFORE RESOLVED by the Board of County Commissioners of Island County, Washington that the provisions of Chapter 70.116 RCW be initiated by declaring Island County a Critical Water Supply Service Area with the following sub-regions:

Camano Island
Central Whidbey Island
South Whidbey
North Whidbey

REVIEWED ON THE 15TH DAY OF JULY 1985 AND SET FOR PUBLIC HEARING ON THE 19TH DAY OF AUGUST 1985, AT 2:00 P.M.

BOARD OF COUNTY COMMISSIONERS
ISLAND COUNTY, WASHINGTON

W.F. DUNLOP, CHAIRMAN

DUANE KEMP, MEMBER

GARY BOSTROM, MEMBER

ATTEST:

HARRY H. FERRIER
COUNTY AUDITOR AND EX-OFFICIO
CLERK OF THE BOARD

Attach.

**70.112.030 Family practice education advisory board——Chairman——Membership.** There is created a family practice education advisory board which shall consist of eight members with the dean of the school of medicine serving as chairman. Other members of the board will be:

(1) Chairman, department of family medicine, school of medicine;

(2) Two public members to be appointed by the governor;

(3) A member appointed by the Washington state medical association;

(4) A member appointed by the Washington state academy of family physicians;

(5) A hospital administrator representing those Washington hospitals with family practice residency programs, appointed by the governor; and

(6) A director representing the directors of community based family practice residency programs, appointed by the governor. [1975 1st ex.s. c 108 § 3.]

**70.112.040 Advisory board——Terms of members——Filling vacancies.** The dean and chairman of the department of family medicine at the University of Washington school of medicine shall be permanent members of the advisory board. Other members will be initially appointed as follows: Terms of the two public members shall be two years; the member from the medical association and the hospital administrator, three years; and the remaining two members, four years. Thereafter, terms for the nonpermanent members shall be four years; members may serve two consecutive terms; and new appointments shall be filled in the same manner as for original appointments. Vacancies shall be filled for an unexpired term in the manner of the original appointment. [1975 1st ex.s. c 108 § 4.]

**70.112.050 Advisory board——Duties——Annual report.** The advisory board shall advise the dean and the chairman of the department of family medicine in the implementation of the educational programs provided for in this chapter; including, but not limited to, the selection of the areas within the state where affiliate residency programs shall exist, the allocation of funds appropriated under this chapter, and the procedures for review and evaluation of the residency programs. On or before January 15 of each year the advisory board shall provide the governor and the legislature with the report on the status of the state-wide family practice residency program. [1975 1st ex.s. c 108 § 5.]

**70.112.060 Funding of residency programs.** (1) The moneys appropriated for these state-wide family medicine residency programs shall be in addition to all the income of the University of Washington and its school of medicine and shall not be used to supplant funds for other programs under the administration of the school of medicine.

(2) The allocation of state funds for the residency programs shall not exceed fifty percent of the total cost of the program.

(3) No more than twenty-five percent of the appropriation for each fiscal year for the affiliated programs shall be authorized for expenditures made in support of the faculty and staff of the school of medicine who are associated with the affiliated residency programs and are located at the school of medicine.

(4) No funds for the purposes of this chapter shall be used to subsidize the cost of care incurred by patients. [1975 1st ex.s. c 108 § 6.]

## Chapter 70.114
## MIGRANT LABOR HOUSING

Sections



**70.114.010 Legislative declaration——Fees for use of housing.** The legislature finds that the migrant labor housing project constructed on property purchased by the state in Yakima county should be continued until June 30, 1981. The employment security department is authorized to set day use or extended period use fees, consistent with those established by the department of parks and recreation. [1979 ex.s. c 79 § 1; 1977 ex.s. c 287 § 1; 1975 1st ex.s. c 50 § 1; 1974 ex.s. c 125 § 1.]

**70.114.020 Migrant labor housing facility——Employment security department authorized to contract for continued operation.** The employment security department is authorized to enter into such agreements and contracts as may be necessary to provide for the continued operation of the facility by a state agency, an appropriate local governmental body, or by such other entity as the commissioner may deem appropriate and in the state's best interest. [1979 ex.s. c 79 § 2; 1977 ex.s. c 287 § 2; 1975 1st ex.s. c 50 § 3; 1974 ex.s. c 125 § 4.]

## Chapter 70.115
## DRUG INJECTION DEVICES

Sections



**70.115.050 Retail sale of hypodermic syringes, needles——Duty of retailer.** On the sale at retail of any hypodermic syringe, hypodermic needle, or any device adapted for the use of drugs by injection, the retailer shall satisfy himself or herself that the device will be used for the legal use intended. [1981 c 147 § 5.]

## Chapter 70.116
## PUBLIC WATER SYSTEM COORDINATION ACT OF 1977

Sections

**70.116.010 Legislative declaration.** The legislature hereby finds that an adequate supply of potable water for domestic, commercial, and industrial use is vital to the health and well-being of the people of the state. Readily available water for use in public water systems is limited and should be developed and used efficiently with a minimum of loss or waste.

In order to maximize efficient and effective development of the state's public water supply systems, the department of social and health services shall assist water purveyors by providing a procedure to coordinate the planning of the public water supply systems. [1977 ex.s. c 142 § 1.]

**70.116.020 Declaration of purpose.** The purposes of this chapter are:

(1) To provide for the establishment of critical water supply service areas related to water utility planning and development;

(2) To provide for the development of minimum planning and design standards for critical water supply service areas to insure that water systems developed in these areas are consistent with regional needs;

(3) To assist in the orderly and efficient administration of state financial assistance programs for public water systems; and

(4) To assist public water systems to meet reasonable standards of quality, quantity and pressure. [1977 ex.s. c 142 § 2.]

**70.116.030 Definitions.** Unless the context clearly requires otherwise, the following terms when used in this chapter shall be defined as follows:

(1) "Coordinated water system plan" means a plan for public water systems within a critical water supply service area which identifies the present and future needs of the systems and sets forth means for meeting those needs in the most efficient manner possible. Such a plan shall include provisions for subsequently updating the plan. In areas where more than one water system exists, a coordinated plan may consist of either: (a) A new plan developed for the area following its designation as a critical water supply service area; or (b) a compilation of compatible water system plans existing at the time of such designation and containing such supplementary provisions as are necessary to satisfy the requirements of this chapter. Any such coordinated plan must include provisions regarding: Future service area designations; assessment of the feasibility of shared source, transmission, and storage facilities; emergency inter-ties; design standards; and other concerns related to the construction and operation of the water system facilities.

(2) "Critical water supply service area" means a geographical area which is characterized by a proliferation of small, inadequate water systems, or by water supply problems which threaten the present or future water quality or reliability of service in such a manner that efficient and orderly development may best be achieved through coordinated planning by the water utilities in the area.

(3) "Public water system" means any system providing water intended for, or used for, human consumption or other domestic uses. It includes, but is not limited to, the source, treatment for purifying purposes only, storage, transmission, pumping, and distribution facilities where water is furnished to any community, or number of individuals, or is made available to the public for human consumption or domestic use, but excluding water systems serving one single family residence. However, systems existing on September 21, 1977 which are owner operated and serve less than ten single family residences or which serve only one industrial plant shall be excluded from this definition and the provisions of this chapter.

(4) "Purveyor" means any agency or subdivision of the state or any municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or person or any other entity, that owns or operates for wholesale or retail service a public water system. It also means the authorized agents of any such entities.

(5) "Secretary" means the secretary of the department of social and health services or the secretary's authorized representative.

(6) "Service area" means a specific geographical area serviced or for which service is planned by a purveyor. [1977 ex.s. c 142 § 3.]

**70.116.040 Critical water supply service area——Designation——Establishment or amendment of external boundaries——Procedures.** (1) The secretary and the appropriate local planning agencies and purveyors, shall study geographical areas where water supply problems related to uncoordinated planning, inadequate water quality or unreliable service appear to exist. If the results of the study indicate that such water supply problems do exist, the secretary or the county legislative authority shall designate the area involved as being a critical water supply service area, consult with the appropriate local planning agencies and purveyors, and appoint a committee of not less than three representatives therefrom solely for the purpose of establishing the proposed external boundaries of the critical water supply

service area. The committee shall include a representative from each purveyor serving more than fifty customers, the county legislative authority, county planning agency, and health agencies. Such proposed boundaries shall be established within six months of the appointment of the committee.

During the six month period following the establishment of the proposed external boundaries of the critical water supply services areas, the county legislative authority shall conduct public hearings on the proposed boundaries and shall modify or ratify the proposed boundaries in accordance with the findings of the public hearings. The boundaries shall reflect the existing land usage, and permitted densities in county plans, ordinances, and/or growth policies. If the proposed boundaries are not modified during the six month period, the proposed boundaries shall be automatically ratified and be the critical water supply service area.

After establishment of the external boundaries of the critical water supply service area, no new public water systems may be approved within the boundary area unless an existing water purveyor is unable to provide water service.

(2) At the time a critical water supply service area is established, the external boundaries for such area shall not include any fractional part of a purveyor's existing contiguous service area.

(3) The external boundaries of the critical water supply service area may be amended in accordance with procedures prescribed in subsection (1) of this section for the establishment of the critical water supply service areas when such amendment is necessary to accomplish the purposes of this chapter. [1977 ex.s. c 142 § 4.]

**70.116.050 Development of water system plans for critical water supply service areas.** (1) Each purveyor within the boundaries of a critical water supply service area shall develop a water system plan for the purveyor's future service area if such a plan has not already been developed: *Provided*, That nonmunicipally owned public water systems are exempt from the planning requirements of this chapter, except for the establishment of service area boundaries if they: (a) Were in existence as of September 21, 1977; and (b) have no plans for water service beyond their existing service area, and (c) meet minimum quality and pressure design criteria established by the state board of health: *Provided further*, That if the county legislative authority permits a change in development that will increase the demand for water service of such a system beyond the existing system's ability to provide minimum water service, the purveyor shall develop a water system plan in accordance with this section. The establishment of future service area boundaries shall be in accordance with RCW 70.116.070.

(2) After the boundaries of a critical water supply service area have been established pursuant to RCW 70.116.040, the committee established in RCW 70.116-.040 shall participate in the development of a coordinated water system plan for the designated area. Such a plan shall incorporate all water system plans developed pursuant to subsection (1) of this section. The plan shall provide for maximum integration and coordination of public water system facilities consistent with the protection and enhancement of the public health and well-being.

(3) Those portions of a critical water supply service area not yet served by a public water system shall have a coordinated water system plan developed by existing purveyors based upon permitted densities in county plans, ordinances, and/or growth policies for a minimum of five years beyond the date of establishment of the boundaries of the critical water supply service area.

(4) To insure that the plan incorporates the proper designs to protect public health, the secretary shall adopt regulations pursuant to chapter 34.04 RCW concerning the scope and content of coordinated water system plans, and shall ensure, as minimum requirements, that such plans:

(a) Are reviewed by the appropriate local governmental agency to insure that the plan is not inconsistent with the land use plans, shoreline master programs, and/or developmental policies of the general purpose local government or governments whose jurisdiction the water system plan affects.

(b) Recognize all water resource plans, water quality plans, and water pollution control plans which have been adopted by units of local, regional, and state government.

(c) Incorporate the fire protection standards developed pursuant to RCW 70.116.080.

(d) Identify the future service area boundaries of the public water system or systems included in the plan within the critical water supply service area.

(e) Identify feasible emergency inter-ties between adjacent purveyors.

(5) If a "water general plan" for a critical water supply service area or portion thereof has been prepared pursuant to chapter 36.94 RCW and such a plan meets the requirements of subsections (1) and (4) of this section, such a plan shall constitute the coordinated water system plan for the applicable geographical area.

(6) Prior to the submission of a coordinated water system plan to the secretary for approval of the design of the proposed facilities pursuant to RCW 70.116.060, the plan shall be reviewed for consistency with subsection (4) of this section by the legislative authorities of the counties in which the critical water supply service area is located. If within sixty days of receipt of the plan, the legislative authorities find any segment of a proposed service area of a purveyor's plan or any segment of the coordinated water system plan to be inconsistent with any current land use plans, shoreline master programs, and/or developmental policies of the general purpose local government or governments whose jurisdiction the water system plan affects, the secretary shall not approve that portion of the plan until the inconsistency is resolved between the local government and the purveyor. If no comments have been received from the legislative authorities within sixty days of receipt of the plan, the secretary may consider the plan for approval. [1977 ex.s. c 142 § 5.]

**70.116.060 Approval of coordinated water system plan——Limitations following approval.** (1) A coordinated water system plan shall be submitted to the secretary for design approval within two years of the establishment of the boundaries of a critical water supply service area.

(2) The secretary shall not approve those portions of a coordinated water system plan which fail to meet the requirements for future service area boundaries as set forth in RCW 70.116.070.

(3) Following the approval of a coordinated water system plan by the secretary:

(a) All purveyors constructing or proposing to construct public water system facilities within the area covered by the plan shall comply with the plan.

(b) No other purveyor shall establish a public water system within the area covered by the plan, unless the secretary determines that existing purveyors are unable to provide the service. If such a determination is made, the secretary may require the new public water system to be constructed in accordance with the construction standards and specifications embodied in the coordinated water system plan approved for the area.

(4) The secretary may deny proposals to establish or to expand any public water system within a critical water supply service area for which there is not an approved coordinated water system plan at any time after two years of the establishment of the critical water supply service area: *Provided*, That service connections shall not be considered expansions. [1977 ex.s. c 142 § 6.]

**70.116.070 Service area boundaries within critical water supply area.** (1) The service area boundaries of public water systems within the critical water supply service area shall be determined by written agreement among the purveyors and with the approval of the appropriate legislative authority. Failure of the legislative authority to file with the secretary objections to the proposed service area boundaries within sixty days of receipt of the proposed boundary agreement may be construed as approval of the agreement.

(2) If no service area boundary agreement has been established within a reasonable period of time, or if the legislative authority has filed with the secretary objections in writing as provided in subsection (1) of this section, the secretary shall hold a public hearing thereon. The secretary shall provide notice of the hearing by certified mail to each purveyor providing service in the critical water supply service area, to each county legislative authority having jurisdiction in the area and to the public. The secretary shall provide public notice pursuant to the provisions of chapter 65.16 RCW. Such notice shall be given at least twenty days prior to the hearing. The hearing may be continued from time to time and, at the termination thereof, the secretary may restrict the expansion of service of any purveyor within the area if the secretary finds such restriction is necessary to provide the greatest protection of the public health and well-being. [1977 ex.s. c 142 § 7.]

**70.116.080 Performance standards relating to fire protection.** The secretary shall adopt performance standards relating to fire protection to be incorporated into the design and construction of public water systems. The standards shall be consistent with recognized national standards. The secretary shall adopt regulations pertaining to the application and enforcement of the standards: *Provided*, That the regulations shall require the application of the standards for new and expanding systems only. The standards shall apply in critical water supply service areas unless the approved coordinated plan provides for nonfire flow systems. [1977 ex.s. c 142 § 8.]

**70.116.090 Assumption of jurisdiction or control of public water system by city, town, or code city.** The assumption of jurisdiction or control of any public water system or systems by a city, town, or code city, shall be subject to the provisions of chapter 35.13A RCW, and the provisions of this chapter shall be superseded by the provisions of chapter 35.13A RCW regarding such an assumption of jurisdiction. [1977 ex.s. c 142 § 9.]

**70.116.100 Bottled water exempt.** Nothing in this chapter shall apply to water which is bottled or otherwise packaged in a container for human consumption or domestic use, or to the treatment, storage and transportation facilities used in the processing of the bottled water or the distribution of the bottles or containers of water. [1977 ex.s. c 142 § 10.]

**70.116.110 Rate making authority preserved.** Nothing in this chapter shall be construed to alter in any way the existing authority of purveyors and municipal corporations to establish, administer and apply water rates and rate provisions. [1977 ex.s. c 142 § 11.]

**70.116.120 Short title.** This chapter shall be known and may be cited as the "Public Water System Coordination Act of 1977". [1977 ex.s. c 142 § 12.]

**70.116.900 Severability——1977 ex.s. c 142.** If any provision of this chapter, or its application to any person or circumstance is held invalid, the remainder of the chapter, or the application of the provision to other persons or circumstances is not affected. [1977 ex.s. c 142 § 13.]

## Chapter 70.117
## SKIING AND COMMERCIAL SKI ACTIVITY

Sections



*Ski lifts, tows, etc.: Chapter 70.88 RCW.*

**70.117.010 Ski area sign requirements.** (1) The operator of any ski area shall maintain a sign system.

# Chapter 248-56 WAC
# WATER SYSTEM COORDINATION ACT—PROCEDURAL REGULATIONS

WAC



**WAC 248-56-100 Purpose.** This chapter is promulgated pursuant to the authority granted in the Public Water System Coordination Act of 1977, chapter 70.116 RCW, for the purpose of implementing a program relating to public water system coordination within the state of Washington, for evaluation and determination of critical water supply service areas, and assistance for orderly and efficient public water system planning. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-100, filed 6/28/78.]

**WAC 248-56-200 Definitions.** (1) "Public water system" – Any system or water supply intended or used for human consumption or other domestic uses including, but not limited to, source, treatment, storage, transmission and distribution facilities where water is furnished to any community, number of individuals or is made available to the public for human consumption or domestic use. This definition shall exclude any water system serving one single family residence, water systems existing prior to September 21, 1977 which are owner operated and serve less than ten single family residences, and water systems serving no more than one industrial plant.

(2) "Purveyor" – Any agency or subdivision of the state or any municipality, firm, company, mutual or cooperative association, institution, partnership, person, or any other entity that owns or operates a public water system for wholesale or retail service (or their authorized agent).

(3) "Municipality" – Any county, city, town, or any other entity having its own incorporated government for local affairs including, but not limited to, metropolitan municipal corporation, public utility district, water district, irrigation district, sewer district, and/or port district.

(4) "Inadequate water quality" – An excess of maximum contaminant levels established by the state board of health (chapter 248-54 WAC).

(5) "Unreliable service" – Low pressure or quantity problems, and/or frequent service interruption inconsistent with state board of health requirements (chapter 248-54 WAC).

(6) "Lack of coordinated planning" – Failure to resolve existing or potential areawide problems related to:

(a) Insufficient control over development of new public water systems.

(b) Adjacent or nearby public water systems constructed according to incompatible design standards.

(c) No future service area agreements, or conflicts in existing or future service areas.

(d) Adjacent public water systems which could benefit from emergency interties or joint-use facilities.

(e) Water system plans which have not been updated in accordance with chapter 248-54 WAC.

(f) Inconsistencies between neighboring water system plans, or failure to consider adopted county or city land use plans or policies.

(7) "Critical water supply service area" – A geographical area designated by the department or county legislative authority characterized by public water system problems related to inadequate water quality, unreliable service, and/or lack of coordinated water system planning. It may be further characterized by a proliferation of small, inadequate public water systems, or by water supply problems which threaten the present or future water quality or reliability of service in such a manner that efficient and orderly development may best be achieved through coordinated planning by public water systems in the area.

(8) "County legislative authority" – The board of county commissioners or that body assigned such duties by a county charter as enacting ordinances, passing resolutions, and appropriating public funds for expenditure.

(9) "Local planning agency" – The division of city or county government responsible for land use planning functions.

(10) "Coordinated water system plan" – A plan for public water systems within a critical water supply service area which identifies the present and future water system concerns and sets forth a means for meeting those concerns in the most efficient manner possible.

(11) "Existing service area" – A specific area within which direct service or retail service connections to customers of a public water system are currently available.

(12) "Future service area" – A specific area for which water service is planned by a public water system, as determined by written agreement between purveyors provided for in WAC 248-56-730.

(13) "Department" – The Washington state department of social and health services. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-200, filed 6/28/78.]

**WAC 248-56-300 Preliminary assessment—Requirement.** In areas where public water systems are suspected of having problems related to inadequate water quality, unreliable service, or lack of coordinated planning, a preliminary assessment shall be undertaken to determine if the geographical area should be designated a critical water supply service area. (See WAC 248-56-200 for definitions.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-300, filed 6/28/78.]

**WAC 248-56-310 Preliminary assessment—Procedures.** (1) The preliminary assessment shall be conducted under the authority of the county legislative authority(ies) and the department with assistance from affected state and local agencies and water purveyors.

(2) Notice that a preliminary assessment is being undertaken shall be made to all affected parties, those who have demonstrated an interest, and the local news media.

(3) The preliminary assessment shall be presented in report form, as short and factual as possible, and shall consider at least the following topics as they relate to public water systems in the potential critical water supply service area:

(a) Existing water systems, including:

(i) History of water quality, reliability and service,

(ii) General fire fighting capability of the utilities, and

(iii) Identification of major facilities which need to be expanded, altered, or replaced.

(b) Availability and adequacy of future water source(s).

(c) Service area boundaries, including a map of established boundaries and identification of systems without established boundaries.

(d) Present growth rate.

(e) Status of water system planning, land use planning, and coordination, including a list of land use plans and policies adopted by local general purpose governments.

(4) Upon completion, the preliminary assessment shall be submitted to the county legislative authority(ies) and the department for review. A copy shall also be transmitted to all potentially affected water purveyors and appropriate news media. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-310, filed 6/28/78.]

**WAC 248-56-400 Declaration of critical water supply service area.** (1) Based upon review of the preliminary assessment, if findings indicate that a geographical area does have problems related to inadequate water quality, unreliable service, or lack of coordinated planning, the county legislative authority(ies) or the department shall declare that area a critical water supply service area.

(2) The declaration shall be in the format of a legislative enactment signed by the county legislative authority(ies), or administrative declaration signed by the secretary of the department or his designee.

(3) The declaring agency shall file its declaration with the other agency(ies) and notify in writing the appropriate local planning agencies, affected water purveyors, and the local news media within ten days. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-400, filed 6/28/78.]

**WAC 248-56-500 Water utility coordinating committee—Establishment.** (1) Within 30 days following the declaration of a critical water supply service area, a water utility coordinating committee shall be appointed by the declaring agency(ies).

(2) The water utility coordinating committee shall consist of one representative from each of the following:

(a) Each county legislative authority within the declared area,

(b) Each county planning agency having jurisdiction within the declared area,

(c) Each health agency having jurisdiction within the declared area (chapters 70.08, 70.05, 43.20 RCW),

(d) Each water purveyor with over fifty services within the declared area.

(Other agencies or purveyors shall be appointed as ex officio members of the committee if determined appropriate by the county legislative authority(ies) or the department).

(3) In order for the water utility coordinating committee to conduct business, at least half but not less than three representatives from the entities listed in subsection (2) shall be present.

(4) At the first meeting of the water utility coordinating committee, the following shall be determined by consensus:

(a) Chairperson

(b) Rules for conducting business, including voting procedure. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-500, filed 6/28/78.]

**WAC 248-56-510 Water utility coordinating committee—Purpose.** (1) The initial purpose of the water utility coordinating committee shall be to recommend

external critical water supply service area boundaries to the county legislative authority(ies) within six months of appointment of the committee. (See WAC 248-56-600.)

(2) Following establishment of external critical water supply service area boundaries, the water utility coordinating committee shall be responsible for development of the coordinated water system plan. (See WAC 248-56-740.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-510, filed 6/28/78.]

**WAC 248-56-600 Establishment of external critical water supply service area boundaries—Procedures.** (1) Proposed boundaries shall be documented by a written report which includes:

(a) A map and narrative description of the recommended boundary.

(b) A narrative statement outlining the reasons for the recommended boundary location, the criteria used and relative importance of each.

(2) Prior to submittal of recommended external boundaries to the county legislative authority(ies), the water utility coordinating committee shall conduct at least one informational meeting for the purpose of soliciting public input.

(3) The water utility coordinating committee shall make a formal report of its recommended external critical water supply service area boundaries to the county legislative authority(ies).

(4) The county legislative authority(ies) shall conduct at least two public hearings on the proposed boundaries within six months from the date the boundaries were submitted by the water utility coordinating committee, for the purpose of soliciting responses to the proposed boundaries.

(5) Within six months from the date proposed boundaries are submitted to the county legislative authority(ies), one of the following actions may be taken by the county legislative authority(ies):

(a) Ratify the proposed boundaries based on findings at the public hearings, or

(b) Modify the proposed boundaries in accordance with findings of the public hearings, and then ratify the revised boundaries.

If neither of the above actions are taken by the county legislative authority(ies) within six months, the boundaries as stated in the proposal submitted by the water utility coordinating committee to said county legislative authority(ies) shall be automatically ratified. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-600, filed 6/28/78.]

**WAC 248-56-610 Establishment of external critical water supply service area boundaries—Criteria.** (1) The water utility coordinating committee, in recommending, and county legislative authority(ies), in determining the location of external critical water supply service area boundaries shall consider factors including, but not limited to:

(a) Existing land use,

(b) Projected land use and permitted densities as documented in adopted county or city plans, ordinances and/or growth policies for at least 10 years into the future,

(c) Other planning activities or boundaries which may affect land use or water system planning,

(d) Physical factors limiting provision of water service,

(e) Existing political boundaries, including boundary agreements in effect and attitudes towards expanding those boundaries,

(f) Future service areas of existing utilities,

(g) Hydraulic factors, including potential pressure zones or elevations,

(h) Economic ability of the public water systems to meet minimum service requirements.

(2) External critical water supply service area boundaries shall not divide any purveyor's existing, contiguous service area. Areas served by a wholesale purveyor may be divided into as many existing service areas as may be justified by geography, engineering or other factors discussed in the preliminary assessment. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-610, filed 6/28/78.]

**WAC 248-56-620 Establishment of critical water supply service area boundaries—Effect.** (1) No new public water system shall be approved within a critical water supply service area subsequent to establishment of external boundaries unless specifically authorized by the department. Authorization shall be based upon compliance with the following:

(a) If unanticipated demand for water supply occurs within a purveyor's future service area, the following shall apply in the listed sequence:

(i) The existing purveyor shall provide service in a timely and reasonable manner consistent with state board of health regulations; or

(ii) A new public water system may be developed on a temporary basis. Before authorization, a legal agreement will be required which includes a schedule for the existing purveyor to assume management and/or connect the new public water system to the existing system; or

(iii) A new public water system may be developed. Before authorization, a revised service area agreement establishing the new purveyor's future service area will be required.

(b) If a demand for water supply occurs outside any purveyor's future service area, the following shall apply in the listed sequence:

(i) Those persons anticipating the need for water service shall contact existing nearby purveyors within the critical water supply service area to determine whether any will be interested in expanding their system to provide water service in a timely and reasonable manner consistent with state board of health regulations.

(ii) A new public water system may be developed on a temporary basis. Before authorization, a legal agreement will be required which includes a schedule for an existing system to assume management and/or connect the new public water system to an existing system; or

(iii) A new public water system may be developed.

Any of the options listed in subdivisions (b)(i), (b)(ii), or (b)(iii) will require establishment of new or revised service area agreements.

(2) If a new public water system is developed, it shall have an approved water system plan pursuant to WAC 248-54-580 and the provisions of this chapter. The plan shall include a section addressing the outcome of subsections (1)(a), or (1)(b) along with documented confirmation by the appropriate existing purveyors(s).

(3) Any proposed new public water system shall not be inconsistent with local adopted land use plans, shoreline management programs, and/or development policies as determined by the appropriate county or city legislative authority(ies).

(4) If a coordinated water system plan has been approved for the affected area, all proposed new public water systems shall be consistent with the provisions of that plan. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-620, filed 6/28/78.]

**WAC 248-56-630 Alteration of external critical water supply service area boundaries.** (1) After establishment of external critical water supply service area boundaries, those boundaries may not be altered until the coordinated water system plan is completed.

(2) Alteration of external critical water supply service area boundaries may be initiated by the department or county legislative authority(ies) in accordance with the procedures and criteria identified in WAC 248-56-600 and 248-56-610. In addition:

(a) The department or county legislative authority(ies), whichever initiates alteration of external boundaries, shall prepare a brief report documenting the need for such alteration, and

(b) The department or county legislative authority(ies), whichever initiates preparation of the report, shall reconvene the water utility coordinating committee and present the report to the committee, together with instructions for committee action.

(3) The coordinated water system plan shall be revised as necessary, due to alteration of external critical water supply service area boundaries, within six months of the date of such action taken by the county legislative authority(ies), unless an extended schedule is approved by the department. [Statutory Authority: Chapter 70-.116 RCW. 78-07-048 (Order 1309), § 248-56-630, filed 6/28/78.]

**WAC 248-56-640 Update of external critical water supply service area boundaries.** External critical water supply service area boundaries shall be reviewed by the water utility coordinating committee and the county legislative authority(ies) at least once every five years, as part of the update of the coordinated water system plan. (See WAC 248-56-760.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-640, filed 6/28/78.]

**WAC 248-56-700 Coordinated water system plan—Requirement.** (1) A coordinated water system plan shall be required for the entire area within the external critical water supply service area boundaries.

(2) In critical water supply service areas where more than one water system exists, a coordinated water system plan shall consist of either:

(a) A compilation of water system plans approved pursuant to WAC 248-54-580, together with supplementary provisions addressing water purveyor concerns relating to the entire critical water supply service area (fulfilling requirements of WAC 248-56-710 and 248-56-720 respectively), or

(b) A single plan covering all affected public water systems and areawide concerns within the external critical water supply service area boundaries (fulfilling requirements of both WAC 248-56-710 and 248-56-720).

(3) The coordinated water system plan shall provide for maximum integration and coordination of public water system facilities consistent with the protection and enhancement of the public health and well-being.

(4) The coordinated water system plan shall not be inconsistent with adopted county and city land use plans, ordinances, and/or growth policies addressing development within the critical water supply service area for at least five years beyond the date of establishment of external boundaries.

(5) If no land use plans, ordinances, or growth policies are in effect for all or a portion of the area within the critical water supply service area at the time the coordinated water system plan is being prepared, the coordinated water system plan shall be based upon the best planning data available from the appropriate local planning agency(ies).

(6) In critical water supply service areas where only one public water system exists, the coordinated water system plan shall consist of the water system plan for the water system. (See WAC 248-54-580 and 248-56-710.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-700, filed 6/28/78.]

**WAC 248-56-710 Coordinated water system plan—Water system plan.** (1) Each purveyor within the external critical water supply service area boundaries shall be responsible for completion of a water system plan for the purveyor's future service area, including provisions of WAC 248-56-730, if such a plan has not already been approved, with the following exception:

(a) Nonmunicipally owned public water systems shall be exempt from the planning requirements (except for the establishment of service area boundaries pursuant to WAC 248-56-730) if they:

(i) Were in existence as of September 21, 1977; and

(ii) have no plans for water service beyond their existing service area; and

(iii) meet minimum state board of health requirements (chapter 248-54 WAC).

NOTE: If the county legislative authority permits a change in development that will increase the demand for water service of such a system beyond the existing system's ability to provide

minimum water service, the purveyor shall develop a water system plan in accordance with this section.

(2) Each purveyors' water system plan shall be updated at the time the coordinated water system plan is prepared, which will eliminate the necessity of updating the water system plan prior to the mandatory five year update of the coordinated water system plan.

(3) The content of a water system plan shall be consistent with WAC 248-54-580 and shall comply with guidelines* which may be obtained from the department. These guidelines have been compiled to further assist in meeting the purpose of this chapter, and address three levels of planning requirements varying in detail, based upon the size of the public water system. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-710, filed 6/28/78.]

**WAC 248-56-720 Coordinated water system plan—Supplementary provisions.** (1) All water purveyors within the external critical water supply service area boundaries (with the exception of the systems specifically exempted in WAC 248-56-710(1)) shall be notified and asked to participate in the development of the supplementary provisions.

(2) The supplementary provisions shall address areawide water system concerns relating to the entire critical water supply service area. The content of the supplementary provisions shall comply with guidelines* which may be obtained from the department.

The supplementary provisions shall include, but not be limited to:

(a) Assessment of related, adopted plans,

(b) Identification of future service areas and service area agreements (WAC 248-56-730),

(c) Minimum areawide water system design standards, including fireflow performance standards,

(d) Procedures for authorizing new water systems in the critical water supply service area,

(e) Assessment of potential joint-use or shared water system facilities and/or management programs.

*Copies of DSHS guidelines entitled, "Plan contents guidelines" may be obtained without charge from the Department of Social and Health Services, Water Supply and Waste Section, Mail Stop LD-11, Olympia, Washington 98504.

[Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-720, filed 6/28/78.]

**WAC 248-56-730 Service area agreements—Requirement.** (1) The service area boundaries of public water systems within the critical water supply service area shall be determined by written agreement among the respective existing purveyors and approved by the appropriate legislative authority(ies).

(2) Future service area agreements shall be incorporated into the coordinated water system plan as provided for in the guidelines identified in WAC 248-56-720.

(3) Future service area boundaries of public water systems shall be determined by existing purveyors. Criteria used in the establishment of future service areas should include, but not be limited to: Topography, readiness and ability to provide water, local franchise areas, legal water system boundaries, city limits, future population, land use projections, and sewer service areas.

(4) All future service areas shall not be inconsistent with adopted land use plans, ordinances, and growth policies of cities, towns, and counties, located within the future service area boundaries.

(5) Failure of the legislative authority(ies) to file with the department objections to service area agreements within 60 days of receipt of the agreement shall indicate automatic approval.

(6) If no service area boundary agreement has been established after a conscientious effort by the purveyors within one year of establishment of the external critical water supply service area boundaries, or if the legislative authority(ies) has filed with the department objections in writing, the department shall hold a public hearing.

(7) If a public hearing is required for the establishment of service areas the following procedures shall apply:

(a) The department shall provide notice of the hearing by certified mail to:

(i) Each purveyor providing service in the critical water supply service area,

(ii) Each county legislative authority having jurisdiction in the area, and

(iii) The public pursuant to chapter 65.16 RCW.

(b) The hearing may be continued from time to time.

(c) At the termination of the public hearing, the department may restrict the expansion of service of any purveyor within the external critical water supply service area boundaries if the department finds such restriction necessary to provide the greatest protection of the public health and well-being. (Individual retail or direct service connections shall not be considered an expansion.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-730, filed 6/28/78.]

**WAC 248-56-740 Coordinated water system plan—Procedures (water utility coordinating committee).** (1) Following establishment of external critical water supply service area boundaries, the water utility coordinating committee shall be responsible for the development of a coordinated water system plan.

(2) No later than two months after establishment of the external critical water supply service area boundary the water utility coordinating committee shall meet for the purpose of formulating arrangements for:

(a) Preparation of the coordinated water system plan, and

(b) Public involvement.

(3) The water utility coordinating committee shall meet as necessary in order to:

(a) Collect and assemble water system plans,

(b) Provide input and direction for the preparation of the supplementary provisions,

(c) Serve as a forum for developing and/or negotiating future service area agreements (WAC 248-56-730),

(d) Accomplish other related business as determined by the committee.

(4) Prior to submittal of the coordinated water system plan to the county legislative authority(ies) for review, the water utility coordinating committee shall:

(a) Prepare written comments on the plan for the benefit of the reviewing authority(ies),

(b) Conduct at least one public informational meeting for the purpose of soliciting public input,

(c) Evaluate and respond to comments received at the hearing(s). [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-740, filed 6/28/78.]

**WAC 248-56-750 Coordinated water system plan—Effect.** (1) All purveyors constructing or proposing to construct public water system facilities within the area covered by the coordinated water system plan shall comply with the plan.

(2) At any time after two years of establishment of the external critical water supply service area boundaries, the department may deny proposals to establish or to expand any public water system within a critical water supply service area for which there is not an approved coordinated water system plan. (Individual retail or direct service connections shall not be considered an expansion.) (See WAC 248-56-620 for provisions pertaining to new public water systems in the interim two years.) [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-750, filed 6/28/78.]

**WAC 248-56-760 Coordinated water system plan—Update.** (1) The coordinated water system plan shall be reviewed and updated by the water utility coordinating committee at a minimum of every five years or sooner, if the water utility coordinating committee feels it is necessary, in accordance with both the provisions of WAC 248-54-580 and this section.

(2) Changes in the coordinated water system plan shall be accomplished in accordance with procedures for developing a coordinated water system plan (WAC 248-56-740). If no changes are necessary, the water utility coordinating committee shall submit to the department a statement verifying that the coordinated water system plan is still current.

(3) If the external critical water supply service area boundaries are altered by the county legislative authority(ies) pursuant to WAC 248-54-630, the coordinated water system plan shall be updated as provided for in WAC 248-56-630. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-760, filed 6/28/78.]

**WAC 248-56-800 Coordinated water system plan—Local review.** (1) Prior to submission of a coordinated water system plan to the department for approval, the plan shall be reviewed by the county legislative authority(ies) in the county(ies) in which the critical water supply service area is located. County review of the coordinated water system plan shall include at least one public hearing.

(2) If no comments have been received from the county legislative authority(ies) within 60 days of receipt of the coordinated water system plan, the department may consider the plan for approval.

(3) If within 60 days of receipt of the coordinated water system plan, the county legislative authority(ies) find any segment of the plan to be inconsistent with adopted land use plans, shorelines master programs, the following shall occur:

(a) The county legislative authority(ies) shall submit written description of their determination and justification supporting their determination prior to the end of the 60 day period to the department and all affected parties.

(b) The county legislative authority(ies) shall make every effort to resolve any inconsistencies within 60 days of submittal of written justification.

(c) The department may approve those portions of the coordinated water system plan found not to be inconsistent with adopted plans and policies at any time after the initial determination by the county legislative authority(ies).

(d) If after the 60 day period established for resolution of inconsistencies an inconsistency still exists, the affected parties shall each present their final recommended alternative solution to the department. The department shall then review all alternative solutions and discuss its recommendations with the county(ies) and the water utility coordinating committee. If after two years of the declaration of the critical water supply service area the inconsistencies persist, the department may deny proposals to establish or to expand any public water system facilities which affect that portion of the critical water supply service area being contested. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-800, filed 6/28/78.]

**WAC 248-56-810 Coordinated water system plan—Department approval.** (1) A coordinated water system plan shall be submitted to the department for design approval within two years of the establishment of external critical water supply service area boundaries.

(a) In its review of the coordinated water system plan, the department shall ensure that every topic in the guidelines identified in WAC 248-56-720 has been covered to the extent necessary based on the size and nature of the water system(s) and characteristics of the critical water supply service area.

(b) The department shall not approve those portions of a coordinated water system plan which fail to meet the requirements for future service area boundaries pursuant to WAC 248-56-730.

(2) The department shall either approve the coordinated water system plan, or respond within 60 days from the date the plan is received. [Statutory Authority: Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-810, filed 6/28/78.]

**WAC 248-56-900 Severability.** If any provision of this chapter or its application to any person or circumstance is held invalid, the remainder of this chapter, or the application of the provision to other persons or circumstances, shall not be affected. [Statutory Authority:

Chapter 70.116 RCW. 78-07-048 (Order 1309), § 248-56-900, filed 6/28/78.]

# Chapter 248-57 WAC
# WATER SYSTEM COORDINATION ACT--FIRE FLOW REGULATIONS

WAC



**WAC 248-57-010 Purpose.** This chapter is promulgated pursuant to the authority granted in the Public Water System Coordination Act of 1977, chapter 70.116 RCW, for the purpose of establishing minimum performance standards related to fire protection, including provisions for their application and enforcement, and incorporating them into the design and construction of new and expanding public water systems. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-010, filed 3/12/79.]

**WAC 248-57-100 Definitions.** (1) "Public water system" – Any system or water supply intended or used for human consumption or other domestic uses including, but not limited to, source, treatment, storage, transmission and distribution facilities where water is furnished to any community, number of individuals, or is made available to the public for human consumption or domestic use. This definition shall exclude any water system serving one single family residence, water systems existing prior to September 21, 1977, which are owner operated and serve less than ten single family residences, and water systems serving no more than one industrial plant.

(2) "Expanding public water systems" – Those public water systems installing additions, extensions, changes, or alterations to their existing source, transmission, storage, or distribution facilities which will enable the system to increase in size its existing service area. New individual retail or direct service connections onto an existing distribution system shall not be considered an expansion of the public water system.

(3) "Department" – The Washington state department of social and health services.

(4) "Critical water supply service area" – A geographical area designated by the department or county legislative authority characterized by public water system problems related to inadequate water quality, unreliable service, and/or lack of coordinated water system planning. It may be further characterized by a proliferation of small, inadequate water systems, or by water supply problems which threaten the present or future water quality or reliability of service in such a manner that efficient and orderly development may best be achieved through coordinated planning by public water systems in the area in accordance with chapter 248-56 WAC.

(5) "Fire flow" – The rate of water delivery needed for the purpose of fighting fires in addition to requirements for normal domestic maximum instantaneous demand as referenced in guidelines published by the department entitled "Design standards for public water supplies."

(6) "Local fire protection authority" – The fire district, city, town, or county directly responsible for the fire protection within a specified geographical area.

(7) "Water system plan" – A document identifying present and future water system needs and establishing a program for meeting those needs in the most efficient manner possible, and consistent with other relevant plans and policies affecting the area in which the system is located. (See WAC 248-54-580, 248-56-710 and 248-56-720, and the plan content guidelines for a detailed description of water system plans.)

(8) "Existing service area" – A specific area within which direct service or retail service connections to customers of a public water system are currently available.

(9) "Future service area" – A specific area for which water service is planned by a public water system as determined by written agreement between purveyors. (See WAC 248-56-730.)

(10) "Planning jurisdiction" – The city, town, county or other entity acting as the responsible agency for preparation and adoption of land use plans, policies or standards affecting development.

(11) "Development classifications" – Specific geographical areas within the existing and future service area of a public water system, identified for the purpose of determining the appropriate level of fire protection. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-100, filed 3/12/79.]

**WAC 248-57-200 Scope.** These standards and regulations shall apply to the following new and expanding public water systems:

(1) Those having more than 1,000 services. (See WAC 248-54-580.)

(2) Those with less than 1,000 services located within the boundaries of a critical water supply service area and subject to the requirement for a coordinated water system plan. (See WAC 248-54-580 and 248-56-700.)

NOTE: Public water systems in existence prior to September 21, 1977, which are owner operated and serve less than ten single family residences; serving no more than one industrial plant; or are nonmunicipally owned with no plans for water service beyond their existing service area are exempt from the planning requirement.

[Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-200, filed 3/12/79.]

**WAC 248-57-300 Administration.** (1) The department shall administer these regulations through its ongoing review and approval of water system plans and engineering reports as provided for in WAC 248-54-580, 248-54-590, and 248-56-810.

(2) In the event that plans and specifications for water system improvements are submitted to the department for approval under WAC 248-54-600 and the design of the proposed improvements is inconsistent with development classifications identified in the water system plan, (see WAC 248-57-400) the department shall not approve the plans and specifications.

(3) Plans and specifications for water system improvements (see WAC 248-54-600) proposed within those cities, towns, or counties which operate under local fire flow standards shall include written confirmation that they meet the requirements of adopted local standards from the authority administrating those standards. (See WAC 248-57-900.) [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-300, filed 3/12/79.]

**WAC 248-57-400 Application.** (1) Water system plans prepared by those public water systems identified in WAC 248-57-200 shall include a section in their plans addressing fire flow, hydrant and system reliability standards in accordance with WAC 248-57-500, 248-57-600, and 248-57-700 respectively. The section shall include a map entitled development classifications consistent with the following:

(a) The map shall delineate the existing and future service area of the water system into the following categories:

(i) Rural - lot sizes greater than one acre (including parks, open space, agricultural lands, etc.)

(ii) Residential - lot sizes one acre or less, (including all single and multi-family structures less than 4000 square feet, and mobile home and recreational vehicle parks)

(iii) Commercial and multi-family residential structures with a floor area 4000 square feet or greater.

(iv) Industrial

(b) Assignment of the above categories shall be based upon:

(i) Existing development, and

(ii) Future development for a minimum of ten years as identified in proposed or adopted land use plans and policies applicable within the existing and future service area.

(c) The development classifications outlined in (a) above shall be determined by any method acceptable to the planning jurisdiction(s), provided that the criteria used is consistent within a given critical water supply service area.

(2) The water system plan shall identify and schedule improvements needed in order for the water system to be capable of supplying required fire flow for new and expanding public water systems consistent with these regulations. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-400, filed 3/12/79.]

**WAC 248-57-500 Minimum standards for fire flow.** (1) Minimum fire flows shall be those set forth by city, town or county legislative authority where local standards have been promulgated in accordance with WAC 248-57-900.

(2) Where local standards have not been promulgated in accordance with WAC 248-57-900, minimim fire flows shall be those identified in Table 1. Contact with the county and local fire protection authority shall be made before applying these standards in a water system plan or to design of individual development.

TABLE 1

MINIMUM FIRE FLOWS *

| Development Classification (as described in WAC 248-57-400) | Minimum Fire Flow Requirement |
|---|---|
| Rural | None |
| Residential | 500 gallons per minute for 30 minutes |
| Commercial and multifamily structures greater than 4000 sq. ft. | 750 gallons per minute 60 minutes** |
| Industrial | 1000 gallons per minute for 60 minutes** |

* Minimum flows are in addition to requirements for normal domestic maximum use.

** Commercial and industrial buildings may be subject to higher flow requirements when evaluated on an individual basis by the local fire protection authority.

NOTE: These minimum standards in most cases require less flow than categories in the guidelines published by the Insurance Services Office (Municipal Survey Service, 160 Water Street, New York, New York 10038) and therefore may not result in lower insurance rates.

[Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-500, filed 3/12/79.]

**WAC 248-57-600 Minimum standards for fire hydrants.** (1) In those areas where minimum fire flow requirements must be met, fire hydrants shall be provided in accordance with WAC 248-57-600. If phased installation of water facilities are approved by the department, fire hydrants do not need to be installed until source, storage, and transmission capacity needed to meet the minimum flow requirements are operational: *Provided*, That in such instances a "T" shall be installed every 900 feet where fire hydrants will be located.

(2) Fire hydrants shall be located at roadway intersections wherever possible and the distance between them shall be no further than 900 feet.

(3) All fire hydrants shall conform to American Water Works Association specifications for dry barrel fire hydrants. Each hydrant shall have at least two hose connections of 2 1/2" diameter each and one pumper connection. All connections must have national standard threads or other connection devices consistent with local fire protection authority requirements.

(4) Fire hydrants shall be installed plumb and be set to the finished grade. The bottom of the lowest outlet of the hydrant shall be no less than eighteen inches above the grade. There shall be thirty-six inches of clear area about the hydrant for operation of a hydrant wrench on the outlets and on the control valve. The pumper port shall face the most likely route of approach of the fire truck as determined by the local fire protection authority.

(5) Fire hydrants shall be located so as to be accessible by fire engines and not be obstructed by any structure or vegetation or have the visibility impaired for a distance of fifty feet in the direction of vehicular approach to the hydrant. Fire hydrants subject to vehicle damage (e.g., such as those located in parking lots) shall be adequately protected.

(6) Provisions shall be made to drain fire hydrant barrels to below the depth of maximum frost penetration.

(7) Out of service fire hydrants shall be repaired as soon as possible.

(8) Public water systems are encouraged to enter into contracts with local fire protection authorities to insure proper maintenance of fire hydrants. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-600, filed 3/12/79.]

**WAC 248-57-700 Minimum standards for system reliability.** (1) The public water system shall be capable of supplying minimum fire flows either by gravity, or under the following conditions where fire flows are supplied by pumping:

(a) The largest pump out of service at any pumping level,

(b) The highest capacity treatment unit out of service, while maintaining minimum acceptable standards of water quality.

(c) A power outage in effect, unless the appropriate power utility(ies) records indicate a low incidence of electrical outage, defined as follows:

(i) Outages shall average three or less per year based on data for the three previous years with no more than six outages in a single year. Power must be lost for a minimum of 30 minutes in order to qualify as an "outage."

(ii) Outage duration shall average less than four hours based on data for the three previous years. Not more than one outage during the three previous year period shall have exceeded eight hours.

(2) In assessing system reliability, the department shall also give consideration to potential reliability hazards such as reservoir repair or cleaning and/or lack of parallel water transmission lines. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-700, filed 3/12/79.]

**WAC 248-57-800 Alternate methods.** Fire protection may be provided by means other than those discussed in these regulations, provided that such alternate methods are fully documented in the water system plan and approved by both the local fire protection authority and the department. [Statutory Authority: RCW 70-.116.080. 79-04-007 (Order 1378), § 248-57-800, filed 3/12/79.]

**WAC 248-57-900 Local standards.** (1) Where standards in these regulations do not fully meet the fire protection needs of a city, town or county, the appropriate city, town or county legislative authority may promulgate fire flow and system reliability performance standards applicable within their respective jurisdiction. Such standards shall be fully documented and provide at least equal performance and protection as the minimum requirements contained in these regulations.

(2) Standards established by local jurisdictions shall be submitted to the department for review, and approval if they at least meet the minimum level of protection required by these regulations.

(3) The city, town, or county which adopts local fire flow or system reliability standards shall be responsible for administering those standards. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-900, filed 3/12/79.]

**WAC 248-57-990 Severability.** If any provision of the chapter or its application to any person or circumstance is held invalid, the remainder of this chapter or the application of the provision to other persons or circumstances, shall not be affected. [Statutory Authority: RCW 70.116.080. 79-04-007 (Order 1378), § 248-57-990, filed 3/12/79.]

**BEFORE THE**
**BOARD OF ISLAND COUNTY COMMISSIONERS**
**ISLAND COUNTY, WASHINGTON**

| | | |
|---|---|---|
| ADOPTING A COORDINATED WATER SYSTEM PLAN AND WATER GENERAL PLAN FOR ISLAND COUNTY, WASHINGTON | } } } } | STATE OF WASHINGTON COUNTY OF ISLAND RESOLUTION NO. _____ |

WHEREAS, the Public Water Systems Coordination Act, Chapter 70.116 RCW, grants counties the authority to adopt coordinated water system plans; and

WHEREAS, Island County has not previously adopted a Coordinated Water System Plan; and

WHEREAS, the Board of Island County Commissioners declared Island County a critical water supply service area pursuant to the provisions of Chapter 70.116 RCW in Resolution No. PD 85-07 on July 15, 1985; and

WHEREAS, the Board established a Water Utility Coordinating Committee pursuant to RCW 70.116.040; and

WHEREAS, the Island County Water Utility Coordinating Committee reviewed a "draft plan" in accordance with the provisions of Chapter 248-56 WAC, Water System Coordination Act-Procedural Regulations; and

WHEREAS, the "draft plan" is entitled, "Regional Supplement of the Island County Coordinated Water System Plan"; and

WHEREAS, the Regional Supplement, in addition to the individual water system plans reviewed and approved according to the provisions of the Regional Supplement, will comprise the Island County Coordinated Water System Plan; and

WHEREAS, the Island County Planning Commission has studied and reviewed the Regional Supplement in accordance with Chapter 70.116 RCW and Chapter 36.70 RCW and recommended that the Board of Island County Commissioners adopt the Regional Supplement, which includes the provisions for review and approval of the individual water system plans, as the Island County Coordinated Water System Plan; and

WHEREAS, all future changes to the Coordinated Water System Plan must be in accordance with the provisions of Chapter 70.116 RCW and chapter 248-56 WAC; and

WHEREAS, the Sewerage Water and Drainage Systems Act, Chapter 36.94 RCW, grants counties the authority to adopt water general plans; and

WHEREAS, the Regional Supplement was also reviewed in accordance with Chapter 36.94 RCW by the Island County Standing Committee for Review of Sewerage and/or Water General Plans created pursuant to Ordinance No. _____; and

WHEREAS, RCW 36.94.030 requires that a sewerage and/or water general plan adopted by a county which has previously adopted a comprehensive land use plan must be adopted as an element of that comprehensive land use plan in accordance with the provisions of Chapter 36.70 RCW, the Planning Enabling Act; and

WHEREAS, the Island County Planning Commission has studied and reviewed the Regional Supplement and recommended that the Board adopt the Regional Supplement as an element of the Island County Comprehensive Land Use Plan in accordance with Chapter 36.94 RCW and Chapter 36.70 RCW; and

WHEREAS, all future changes to the Water General Plan must be in accordance with Chapter 36.94 RCW and Chapter 36.70 RCW; and

WHEREAS, the Board of Island County Commissioners held a public hearing on _____, pursuant to the notices required by law, at which time the Board considered the adoption of the Regional Supplement as the Island County Coordinated Water System Plan and the Island County Water General Plan; and

WHEREAS, after careful consideration of the recommendations of the Water Utility Coordinating Committee and the Planning Commission, the Board now finds the Regional Supplement is consistent with goals and policies of the Island County Comprehensive Plan and Chapter 36.70 RCW, and it is in the public interest that the Regional Supplement be adopted as the Island County Coordinated Water System Plan and as an element of the County Comprehensive Plan; and

WHEREAS, after careful consideration of the recommendations of the Standing Committee for Review of Sewerage and/or Water General Plans, and the Planning Commission, the Board now finds that it is advisable and necessary for the public health and welfare of the citizens of Island County that the Regional Supplement be adopted as the Island County Water General Plan so that the County may establish the authority to implement, to the extent it is deemed appropriate by the Board, certain provisions and recommendations of the Regional Supplement.

NOW, THEREFORE, BE IT RESOLVED by the Board of County Commissioners of Island County, Washington, that:

The Regional Supplement of the Island County Coordinated Water System Plan, attached as Exhibit A, and by this reference incorporated herein, is hereby adopted as follows:

1. As the Island County Coordinated Water System Plan, together with individual water system plans prepared by water purveyors in accordance with Chapter 248-54 WAC and Chapter 258-56 WAC, and subsequently reviewed and adopted in accordance with the provisions contained in the Regional Supplement; and

2. As an element of the Island County Comprehensive Plan in accordance with Chapter 36.70 RCW, for purpose of guiding future development of public water supply services and facilities, and adoption of official controls; and

3. As the Island County Water General Plan, pursuant to Chapter 36.94 RCW, subject to the stipulations that:

A. The County, by establishing an authority to adopt, provide for, accept, establish, condemn, purchase, construct, add to, and/or maintain a system of water, shall undertake such activities if, and only if, in each case, the Board has determined, by its sole discretion, that such action by the County is in the public interest; and

B. The County may, if deemed appropriate by the Board, enter into contracts for the establishment, maintenance, and operation of all or a portion of a system of water as outlined in the Regional Supplement and Water General Plan, and as provided in RCW 36.94.190; and

C. No other duties or obligations shall be incurred by Island County, unless consistent with the provisions of the Water General Plan and specifically approved by the Board.

## APPENDIX B

## INDIVIDUAL WATER SYSTEM PLANS

In the following Appendix, Table B-1 lists water systems in Island County which are either:

1. Class 1
2. Municipal or Special District
3. Expanding (see Section VI, 1., Regional Supplement)

The Table provides columns which identify the water system planning requirements (see Section II) and dates of approval by the County and DOH. This Appendix is intended to be updated by the County as new systems are eligible for preparation of water system plans, and as plans are submitted and approved.

Also included in this Appendix are guidelines adopted in this Regional Supplement for the content of:

1. Water System Plans (Checklist only - utilities are referred to DOH, Drinking Water Program, which will supply a complete guidelines booklet on request)

2. Abbreviated Water System Plan

3. Planning Questionnaire

# APPENDIX TABLE B-1

## ISLAND COUNTY CWSP
## STATUS OF WATER SYSTEM PLANNING OF PARTICIPATING PURVEYORS

| I.D. Number | Purveyor | Class | Plan Requirement | Date of Plan Submittal | Date of Plan Approval | |
|---|---|---|---|---|---|---|
| | | | | | County | DSHS |
| MAJOR SYSTEMS, EXPANDING OR NON-EXPANDING | | | | | | |
| Cities | | | | | | |
| 155509 | Town of Coupeville | 1 | AWSP | | | |
| 45950W | City of Langley | 1 | AWSP | | | |
| 62650C | City of Oak Harbor | 1 | WSP | | | |
| Districts | | | | | | |
| 04950P | Bayview Beach Water Dist. | 2 | Q | | | |
| 107483 | Camano Vista Water Dist. | 2 | Q | | | |
| 13900C | Clinton Water District | 1 | AWSP | | | |
| 162562 | Crockett Lake Water Dist. | 1 | AWSP | | | |
| 264508 | Freeland Water District | 1 | AWSP | | | |
| 435508 | Lagoon Point Water Dist. | 1 | AWSP | | | |
| 46650K | Ledgewood Beach W.D. | 2 | Q | | | |
| 480205 | Long Beach Water Dist. | 2 | Q | | | |
| 669501 | Penn Cove Water District | 1 | AWSP | | | |
| 72150R | Rhodena Beach Water Dist. | 2 | Q | | | |
| 76470X | Scatchet Head Water Dist. | 1 | AWSP | | | |
| 96042Q | Swantown Water Dist. | 2 | Q | | | |
| Other Class 2 Systems | | | | | | |
| 00410R | Admiral's Cove, Inc. | 1 | AWSP | | | |
| 10580Q | Camaloch Association | 1 | AWSP | | | |
| 10600T | Camano Co-op Water & Power | 1 | AWSP | | | |
| SP130F | Camano Island State Park | 1 | -- | | | |
| 107507 | Camano Water Association | 1 | AWSP | | | |
| 37680C | Chateau St. Michelle | 1 | -- | | | |
| 16274J | Crosswoods Water Co. | 1 | AWSP | | | |
| 20250L | Dugualla Community, Inc. | 1 | AWSP | | | |
| SP285T | Fort Eby State Park | 1 | -- | | | |
| SP2757 | Fort Casey State Park | 1 | -- | | | |
| 33150P | Hillcrest Village Water Co. | 1 | AWSP | | | |
| 499547 | Madrona Beach Community Water System | 1 | AWSP | | | |
| 034207 | NAS Whidbey Island | 1 | WSP | | | |
| 592000 | New Utsalady Water System | 1 | Q | | | |
| 61750E | Northgate Terrace | 1 | AWSP | | | |
| 662187 | Parkwood Manor MHP | 1 | AWSP | | | |
| 74000F | Rolling Hills Glencairn Community | 1 | AWSP | | | |

TABLE B-1 continued

| I.D. Number | Purveyor | Class | Plan Requirement | Date of Plan Submittal | Date of Plan Approval | |
|---|---|---|---|---|---|---|
| | | | | | County | DSHS |
| 76050W | Sandy Hook Yacht Club Est. | 1 | AWSP | | | |
| 763000 | Saratoga Water, Inc. | 1 | AWSP | | | |
| 771486 | Sea View Water Co. | 1 | AWSP | | | |
| 789759 | Sierra Country Club, Inc. | 1 | AWSP | | | |
| SP8204 | S. Whidbey State Park | 1 | -- | | | |
| 466703 | W. B. Waterworks No. 1 | 1 | AWSP | | | |
| 363146 | Whidbey West Water System | 1 | AWSP | | | |
| OTHER WATER SYSTEMS EXPANDING | | | | | | |
| North Whidbey (Class 2) | | | | | | |
| | Fircrest Water Association | 2 | Q | | | |
| | Harris Custer Estates Water Association | 2 | Q | | | |
| | Indian Ridge Water Co. | 2 | Q | | | |
| | Shirona Water System | 2 | -- | | | |
| | Wildwood Water System | 2 | -- | | | |
| North Whidbey (Class 3 and 4) | | | | | | |
| | Cliff View Water Coop. | 4 | Q | | | |
| | Strawberry Pt. Water Assn. | 4 | Q | | | |
| Central Whidbey (Class 3 and 4) | | | | | | |
| | Fort Casey Inn | 3 | Q | | | |
| South Whidbey (Class 2) | | | | | | |
| | Inglewood Park Water Sys. | 2 | Q | | | |
| | Skyline West Comm. Club | 2 | Q | | | |
| | Useless Bay Shores | 2 | Q | | | |
| | Windmill Heights Community | 2 | Q | | | |
| South Whidbey (Class 3 and 4) | | | | | | |
| | Beverly Beach Division #3 | 4 | Q | | | |
| | Groom, J. D. | 4 | Q | | | |
| Camano Island (Class 2) | | | | | | |
| | Camano City Comm. Club | 2 | Q | | | |

TABLE B-1 continued

| I.D. Number | Purveyor | Class | Plan Requirement | Date of Plan Submittal | Date of Plan Approval | |
|---|---|---|---|---|---|---|
| | | | | | County | DSHS |
| | | | | | | |

TABLE B-1 continued

| I.D. Number | Purveyor | Class | Plan Requirement | Date of Plan Submittal | Date of Plan Approval | |
|---|---|---|---|---|---|---|
| | | | | | County | DSHS |
| | | | | | | |

AWSP - Abbreviated Water System Plan
WSP - Water System Plan
Q - Planning Questionnaire

# CONTENT GUIDELINES FOR

# WATER SYSTEM PLANS

(Checklist Only)

From:

Planning Handbook
August, 1985
Department of Health

# INTRODUCTION

## OBJECTIVE

Planning is a critical management activity of all water utilities. The principal goal of water system planning is to make efficient use of available resources. This is accomplished by making decisions about water system capital improvements and operations which are in accordance with overall system policies and direction expressed in a utility's water system plan.

Another reason for developing a water system plan is to assure orderly growth of the system while maintaining reliable delivery of high quality water. The plan, then, is intended to guide water utility actions in a manner consistent with other activities taking place within the community. If considerable growth or change is occurring in the community, the water system plan will undoubtedly be fairly comprehensive and complex since it deals with the implications of that growth or change. Conversely, a water system plan for an area not undergoing significant growth or change should be fairly simple and straightforward.

The planning handbook has been written to provide assistance to utilities preparing water system plans. The purpose of the planning handbook is to systematically present information needed to develop a good water system plan. It is intended to be used as a guide by those persons responsible for preparing water system plans. The handbook explains the detail needed to thoroughly cover each planning topic.

Hopefully, the educational material presented herein will result in well-conceived and clearly-stated water system plans. The ultimate effect will be improved quality of water service to the public water consumers of Washington State.

## SYSTEMS REQUIRED TO HAVE PLANS

The following systems are required to have water system plans approved by the Department of Social and Health Services (DSHS):

1. Systems with 1000 or more services.

2. Systems with 100 to 999 services when specifically requested by DSHS.

3. Systems in areas utilizing the Public Water System Coordination Act, Chapter 70.116 RCW.

Requirements pertaining to water system planning are identified in WAC 248-54-065. The requirements list general topics which must be addressed in the water system plan. This handbook provides a more thorough, specific description of how each topic should be discussed.

In areas utilizing the Public Water System Coordination Act, the water system plan should closely relate to the Regional Supplement required under that program. Page 4 provides a checklist of subjects required in the Regional Supplement which should also be covered in the water system plan.

## HANDBOOK ORGANIZATION

The planning handbook is organized into five major chapters. Each chapter represents a basic water system plan component. The five chapters are:

Chapter 1. Basic Planning Data
Chapter 2. System Analysis
Chapter 3. Improvements
Chapter 4. Operations Program
Chapter 5. Supportive Documents

Each chapter is divided into several sections to address specific topics in detail. For each section, the handbook describes the Objective (why the subject needs to be addressed), Plan Content (how the subject is expected to be addressed) and Information Sources (where information about the subject may be obtained).

Page 5 presents a checklist which may be used to assure that each subject discussed in this handbook has been addressed.

## THE PLANNING HORIZON

Water system plans are intended to look ahead at least ten years into the future. A longer planning period may be appropriate to coincide with comprehensive or land use plans which typically look ahead twenty years. Some utilities look ahead fifty years to coincide with the life expectancy of some of their facilities.

The first five-year planning interval should be readily predictable for most water utilities. Thus, a definite improvement schedule and financial program is expected for at least the first five years of the water system plan. The second five-year interval is often less predictable, so a more conceptual approach to improvements and financing is expected. The water system plan should continually provide adequate guidance to decision makers, since it must be updated at least every five years.

## PLAN DEVELOPMENT AND REVIEW

Most utilities find it helpful to enlist a consultant to prepare their water system plans. Some accomplish the planning requirement through use of "in-house" staff. DSHS encourages a partnership approach that involves the utility manager, utility operator, city and/or county planner, engineering consultant, financial consultant and the utility owner/decision makers.

The planning needs of a particular water system should be satisfied by its water system plan. Because planning needs are specific for individual systems, the length and complexity of plans will vary from utility to utility. These guidelines have been developed to provide adequate coverage of topics for the state's larger, more complex water systems. Therefore, they may be more detailed than necessary for smaller, less complex water systems.

Although public involvement is not required, some systems utilize an advisory committee to assist in plan development. DSHS recommends that the utility conduct public meetings or hearings to educate the public about the water system's future and to receive valuable input which may influence the plan. Decision makers should be kept well-informed about the plan throughout its development. Other agencies or entities may have specific requirements affecting preparation of the water system plan. Thus, it may be appropriate to contact them at the onset of plan development.

## WATER SYSTEM PLAN APPROVAL

This handbook will also serve as a guide for the DSHS review of water system plans. A water system plan will be approved by DSHS when each topic identified herein has been adequately addressed. Once approved, DSHS considers a utilities' plan to be a commitment to implement the actions identified in the improvement schedule. The utility will be expected to make decisions in accordance with its plan. The specific process for plan development and review is identified on page 8. The process is designed so the utility, DSHS and the county may work together to achieve the most useful planning document possible.

TABLE 1

# REGIONAL SUPPLEMENT CHECKLIST

The following checklist identifies elements of the Regional Supplement which need to be addressed in the text of the water system plan. This checklist should only be used if the utility is involved with the Public Water System Coordination Act (Chapter 70.116 RCW).

| Regional Supplement Element | *Covered in Water System Plan? |
|---|---|
| Map of Future Service Area | ☐ |
| Signed Service Area Agreement | ☐ |
| Population and Water Demand Projections | ☐ |
| Design Standards | ☐ |
| Implementation of Minor Regional Projects | ☐ |
| Implementation of Major Regional Projects | ☐ |
| Implementation of Water Utility Service Review Procedure | ☐ |
| Implementation of Satellite System Management Program | ☐ |
| Water Reservation Conservation Program | ☐ |

*These items should be addressed in their appropriate section of the plan as opposed to a special chapter or appendix.

TABLE 2

# PLAN CONTENT CHECKLIST

The following checklist summarizes the topics which are discussed in each section of this handbook. It is intended to function as a checklist for the utility, assuring that key topics are in the draft water system plan. DSHS will use this checklist during the plan review process. Another copy of this checklist is included at the end of the handbook so it can be torn out for easy reference.

| Section | Topic |
|---|---|
| ☐ Future Service Area | |
| Map of Existing Service Area | ☐ |
| Criteria for Future Service Area | ☐ |
| Map of Future Service Area | ☐ |
| Explanation of Boundaries Shown on Map | ☐ |
| ☐ Service Area Characteristics | |
| History of Growth and Water Service | ☐ |
| Inventory and Summary of Related Plans | ☐ |
| Geography of the Service Area | ☐ |
| Other Items Affecting the Service Area | ☐ |
| ☐ Service Area Policies | |
| Summary of Applicable Policies | ☐ |
| Discussion on Effect of Applicable Policies | ☐ |
| ☐ Future Growth | |
| Existing Land Use Patterns | ☐ |
| Map of Future Land Use Patterns | ☐ |
| Methodology and/or Source of Land Use Projections | ☐ |
| Population Forecasts | ☐ |
| Methodology and/or Source of Population Forecasts | ☐ |
| Map of Future Population Distribution | ☐ |
| ☐ Future Water Demand | |
| Amount of Water Used by Category | ☐ |
| Evaluation of Existing Water Use | ☐ |
| Conservation | ☐ |
| Assumptions for Future Water Demand Calculations | ☐ |

- [ ] Future Water Demand Projections
- [ ] Justification of Future Water Demand
- [ ] Map Showing High Demand Areas

- [ ] Performance and Design Criteria
  - [ ] List of Applicable Criteria
  - [ ] How Criteria will be Applied

- [ ] Inventory of Existing System
  - [ ] List of Facilities in Each Grouping
  - [ ] Functions and Relationships of Facilities
  - [ ] Evaluation of Effectiveness of Facilities
  - [ ] Relationship of Groupings
  - [ ] Evaluation of Recent Improvements
  - [ ] Map of Facilities and Pressure Zones

- [ ] Fireflow
  - [ ] Identification of Standards
  - [ ] Source of Fireflow Standards
  - [ ] Map of Development Classifications (or the Utility's Own Categories)
  - [ ] Summary of Future Fireflow Needs

- [ ] Hydraulic Analysis
  - [ ] Methodology and/or Description of Program
  - [ ] Pressure Limitations and Justification
  - [ ] Description of Scenarios
  - [ ] How Input Data was Derived
  - [ ] Summary of Results

- [ ] Water Resources
  - [ ] Description and Evaluation of Existing Source
  - [ ] Inventory and Summary of Water Resource Studies
  - [ ] Evaluation of Potential for Contamination
  - [ ] Water Rights Assessment (Chart)

- [ ] Water Quality
  - [ ] Assessment of Source Water Quality
  - [ ] Assessment of Distribution System Water Quality
  - [ ] How Identified Problems will be Addressed

- [ ] Summary of System Deficiencies
  - [ ] List of Documented Deficiencies
  - [ ] Discussion of Deficiencies not Previously Documented

☐ Identification of Improvements

- List of Alternative Packages
- Evaluation Criteria
- Assessment of Alternatives
- Description and Justification of Selected Alternatives
- Map of Improvements

☐ Scheduling of Improvements

- Five-Year Definite Schedule
- Schedule for Remaining System Needs
- Improvement Program (Chart)

☐ Financial Program

- Past and Present Financial Status
- Available Revenue Sources
- Allocation of Revenue Sources
- Ability to Secure Needed Revenue
- Assessment of Impact Upon Rates

☐ Operations Program

- Organizational Chart
- Responsibilities of Positions
- Certification Status
- Identification of System Components
- Routine Operation
- Preventive Maintenance Program
- Inventory of Chemicals, Equipment and Supplies
- Sampling Procedure
- Violation Response Procedure
- Emergency Call-up List
- Vulnerability Analysis
- Contingency Plans
- Cross-Connection Control Program

☐ Miscellaneous Supportive Documents

- Environmental Impact Statement or Determination of Non-Significance
- Satellite System Management Program
- Text of Appropriate Agreements
- Response from Affected Entities
- Standard Construction Specifications (Chart)
- Watershed Control Program

TABLE 3

# THE PLANNING PROCESS

The following chart briefly identifies the activities involved in developing and approving a water system plan. The chart also lists which entity is responsible for fulfilling each activity. As can be seen, a partnership approach is utilized throughout.

| Activity | Responsible Entity(ies) | | |
|---|---|---|---|
| | DSHS | Utility or Consultant | *County |
| 1. Arrange Pre-Plan Meeting | | X | |
| 2. Attend Pre-Plan Meeting | X | X | X |
| 3. Prepare Plan | | X | X |
| 4. Submit Draft Plan | | X | |
| 5. Review Plan (30 days) | X | | X |
| 6. Arrange Comment Meeting | X | | |
| 7. Attend Comment Meeting | X | X | X |
| 8. Prepare Written Response | X | | |
| 9. Revise Plan | | X | |
| 10. Submit Final Plan | | X | |
| 11. Review Final Plan (May result in returning to 6) | X | | |
| 12. Approve Plan | X | | |
| 13. Adopt Plan | | X | X |

*DSHS has a working agreement with some counties for development and review of water system plans. Thus, county actions identified in the chart may not be applicable.

# CONTENT GUIDELINES FOR

# ABBREVIATED WATER SYSTEM PLANS

(Island County)

# ABBREVIATED WATER SYSTEM PLAN

An abbreviated water system plan is required from water systems between 100 and 1,000 services which are located within a Critical Water Supply Service Area. Some systems may be exempted from this requirement, so be sure to check with the Department of Health prior to beginning the plan.

The abbreviated water system plan is intended to be less detailed than a water system plan. In general, the larger the water system, the more effort and detail should go into plan preparation. For more complete information about topics identified in this outline, please refer to the DOH Planning Handbook for Water System Plans.

## 1. BASIC PLANNING DATA

A. Future service area map and agreement(s).
B. History of water system development.
C. Existing population and land use.
D. Future population and land use projections for at least the next 10 years.
E. Existing water consumption and future water demand for at least the next 10 years.

## 2. SYSTEM ANALYSIS

A. Inventory of existing facilities, including map of facilities and pressure zones.

B. Evaluation of existing system, including:

(1) Hydraulics
(2) Fireflow
(3) Water Quality
(4) Water Rights
(5) Adequacy of Source
(6) Potential for Sea Water Intrusion

## 3. IMPROVEMENTS

A. Identify improvements which will be needed in the next 10 years.
B. Improvement schedule (definite for at least the first 5 years).
C. Cost of scheduled improvements, and how each will be financed.

## 4. OPERATIONS PROGRAM

A. Name, phone numbers, and responsibilities of person(s) involved in water system operations. (Identify who is certified and at what level.)
B. Routine operation procedures.
C. Preventive maintenance procedures.
D. Sampling procedure, including response when sample results exceed state standards.
E. Sampling requirements addressed in the Sea Water Intrusion Policy as indicated by the Island County Health Department.
F. Response to emergencies.

## 5. RELATIONSHIP WITH OTHER PLANS

A. Compatibility with Regional Supplement.
B. Compatibility with other related plans, including water system, land use, and water resource planning efforts.

## 6. COMPLIANCE WITH SEPA REQUIREMENTS

# CONTENT GUIDELINES FOR

# PLANNING QUESTIONNAIRE

(Island County)

# PLANNING QUESTIONNAIRE

To aid in the development of water systems located within designated Critical Water Supply Service Areas, purveyors are required to develop a water system plan. This questionnaire is to be filled out by water purveyors which have less than 100 services.

## PART 1 - FACILITIES

1. Describe how your existing system works.

2. Has your system had any water quality problems? If so, how have they been corrected?

3. (A) How many existing services does your system have?

   (B) How may services do you expect to have 10 years from now? How did you arrive at that number?

4. Does your system have adequate water rights? If not, explain the situation. Attach a copy of your existing water rights.

5. What improvements will your system need in the next 5 years? Describe why each will be needed.

_____

_____

_____

_____

_____

6. (A) How much will each improvement cost?

   (B) How will each improvement be financed?

_____

_____

_____

_____

7. Attach a copy of your service area map and agreement(s).

8. (A) Are you interested in sharing facilities or intertying with another water system?

_____

   (B) Are you interested in having another entity operate and maintain your system?

_____

## PART 2 - OPERATIONS PROGRAM

1. List name and phone number of person(s) responsible for your water system.

_____

_____

_____

2. What are procedures for turning your system on and off, and for routine operation?

3. (A) Who do you call when an operational problem arises?

(B) How do they respond to emergencies?

4. List procedures for cleaning your system (tanks, mains, etc.)

5. (A) What is your sampling frequency and procedure?

(B) How do you respond when results of samples exceed state standards?

6. Indicate how your system will incorporate the Sea Water Intrusion Policy requirements as indicated by the Island County Health Department?

_____

_____

_____

_____

7. Other items unique to your system:

_____

_____

_____

_____

# APPENDIX C

## POPULATION AND DEMAND FORECASTS

TABLE C-1

ISLAND COUNTY WATER DEMAND PROJECTIONS (1)

ANNUAL WATER CONSUMPTION (Million Gallons)

| PROJECTION -- | YEAR 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. ANNUAL CONSUMPTION BASED ON OFM POPULATION PROJECTION (2) | | | | | | | | | | | | | |
| Camano Island | 185 | 207 | 240 | 268 | 297 | 325 | 354 | 382 | 411 | 439 | 468 | 496 | 524 |
| Central Whidbey | 224 | 250 | 290 | 324 | 359 | 393 | 428 | 462 | 497 | 531 | 565 | 600 | 634 |
| North Whidbey | 932 | 1,041 | 1,205 | 1,348 | 1,491 | 1,634 | 1,778 | 1,921 | 2,064 | 2,207 | 2,350 | 2,493 | 2,636 |
| South Whidbey | 266 | 297 | 344 | 385 | 426 | 467 | 507 | 548 | 589 | 630 | 671 | 711 | 752 |
| Whidbey Island | 1,422 | 1,589 | 1,839 | 2,058 | 2,276 | 2,494 | 2,712 | 2,931 | 3,149 | 3,367 | 3,586 | 3,804 | 4,022 |
| COUNTY TOTAL | 1,608 | 1,796 | 2,079 | 2,326 | 2,573 | 2,819 | 3,066 | 3,313 | 3,560 | 3,806 | 4,053 | 4,300 | 4,547 |
| 2. ANNUAL CONSUMPTION BASED ON ICPD POPULATION PROJECTION (2) | | | | | | | | | | | | | |
| Camano Island | 186 | 230 | 277 | 327 | 376 | 425 | 475 | 524 | 573 | 622 | 672 | 721 | 770 |
| Central Whidbey | 223 | 270 | 325 | 381 | 438 | 495 | 551 | 608 | 664 | 721 | 777 | 834 | 891 |
| North Whidbey | 931 | 1,062 | 1,278 | 1,498 | 1,719 | 1,940 | 2,161 | 2,382 | 2,602 | 2,823 | 3,044 | 3,265 | 3,486 |
| South Whidbey | 266 | 321 | 387 | 454 | 522 | 589 | 657 | 725 | 792 | 860 | 927 | 995 | 1,062 |
| Whidbey Island | 1,420 | 1,653 | 1,989 | 2,334 | 2,679 | 3,024 | 3,369 | 3,714 | 4,059 | 4,404 | 4,749 | 5,094 | 5,439 |
| COUNTY TOTAL | 1,606 | 1,883 | 2,267 | 2,661 | 3,055 | 3,449 | 3,843 | 4,238 | 4,632 | 5,026 | 5,420 | 5,814 | 6,209 |
| 3. SEASONAL CONSUMPTION BASED ON ICPD PROJECTION (4) | | | | | | | | | | | | | |
| Camano Island | 71 | 80 | 90 | 100 | 109 | 119 | 128 | 138 | 147 | 157 | 166 | 176 | 185 |
| Central Whidbey | 35 | 39 | 44 | 48 | 52 | 56 | 60 | 65 | 69 | 73 | 77 | 81 | 85 |
| North Whidbey | 5 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 15 |
| South Whidbey | 66 | 75 | 84 | 97 | 109 | 122 | 134 | 146 | 159 | 171 | 184 | 196 | 208 |
| Whidbey Island | 106 | 120 | 134 | 152 | 169 | 187 | 204 | 222 | 239 | 257 | 274 | 292 | 309 |
| COUNTY TOTAL | 177 | 200 | 224 | 251 | 278 | 305 | 332 | 359 | 386 | 413 | 440 | 467 | 494 |
| TOTAL CONSUMPTION WITH SEASONAL ESTIMATE INCLUDED (MG) | | | | | | | | | | | | | |
| OFM BASIS (1 PLUS 3) | 1,785 | 1,996 | 2,303 | 2,577 | 2,851 | 3,125 | 3,398 | 3,672 | 3,946 | 4,220 | 4,493 | 4,767 | 5,041 |
| ICPD BASIS (2 PLUS 3) | 1,783 | 2,083 | 2,491 | 2,912 | 3,333 | 3,755 | 4,176 | 4,597 | 5,018 | 5,439 | 5,860 | 6,282 | 6,703 |

FOOTNOTES:

(1) Average Day Demands are based on 100 gallons per capita per day.

(2) Based on population forecast by the Washington State Office of Financial Management - See Section III

(3) Based on population forecast by the Island County Planning Department (Population Trends in Island County) - See Section III

(4) Consumption by seasonal population at same per capita rate as resident, but assumes only 15% of capacity during 4 months of the year

TABLE C-2

ISLAND COUNTY
SUMMARY OF 1980 CENSUS DATA ON HOUSING OCCUPANCY

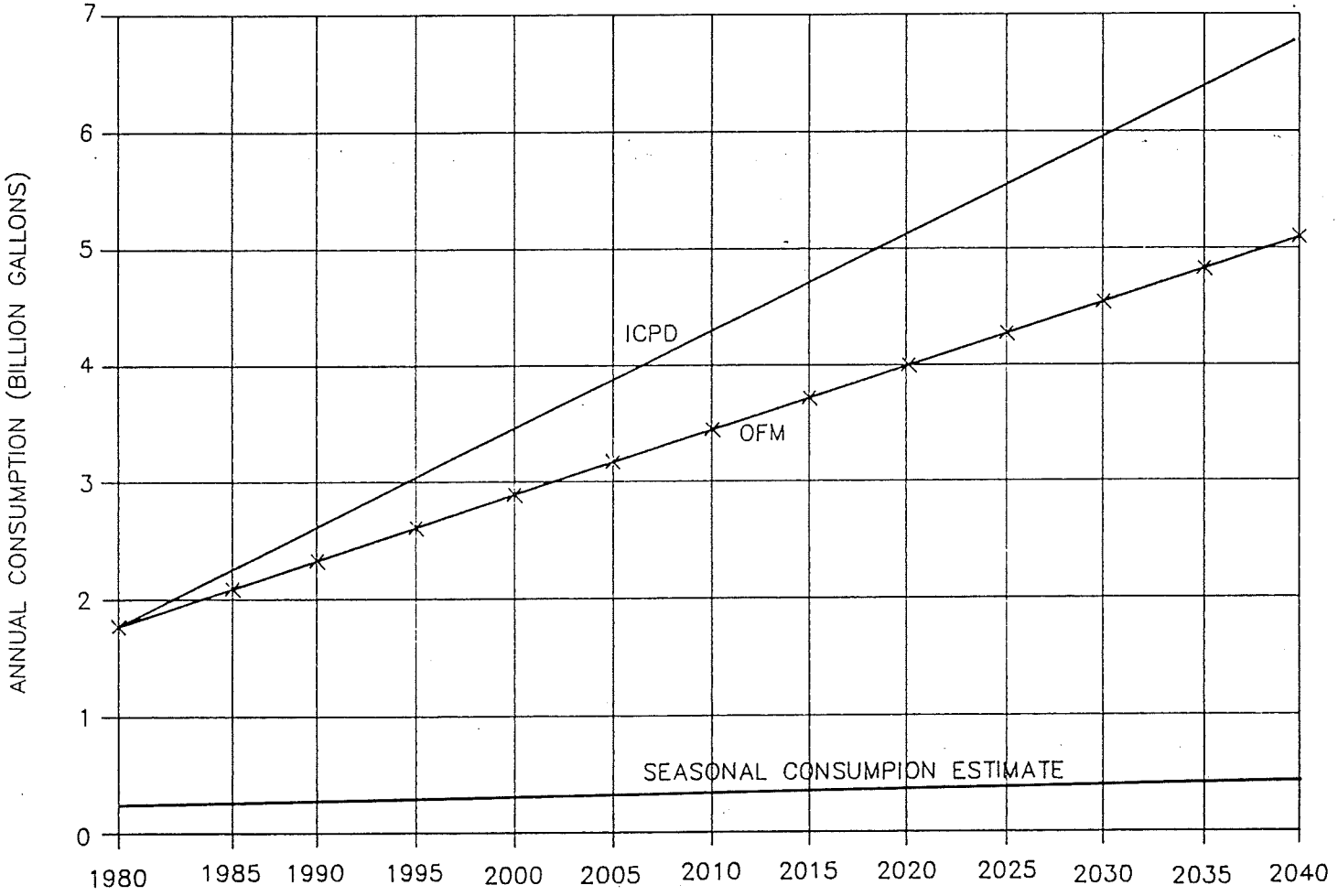
| Area | No. of Persons | | | No. of Families | Number of Housing Units (1) | | | Year-Round Housing (2) | | | Heads Per Household (3) | Seasonal Housing (4) | Seasonal Population (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | Rural | Total | | Urban | Rural | Total | Occupied | Vacant | Total | | | |
| Camano Island | 0 | 5,080 | 5,080 | 1,667 | 0 | 3,854 | 3,854 | 2,151 | 354 | 2,505 | 2.36 | 1,349 | 3,373 |
| Central Whidbey | 0 | 6,144 | 6,144 | 1,904 | 0 | 3,582 | 3,582 | 2,558 | 708 | 3,266 | 2.40 | 316 | 790 |
| North Whidbey | 0 | 25,535 | 25,535 | 6,447 | 0 | 4,131 | 8,885 | 8,222 | 588 | 8,810 | 3.11 | 75 | 188 |
| South Whidbey | 0 | 7,289 | 7,289 | 2,147 | 0 | 4,551 | 4,551 | 2,928 | 399 | 3,327 | 2.49 | 1,224 | 3,060 |
| Whidbey Island | 0 | 38,968 | 38,968 | 10,498 | 0 | 12,264 | 17,018 | 13,708 | 1,695 | 15,403 | 2.84 | 1,615 | 4,038 |
| Island County | 0 | 44,048 | 44,048 | 12,165 | 0 | 16,118 | 20,872 | 15,859 | 2,049 | 17,908 | 2.78 | 2,964 | 7,410 (6) |

Footnotes:

(1) Includes vacant, seasonal, and migratory units (note: U.S. Census Bureau does not classify Oak Harbor area as "urban").
(2) Includes only year-round housing units.
(3) Based on total number of persons and occupied year-round housing units.
(4) Computed from total housing units minus year-round housing.
(5) Assumes 2.5 heads per seasonal household. May not include all hotel, motel, and bread and breakfast units. The Economic Development Council estimates there are approximately 420 hotel/motel, etc. rooms available in Island County.
(6) Compare to 1980 population figure taken from "Island County Population Trends" of 11,200 persons. The latter estimate is based on a 1977 special census of seasonal housing counts and assumes 3.0 persons per dwelling unit.

# EXHIBIT C-1

## ISLAND COUNTY WATER CONSUMPTION
## BASED ON ICPD AND OFM PROJECTIONS




ICPD AND OFM PROJECTIONS INCLUDE SEASONAL CONSUMPTION
BASED ON AVERAGE ANNUAL CONSUMPTION OF 100 GALLONS PER DAY PER CAPITA

# APPENDIX D

## WATER SYSTEM DATA

SUMMARY OF CLASS ONE WATER PURVEYORS



| | Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information: Services | Service Information: Population (see note) | Service Information: Potential Services | System Facilities: Source | System Facilities: Available Supply (gpm) | System Facilities: Storage (thousand gallons) | System Facilities: Distribution | Fire Flow | Certified Operator | Water Treatment | Future Expansion | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Admiral's Cove T31N, R1E S24 | Owned by Admiral's Cove Inc. Platted development On Whidbey Island. | no | 171 | 325 | Unk. Pot. Services 821 lots | G-195 ft.<br>G-201 ft. | 312<br>234 | 49 (S) | 4",6",8" | yes | no | Cl | no | Expansion will be limited to connections to the existing system. Many lots probably will not be developed because of failing perc. tests. Further development in area will probably be limited by Naval jet training strip nearby. Only one other small water system nearby. |
| 2. | Ault Field T33N, R1E | System Serves the Naval Air Station Polnell Pt., OLF and the Sea Plane Base near Oak Harbor | no | 1400 | 8,000 | Unk. | Purchase (Oak Harbor)<br>5 wells | <br>335 | 6,800 (C) | Up to 18" | yes | temp | Cl, Fl | yes | The system will expand within the boundaries of the Naval Station only. It will not supply water outside of the boundaries. If necessary, right of of way may be available to extend utilities through the base. |
| 3. | Bayview Beach Water District, Systems #1 and #2 T29N, R2E S18 & 24 | Located on Useless Bay in south Whidbey Is. Two separate water systems under the same management. | 1985 | #1 99<br>#2 98 | 300<br>300 | 98<br>150 | G-146 ft.<br>G-167 ft. | 150<br>200 | 78 (C)<br>120 (C) | 6",8"<br>4",6",8" | yes<br>yes | not required | none<br>none | no<br>no | Growth for the system on the beach is limited by geographical constraints. To the west is Double Bluff, a very steep hill. To the north is marsh, unsuitable for development. The second system, on the north side of Deer Lagoon, will support additional connections. No plans for future suervice area, but possibly to the north side of Hwy 525. Several small systems to the east with potential for coordination. |
| 4. | Camaloch Assn. T32N, R3E S30 | Community owned system in platted development. On Camano Island. | no | 210 | 560 | Unk. Pot. Services 460 lots | G-223 ft.<br>G-230 ft.<br>G-230 ft. | 190<br>420<br>420 | 115 | 4" | no | yes | Cl | no | The system is completely installed as is. The contact people feel that the community has no interest in external management nor are they interested in being a water purveyor. Fire flow limited by line size. |
| 5. | Camano Co-op Water & Power Co. T31N, R2E S14 | Cooperative water system on west side of Camano Island. Present system dates back to 1957. | 1974 | 187 (P)<br>150 (T) | 500 (P)<br>400 (T) | 450 | 46 Shallow wells, 6 to 22 ft.<br><br>G-318 ft. | 265<br><br>128 | 100 (C)<br>30 (C)<br>40 (C) | 4",6" | no | no | Cl | yes | Fire flow limited by primary 4" mains. Some 2" fire risers exist. Expansion of mains would be limited to areas seviceable by gravity only. Recently, aquired Lost Meadows water system. Deep well not in service yet. Plans for new storage in 100,000 gal range or greater. Future improvements will upgrade exist sytem to standards. Potential for coordination with Camano City and Onamac water systems. New well and storage will add to potential connections. Revised hydraulic studies have been performed and approved by the DSHS for new additons. Maintaining sufficient pressure in some areas is a problem. |
| 6. | Camano Island State Park T31N, R2E S36 | State Park on south west side of Camano Island, system dates to early 60's | no | 4 (P) | 6 (P)<br>Up to 3,500/month (T) | Unk. | G-198 ft.<br>G-220 ft. | Unk.<br>Unk. | 12 | Unk. | Unk. | yes | none | no | This State park, like others in Island Co., does not anticipate immediate growth. Water sevice is provided primarily at hose bibs to campers. Any improvements or upgrades would be financed by Washington State. The system is not capable of providing water outside the park. |

| | Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information | | | System Facilities | | | | Fire Flow | Certified Operator | Water Treatment | Future Expansion | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Services | Population (see note) | Potential Services | Source | Available Supply (gpm) | Storage (thousand gallons) | Distribution | | | | | |
| 7. | Camano Water Assn. T31N, R3E S19,29,30 | Large development water system on east side of Camano Island. Community owned | no | 400 | 1,100 | Unk. | G-207 ft.<br>G-118 ft.<br>G-238 ft.<br>G-372 ft.<br>G-327 ft. | 125<br>36<br>20<br>70<br>95 | 100 (C)<br>80 (C)<br>80 (C)<br>40 (C)<br>20 (C) | 4",6" | yes | temp | none | yes | Well capacities reported lower than DSHS records. One supposedly suffered damage to well screen. Expansion of system will be into areas within the boundary of the development. Some areas have mains too small for required fireflow. Smallest reservoir is not used. System in good condition. Possible to serve other areas. The community prepared a comprehensive water system plan in 1985 but it was not submitted to DSHS for approval. |
| 8. | Clinton Water District T29N, R3E S25 | Water district serving area adjacent to S. Whidbey Is. ferry terminal. | 1975 | 491 | 1,050 | Unk. | G-135 ft.<br>G-100 ft.<br>G-250 ft.<br>G-90 ft.<br>G-100 ft. | 85<br>85<br>85<br>50<br>85 | 100 (R)<br>100 (R) | 2"-8" | yes | yes | none | yes | Some areas are still served by 2" lines which are insufficient for fire flow. These are to be upgraded in the future. |
| 9. | Town of Coupeville T32N, R1E S33 & 34 | Municipal water system located in central Whidbey Island, dates to 1920's | 1981 | 670 | 2,500 | Unk. | G-30 ft.<br>G-215 ft.<br>G-210 ft. | 95<br>200<br>30 | 500 (S)<br>500 (B) | 4"-12" | yes | yes | Cl<br>soft | yes | The system anticipates growth and expanding service to areas adjacent to the city limits. The system has been upgraded over time. Fire flow does not meet county standards in some areas. The electrodialysis treatment plant is currently operating only during times of high water demand. The operational costs are relatively expensive. |
| 10. | Crockett Lake Water District T31N, R1E S14 | Water district in small development south of Coupeville. | 1987 | 115 | 300 | 115 | G-204 ft.<br>G-204 ft. | 53<br>65 | 40 | 2-1/2", 4" | no | temp | Cl | no | Plan for upgrading system approved in May of 1987. Plans include new 45,000 gal tank, upgrade pressure system and install meters at connections. The area is under a building moratorium until the upgrades are completed. Construction expected in the spring of 1988. |
| 11. | Crosswoods Water Co T32N, R1E S3 | Small development west of Oak Harbor | no | 127 | 425 | 150 | G-177 ft.<br>G-177 ft. | 55<br>45 | 43 | 6" | yes | no | none | no | It is intended that the system will annex to Oak Harbor and then receive supply from the City. There is no plan to expand the service. The system appears well designed. |
| 12. | Deception Pass State Park T34N, R1E S35 | State Park at north end of Whidbey Island | no | 1 | 2 (P)<br>Up to 25,000/month (T) | Unk. | Purchase (Oak Harbor)<br>G-175 ft. | <br>25 | 20 | 6" | Unk. | yes | none | no | No immediate plans for expansion. If purchased water from Oak Harbor is extended to Cornet Bay the existing well would be abandoned. The park area on the west side of Hwy 20 is served by water from Oak Harbor transmission lines. |
| 13. | Driftwood Hts. Assn., Driftwood Hts. Assn. #2, Camano Sunrise Water System, Green Island Water System T31N, R2E S12 | Small water systems intertied on Camano Island | no | 86 | 215 | 100 | G-190 ft. | 160 | 80 | 4" | no | not required | none | no | These systems are particularly significant in that they are all intertied together. Each one operates independently. The most recent, DH #2, meets all design standards and provides adequate fireflow. DH #1 has experienced some problems with pressure. The water quality for all the systems has been described as good. |
| | | | no | 4 | 10 | 25 | G-188 ft. | 25 | | 6" | yes | not required | none | no | |
| | | | no | 33 | 66 | 90 | G-212 ft. | 70 | 85 | Unk. | Unk. | not required | none | no | |
| | | | no | 25 | 75 | 110 | G-152 ft.<br>G-554 ft. | 25<br>100 | 80 | 4",6" | yes | not required | none | no | |

| Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information | | | System Facilities | | | | Fire Flow | Certified Operator | Water Treatment | Future Expansion | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Services | Population (see note) | Potential Services | Source | Available Supply (gpm) | Storage (thousand gallons) | Distribution | | | | | |
| 14. Dugualla Community Association T33N, R2E S17 | Located north east of Ault Field on Dugualla Bay | no | 160 | 400 | 260 | G-56 ft.<br>G-56 ft. | 260<br>160 | 22 (C)<br>40 (C)<br>105 (C) | 6" | yes | yes | none | no | Expansion limited to additional connections on existing system. Growth at 1-5 homes a year. The community is isolated from other systems making interties difficult. Appears to be a well designed system with adequate supply and storage. The Island County Health Dept. has noted some problems with pressure and water quality. Further investigation will determine specific problems. |
| 15. Fort Ebey State Park T32N, R1W S36 | State Park located west of Coupeville. | no | 1 | 4 (P)<br>Up to 2,000/month (T) | Unk. | G-210 ft. | 14 | 20 | Unk. | Unk. | yes | none | no | The well is suspected of salt water intrusion. An increase in service may require another source. |
| 16. Fort Casey State Park T31N, R1E S22 | State Park located east of Coupeville. | no | 2 - 6 | (P)<br>Up to 5,000/month (T) | Unk. | Purchase (Coupeville) | | | 4",6" | yes | yes | none | no | The system will probably not expand. There will be system upgrades as required. |
| 17. Freeland Water District T29N, R2E S10 | Growing water district in south Whidbey Is., dates back to 1964 | 1981 | 275 | 700 | Unk. | G-240 ft.<br>G-200 ft. | 140<br>130 | 100 (R) | 6"-10" | yes | temp | none | yes | The system is prepared to expand. Mains extend into currently undeveloped areas. Additional future improvements include additional storage, further extension of mains to loop system and add additional service area. |
| 18. Hilcrest Village Water Co. Inc. T33N, R1E S33 | Development west of Oak Harbor | no | 280 | 750 | Unk. | G-226 ft.<br>G-226 ft.<br>G-220 ft.<br>G-220 ft. | 70<br>70<br>90<br>90 | 72 | 4" | no | yes | Cl | no | The system is switching to a new operator. The hope is that the area will eventually be annexed to Oak Harbor which would then supply the water. The system does have fire hydrants but flow is limited by the small mains. |
| 19. Lagoon Point Water District T30N, R3E S11 | Large development on Admiralty Inlet. Existing dates to 1970 | 1970 | 130 (P)<br>155 (T) | 187 (P)<br>325 (T) | 525 | 4 wells | 360 | 128 (S) | 4",6",8" | yes | yes | none | no | The system appears to be well planned and designed. The wells appear to produce a good quantity and quality of water. Plans for a 300,000 gallon reservoir on the ridge east of the system. The reservoir would provide backup and additional storage for the existing system. There are no plans to expand the existing service area. It is proposed to finance the tank with a general obligation bond. There are concerns about the extent of the aquifer. Good potential for expansion and coordination with adjacent area especially if new reservoir is built. Currently, the system is isolated from other water systems. All connections metered. Comprehensive water plan prepared in 1970. |
| 20. City of Langley T30N, R3E S34 | Municipal water system in S. Whidbey | 1980 | 600 | 1,600 | Unk. | G-50 ft.<br>G-50 ft.<br>G-270 ft.<br>G | 90<br>40<br>200<br>500 | 275 | Unk. | yes | yes | none | yes | The city would like to extend the water sevice area with annexation. This may not be feasible in all cases. The new well will provide adequate supply to the city and future service area. |

| | Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information: Services | Service Information: Population (see note) | Service Information: Potential Services | System Facilities: Source | System Facilities: Available Supply (gpm) | System Facilities: Storage (thousand gallons) | System Facilities: Distribution | Fire Flow | Certified Operator | Water Treatment | Future Expansion | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21. | Ledgewood Water District T31N, R2E S10 | Water district in central Whidbey, system dates to 60's, district formed 1980 | 1985 | 93 | 340 | 200 | G-232 ft.<br>G-315 ft. | 33<br>18 | 17 (C)<br>28 (C) | 1.5"-6" | no | not required | none | no | There are plans for additional storage capacity. Upgrades for the system are financed by Local Improvement District (LID). Currently, small diameter existing pipe is being replaced with 6". The system upgrades will provide fire flow. Potential for cooperation and interties with neighboring systems. |
| 22. | Madrona Beach Community Water System T31N, R2E S34 | Community owned system on the east side of Camano Island | no | 156 | 375 | Unk. | G-471 ft.<br>G-500 ft. | 105<br>95 | 150 (C) | 3"-8" | yes | yes | Cl | no | The system has been upgraded over the last 10 years. It appears in good condition. 500 ft. maximum distance to a fire hydrant. The system was reported to meet fire flow requirements. Plans for an emergency intertie with neighboring water system. Well capacities and number reported differ from DSHS records. |
| 23. | New Utsalady Water System Inc. T32N, R3E S19 | Development in north Camano Is., dates back to late 1950's | no | 56 (P)<br>54 (T) | 120 (P)<br>160 (T) | 124 | G-134 ft.<br>G-56 ft. | 61<br>4 | 22 (C)<br>13 (C) | 4",6" | no | not required | none | no | The area is fairly well developed. A third well was to have been drilled recently for additional supply. Other future improvements planned include a new 76,000 gallon reservoir and new mains parallel to existing lines to loop and provide fire flow. Several other water systems in the area with good potential for coordination. Possible interest in operations, management and acquistion. |
| 24. | North Whidbey Water District T34N, R1E S35 | Small water district loscated just south of Deception Pass, dates to the 1970's | Unk. | 5 | 20 (P)<br>Up to 200/mon. (T) | 10 | Purchase (Oak Harbor) | | none | 6" | yes | not required | none | yes | Presently, a Class 3 system. Expanding the system would require storage facilities. Several areas in North Whidbey could be served by the District. No immediate plans for expansion but interested in expanding service. Meter at the main connection and meters at all individual connections. Two 2" connections at the supply line at 130 psi. Storage would be required for additional services. |
| 25. | Northgate Terrace Water System T33N, R1E S11 | Located north of Ault Field. System installed in 1970. | no | 206 | 650 | 274 | G-171 ft.<br>G-230 ft. | 140<br>140 | 80 (C) | 4" | no | yes | Cl | no | There are no plans for extending the current service area. Connections have been made however beyond the existing plan filed with DSHS. Fire flow is limited by line sizes. Located adjacent to Oak Harbor supply lines but are not currently connected. |
| 26. | Oak Harbor T32N, R1E | Large municipal water system. | 1988 | 3000 | 14,000 | Unk. | Purchase (Anacortes)<br>G-250 ft.<br>G-245 ft.<br>G-160 ft. | 1,900<br>180<br>180<br>180 | 2,000 (S)<br>500 (S)<br>500 (S) | 2"-24" | yes | yes | Cl,Fl | yes | The proposed service area will extend into area west and south of the city. Fire flow does not meet standards in some areas. |
| 27. | Parkwood Manor Mobil Home Park T33N, R1E S34 | Serves mobil home park on north side of Oak Harbor service area. | no | 198 | 530 | 198 | G-192 ft.<br>G-192 ft. | 60<br>60 | 80 | 2",4" | no | yes | none | no | This system is completely developed with no plans for expansion. Has no fire flow. There are no plans for connecting with the Oak Harbor water system. There is some discrepancy between the reported well capabilities and DSHS records. |

| | Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information | | | System Facilities | | | | Fire Flow | Certified Operator | Water Treatment | Future Expension | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Services | Population (see note) | Potential Services | Source | Available Supply (gpm) | Storage (thousand gallons) | Distribution | | | | | |
| 28. | Penn Cove Water District T32N,R1E S22 | Water district that serves a develpement on the north side of Penn Cove. | Unk. | 161 | 500 | Unk | G-180 ft.<br>G-180 ft. | 150<br>150 | 80 | 4",6" | yes | yes | soft | no | This is a gravity system with exception of one small area. It appears to be in need of upgrade to the existing system. The area is almost completely developed. The wells can not be operated at the same time for extended periods because they lie in the same aquifer and are very close to each other. Large amounts of salts are used to soften the water. |
| 29. | Rolling Hills Glencairn T32N, R1E S20 | Water district that serves a develpement on the north side of Penn Cove. Dates to 1960 with system upgrades. | no | 230 | 450 | Unk. | G-185 ft.<br>G-265 ft. | 115<br>115 | 125 (C)<br>65 | 4" | no | yes | Cl<br>soft | no | There are 2 in. fire risers but flow is limited by main sizes. The mains need replacement. There is possible interest in outside acquisiton, management and operation. There is also interest in receiving off insland water if extended from Oak Harbor |
| 30. | Sandy Hook Yacht Club Estates T28N, R3E S14 | Community owned system in platted development. Future expansion limited to additional services on existing system. | no | 88 (P)<br>69 (T) | 200 (P)<br>300 (T) | 165<br>269 lots | G-450 ft. | 182 | 130 (C) | 4"-8" | yes | no | none | no | The system depends on a single deep well with a long history of good production. The contact person felt the community has no interest in supplying other areas with water through expansion or intertie. Fireflow is limited by fire standpipes. |
| 31. | Saratoga Water Inc. T30N, R3E S19 | Water system serving development in South Whidbey | no | 155 | 414 | 155 | G-164 ft.<br>G-164 ft. | 30<br>30 | 40 | Unk. | Unk. | no | none | Unk. | The system is under a building moratorium until the sytem is upgraded to the approval of the DSHS. One well was not approved by the DSHS. The system is described by the DSHS as "seriously inadequate" to serve the existing connections. Information based on DSHS and Island Co. Health Dept. records. System upgrades are supposedly under design; the owner and engineer were unavailable for comment. |
| 32. | Scatchet Head Water Dist. T28N, R3E S15 | Water district in S. Whidbey Island on Cultus Bay | 1978 | 163 | 435 | Unk. Pot. Services 232 meters 492 lots | G-272 ft.<br>G-100 ft. | 300<br>125 | 300 | 2",4",6" | yes | yes | Cl | no | The district is still developing and adding new connections. 492 lots total but many will not perc. There is inconsistency with the large well capability reported and the DSHS records. Small well used only for back up. Salt water intrusion suspected in small well. Little interest in extending the district boundary. |
| 33. | Sea View Water Co. T32N, R1E S7 | Privately owned system in small platted development. | no | 135 | 330 | 210 | G 274 ft.<br>G 274 ft.<br>G 288 ft. | 80<br>80<br>100 | 30 (C)<br>30 (C) | 4" | no | yes | filter | yes | Fireflow is limited by line size. There are 20 acres on the north east side of the service area that the owner would like to develop in the next five years. The expansion would be privately financed. There is an emergency intertie with Whidbey West water system. |
| 34. | Sierra Country Club Inc. T32N, R1W S25 | Community owned system in development on west side of Whidbey Is. | no | 130 | 300 | 160 | G-315 ft.<br>G | 90 | 81 (C) | 4",6" | yes | temp | Cl<br>Soft | no | This system has particularly poor water quality. The Mn and Fe concentrations are high and there are indications of salt water intrusion. The County Health Dept. and the DSHS are monitoring the quality and regulating new construction. Fire hydrants exist but the actual fire flow capabilities are not known. Storage is somewhat limited. Change in ownership, management or operation possible. Interest in of island water if extended form Oak Harbor. Not interested in supplying water to others. |

| Water System Name Township/Range | Description | Approved Comp. System Plan | Service Information: Services | Service Information: Population (see note) | Service Information: Potential Services | System Facilities: Source | System Facilities: Available Supply (gpm) | System Facilities: Storage (thousand gallons) | System Facilities: Distribution | Fire Flow | Certified Operator | Water Treatment | Future Expansion | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35. Silver Lake Water Co. T33N, R2E S34 | Corporation owned system in NE Whidbey Is., dates to 70's | no | 98 | 400 | 234 | G-350 ft.<br>G-333 ft. | 50<br>50 | 50 (C)<br>50 (C) | 4",6" | yes | not required | sequest-ering | no | There are no plans to extend the service area. The majority of the sevice area is undeveloped with the mains readily accessable for connection. Other storage facilities will be added as required. Intertie supplies water to Polnell Hts. Water Assn. during some parts of the year. The wells and all connections are metered. Potential for coordination with other systems. |
| 36. South Whidbey State Park T30N, R2E S29 | State Park in SW Whidbey Island | no | 1 | 4 (P)<br>Up to 3,000/mon. (T) | Unk. | G-358 ft. | 19 | Unk. | Unk. | Unk. | yes | none | no | This park serves somewhat as an overflow for the other two parks on Whidbey Island. There are no plans to expand the service. The system is isiotated neighboring systems. |
| 37. W & B Waterworks # 1 T29N, R2E S22 | Privately owned water system. Serves developments in S. Whidbey. | no | 200 | 535 | 350 | G-280 ft.<br>G-300 ft.<br>G-280 ft.<br>G-264 ft. | 75<br>50<br>75<br>25 | 50 (C)<br>50 (C) | 4",6",8" | yes | yes | none | yes | The owner has extended mains into areas previously served by other water systems. Would like to extend service to other areas that can be supplied by gravity flow. Potential for upgrading supply sources and supplying a larger area. Any expansions of the system would be privately financed or assessed to the induviduals receiving the future service. |
| 38. Whidbey West Water System T33N, R1E S32 | Private owner. Combination of four water systems on west side of Whidbey Island. | no | 128 | 340 | Unk. | G-100 ft.<br>G-75 ft.<br>G-206 ft.<br>G-337 ft. | 50<br>50<br>132<br>52 | 50 (C)<br>6 (C)<br>40 (C) | 2",4",6" | yes | no | none | yes | These four systems have been intertied but it appears that they operate somewhat independently. Fire flow is limited to only the newer developments. Upgrades needed for the area on West Beech. |



Legend

| | | | | | |
|---|---|---|---|---|---|
| C | Concrete Reservoir | G-115 ft. | Groundwater-Depth of well | soft | Water softening |
| S | Steel Reservoir | Unk. | Unknown | B | Below Ground Reservoir |
| R | Redwood Reservoir | Cl | Chlorine | temp | Temporary Certified System Operator |
| P | Permanent Customers | T | Temporary or Seasonal Customers | | |

Notes

If the population served was not available, a service was assumed to be one household with 2.67 people per household. Based on 1980 Census data for Island County.

| Water System Name | Water Rights (Instantaneous gpm/ Annual Acre-ft/yr) | Water Rights (Average gpd from Annual total) | 1986 Average Day (gpd) | 1986 Maximum Day (gpd) | 1985 Average Day (gpd) | 1985 Maximum Day (gpd) | 1984 Average Day (gpd) | 1984 Maximum Day (gpd) | 1983 Average Day (gpd) | 1983 Maximum Day (gpd) | 1982 Average Day (gpd) | 1982 Maximum Day (gpd) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13. Driftwood Hts. #1 and #2, Camano Sunrise, Green Island | C-395/174 | 155,000 | | | | | | | | | | |
| 14. Dugualla Community Association (E) | C-400/112.5 | 100,500 | 40,000 | 100,000 | 40,000 | 100,000 | 38,000 | 95,000 | 38,000 | 95,000 | 36,500 | 91,000 |
| 15. Fort Ebey State Park | Unk. | | | | | | | | | | | |
| 16. Fort Casey State Park | Unk. | | | | | | | | | | | |
| 17. Freeland Water District (R) | C-250/168 | 150,000 | 70,000 | 175,000 | | | | | | | | |
| 18. Hilcrest Village Water Co. Inc. (E) | C-310/370 | 330,000 | 82,000 | 205,000 | 80,000 | 200,000 | 78,000 | 195,000 | 76,000 | 190,000 | 74,000 | 185,000 |
| 19. Lagoon Point Water District (E) | C-140/223 | 199,000 | 27,000 | 87,000 | 27,000 | 87,000 | 25,500 | 64,000 | 25,500 | 64,000 | 24,600 | 62,000 |
| 20. City of Langley (E) | C-500/458<br>A-500 | 409,000 | 150,000 | 300,000 | | | | | | | | |
| 21. Ledgewood Beach Water District (E, M) | C-700/225 | 201,000 | 21,000 | 53,000 | 21,000 | 53,000 | 21,000 | 53,000 | 17,000 | 42,500 | 17,000 | 42,500 |
| 22. Madrona Beach Community Water System (R) | C-75/120<br>P-75/7.5 | 107,000<br>7,000 | 37,500 | 94,000 | | | | | | | | |
| 23. New Utsalady Water System Inc. (E) | C-70/110 | 98,000 | 46,000 | 55,000 | | | | | | | | |
| 24. North Whidbey Water District | Unk. | | | | | | | | | | | |
| 25. Northgate Terrace Water System (E) | C-165/320 | 286,000 | 35,000 | 60,000 | | | | | | | | |

| Water System Name | Water Rights (Instantaneous gpm/ Annual Acre-ft/yr) | Water Rights (Average gpd from Annual total) | 1986 Average Day (gpd) | 1986 Maximum Day (gpd) | 1985 Average Day (gpd) | 1985 Maximum Day (gpd) | 1984 Average Day (gpd) | 1984 Maximum Day (gpd) | 1983 Average Day (gpd) | 1983 Maximum Day (gpd) | 1982 Average Day (gpd) | 1982 Maximum Day (gpd) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26. Oak Harbor (M) | C-1030/1650<br>P-1060/1696 | 1,473,000<br>1,514,000 | 1,100,439 | 2,647,700 | 1,164,553 | 2,535,200 | 1,078,028 | 2,511,200 | 982,514 | 1,988,800 | 905,639 | 2,142,900 |
| 27. Parkwood Manor Mobil Home Park (E) | C-50/80 | 71,500 | 30,000 | 64,000 | 30,000 | 64,000 | 30,000 | 64,000 | 30,000 | 64,000 | 30,000 | 64,000 |
| 28. Penn Cove Water District (M, E) | C-100/160 | 143,000 | 44,000 | 110,000 | 44,000 | 110,000 | 44,000 | 110,000 | 44,000 | 110,000 | 43,000 | 108,000 |
| 29. Rolling Hills Glencairn (E) | C-115/184 | 164,000 | 45,000 | 115,000 | 43,000 | 108,000 | 41,000 | 103,000 | 39,000 | 98,000 | 37,000 | 93,000 |
| 30. Sandy Hook Yacht Club Estates (E) | Unk. | | 57,000 | 95,000 | 57,000 | 95,000 | 57,000 | 95,000 | 55,000 | 85,000 | 55,000 | 85,000 |
| 31. Saratoga Water Inc. (E) | Unk. | | 15,000 | 38,000 | 15,000 | 38,000 | 14,000 | 35,000 | 14,000 | 35,000 | 14,000 | 35,000 |
| 32. Scatchet Head Water Dist. (E) | C-215/241 | 215,000 | 29,000 | 71,000 | 27,000 | 67,000 | 26,000 | 65,000 | 24,500 | 61,000 | 24,000 | 60,000 |
| 33. Sea View Water Co. (M) | C-100/65<br>A-120 | 58,000 | 33,000 | 67,000 | | | | | | | | |
| 34. Sierra Country Club Inc. (E) | C-95/150 | 134,000 | 30,000 | 50,000 | | | | | | | | |
| 35. Silverlake Water Co. (E) | C-75/108<br>C-75/60 | 96,400<br>53,500 | 29,500 | 74,000 | 29,500 | 74,000 | 28,000 | 70,000 | 28,000 | 70,000 | 27,000 | 68,000 |
| 36. South Whidbey State Park | C-18/10 | 8,900 | | | | | | | | | | |
| 37. W & B Waterworks # 1 (E) | C-225/105 | 93,700 | 29,000 | 72,000 | 29,000 | 72,000 | 26,000 | 65,000 | 23,000 | 58,000 | 23,000 | 58,000 |

| Water System Name | | Water Rights (Instantaneous gpm/ Annual Acre-ft/yr) | Water Rights (Average gpd from Annual total) | 1986 Average Day (gpd) | 1986 Maximum Day (gpd) | 1985 Average Day (gpd) | 1985 Maximum Day (gpd) | 1984 Average Day (gpd) | 1984 Maximum Day (gpd) | 1983 Average Day (gpd) | 1983 Maximum Day (gpd) | 1982 Average Day (gpd) | 1982 Maximum Day (gpd) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38. Whidbey West Water System (R) | | C-130/34 A-150 | 30,000 | 34,000 | 85,000 | | | | | | | | |

Legend

E Estimated by water system personnel, Island Co. Health Dept. data or from DSHS information
M Metered
R Estimated by R.W. Beck, 100 gpcd average, 250 gpcd maximum
C Certificated Water Right
P Permitted Water Right
A Application for Water Right

# APPENDIX E

## WATER RIGHT TABLES

APPENDIX E

SPECIFIC WATER RIGHT INFORMATION FOR CLASS 1 SYSTEMS

CAMANO ISLAND

CAMALOCH ASSN. 10580 Q (1)

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| 2 Wells | 32N 03E 31G | G1-22079C | 200 | .29 | 40 | 840 | 1.21 | a. b. |
| w/Fld. | 32N 03E 31G | G1-23467C | 200 | .29 | 40(s) | 190 | .27 | |
| Totals | | | 400 | .58 | 40(3) | 1,030 | 1.48 | |

a. DSHS shows only wellfield at 190 gpm.
b. Capacity exceeds water rights identified.

CAMANO COOP WATER & POWER 10600 T

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| 46 Dug Wells | 31N 02E 12N | S*02631C | 225 (0.5) | .32 | a. | 265 | .38 | |
| Totals | | | 225 | .32 | | 265 | .38 | |

a. No annual total identified on this surface water right.

CAMANO ISLAND STATE PARK SP130F

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 30N 02E 01 | G1*06173C | 20 | .03 | 9 | | | a. |
| Well No. 2 | 31N 02E 36Q | G1*06161C | 50 | .07 | 11 | | | a. |
| Totals | | | 70 | .10 | 20 | | | |

a. DSHS shows both wells to be in 30N 02E 36.

CAMANO WATER ASSN. 107507

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 4 | 31N 02E 24A | G1-00513 CBL | 800 | 1.15 | 336 | 70 | .10 | a. |
| Well No. 1 | 31N 03E 19K | G1-00513CCL | | | | 36 | .05 | |
| Well No. 2 | 31N 03E 19F | G1-00513CCL | | | | 125 | .18 | |
| Well No. 5 | 31N 03E 19L | | | | | 95 | .14 | b. |
| Well No. 3 | 31N 03E 29P | G1-00513CAL | | | | 20 | .03 | |
| Totals | | | 800 | 1.15 | 336 | 346 | .50 | |

a. DSHS shows capacity of Well No. 4 to be 100 gpm.
b. Cannot specifically tie Well No. 5 to water right.

MADRONA BEACH COMM. WATER SYSTEM 499547

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well | 32N 02E 34J | G1-22820C | 75 | .11 | 120 | 105 | .15 | a., b. |
| Well | 32N 02E 34J | G1-24039P | 75 | .11 | 7.5 | 95 | .14 | |
| Totals | | | 150 | .22 | 127.5 | 200 | .29 | |

a. DSHS shows only one well with capacity of 75 gpm.
b. If capacity figures are correct, water rights appear deficient.

NEW UTSALADY WATER SYSTEM 592000

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 2 | 32N 02E 19C | G1*00926C | 35 | .05 | 56 | | | a. |
| Well No. 1 | 32N 02E 19C | G1*04704c | 35 | .05 | 54 | 61 | .09 | |
| Totals | | | 70 | .10 | 110 | 61 | .09 | |

a. Well has capacity of 7.5 gpm, but not in service.

ADMIRAL'S COVE, INC. 00410R

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 31N 02E 19D | G1*06762C | 100 | .14 | 28 | 312 | .45 | a., b. |
| Well No. 2 | 31N 02E 19D | G1*09287C | 300 | .43 | 38 | 234 | .34 | |
| | | | | | 28(s) | | | |
| Totals | | | 400 | .57 | 66(3) | 546 | .79 | |

a. DSHS shows capcity of 450 gpm, each well.
b. Water rights apear deficient.

AULT FIELD 034207

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| ALL WATER PURCHASED | | | | | | | | |

CHATEAU ST. MICHELLE - RANCH 5 37680C

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well | 30N 02E 05J | | | | | 28 | .04 | a. |
| Totals | | | | | | 28 | .04 | |

a. Cannot locate groundwater right - there is an irrigation right for 0.78 cfs for irrigation in 30N 02E 08H.

CLINTON WATER DISTRICT 13900C

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 4 | 29N 03E 24N | G1*05384C | 90 | .13 | 144 | 50 | .07 | a. |
| 2 Wells | 29N 03E 25K | G1-23771A | 150(4) | | | 85 | .12 | |
| | | | | | | 85 | .12 | |
| Well | 29N 03E 26 | G1-22653C | 55 | .08 | 68 | 85 | .12 | |
| Well No. 3 | 29N 03E 36A | G1-24389A | 150(4) | | | 85 | .12 | |
| Totals | | | 145 | .21 | 212 | 390 | .55 | |

a. Locations at variance with DSHS records.

COUPEVILLE, TOWN OF 155509

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Ft. Casey Wells | 31N 01E 14J | G1*08242C | 150 | .22 | 240 | 95 | .14 | a. |
| Well | 31N 01E 14H | G1-24375A | 300(4) | | | | | |
| | 32N 01E 33 | G1*00845S | 250 | .36 | 26 | | | |
| | 32N 01E 33 | G1*01397C | 150 | .22 | 42 | | | |
| Well Nos. 4 & 5 | 32 01E 33J | G1-20359C | 210 | .30 | 190 | 200 | .29 | b. |
| Well No. 1 | 32 01E 33G | G1-20378C | 210 | .30 | 190 | 30 | .04 | |
| Totals | | | 970 | 1.40 | 688 | 325 | .47 | |

a. DSHS shows 85 gpm capacity.
b. DSHS shows 185 gpm capacity.

CROCKETT LAKE WATER DISTRICT 162562

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well | 31N 01E 14 | G1-00549C | 65 | 0.09 | 45 | 65 | .09 | |
| Wells | 31N 01E 14B | G1-24771C | 55 | 0.08 | 11.9 (s) | 53 | 0.08 | |
| | | | | | 45 | | | |
| Totals | | | 120 | 0.17 | 90 (3) | 118 | 0.17 | |

CROSSWOODS WATER CO. 16274J

| Source I.D. | Location | Water Right Control No. | Water Right GPM (cfs) | Water Right MGD | Water Right AF/YR(s) | Inservice Cap. (2) GPM | Inservice Cap. (2) MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 32N 01E 03M | G1-20362C | 65 | .09 | 36 | 55 | .08 | a. |
| Well No. 2 | 32N 01E 03M | G1-22902C | 55 | .08 | 50 | 45 | .06 | |
| Totals | | | 120 | .17 | 86 | 100 | .14 | |

a. DSHS shows total capacity of both wells to be 250 gpm.

DUGUALLA COMM. INC. 202506

| Source I.D. | Location | Water Right Control No. | Water Right GPM (cfs) | Water Right MGD | Water Right AF/YR(s) | Inservice Cap. (2) GPM | Inservice Cap. (2) MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 32N 02E 17G | | | | | 260 | .37 | a., b. |
| Well No. 2 | 31N 02E 17G | | | | | 160 | .23 | |
| Totals | | | | | | 420 | .60 | |

a. DSHS shows total capacity of Well No. 1 and 2 to be 380 gpm.
b. Cannot tie water right to these wells.

FT. EBEY STATE PARK SP285F

| Source I.D. | Location | Water Right Control No. | Water Right GPM (cfs) | Water Right MGD | Water Right AF/YR(s) | Inservice Cap. (2) GPM | Inservice Cap. (2) MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Old Mil. Well | 32N 01W 36D | | | | | 14 | .02 | a. |
| Totals | | | | | | 14 | .02 | |

a. Cannot tie water right to this well.

FREELAND WATER DISTRICT 264508

| Source I.D. | Location | Water Right Control No. | Water Right GPM (cfs) | Water Right MGD | Water Right AF/YR(s) | Inservice Cap. (2) GPM | Inservice Cap. (2) MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Wells A & B | 29N 02E 14E | G1*07797C | 250 | .36 | 168 | 140 | .20 | a. |
| | | | | | | 130 | .19 | |
| Totals | | | 250 | .36 | 168 | 270 | .39 | |

a. Total capacity of Wells A and B appears to exceed water right.

FT. CASEY SP2757

| Source I.D. | Location | Water Right Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2) GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| ALL WATER PURCHASED | | | | | | | | |

HILLCREST VILLAGE WATER CO., INC. 33150P

| Source I.D. | Location | Water Right Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2) GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well Nos. 1, 2, & 3 | 33N 01E 33Q | G1*07004C | 200 | .29 | 194 | 230 | .33 | |
| Well No. 4 | 33N 01E 33Q | G1*08893C | 110 | .16 | 176 | 90 | .13 | |
| Totals | | | 310 | .45 | 370 | 320 | .46 | |

LAGOON POINT WATER DISTRICT

| Source I.D. | Location | Water Right Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2) GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well | 30N 02E 19G | G1*06049C | 30 | .04 | 48 | | | |
| Well | 30N 02E 19G | G1-00056C | 30 | .04 | 48 | | | |
| Well | 30N 02E 19G | G1-20382C | 30 | .04 | 48 | | | |
| Well | 30N 02E 19K | G1-23651C | 30 | .04 | 48 | ___ | ___ | a. |
| Totals | | | 120 | .16 | 192 | 360 | .52 | b. |

a. DSHS shows this well to be in 30N 02E 19G.

b. R.W. Beck shows total capacity of four wells to be 360 gpm. DSHS shows 120 gpm total for wellfield.

LANGLEY, CITY OF 45950W

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 29N 03E 03B | G1*06456C | 90 | .13 | 144 | 500 | .72 | a. |
| Well No. 2 | 29N 03E 03G | G1-00121C | 160 | .23 | 157 | 40 | .06 | |
| Well No. 3 | | G1-00121C | | | | 90 | .13 | |
| Well No. 5 | 29N 03E 04H | G1-00068C | 250 | .36 | 157(s) | 200 | .29 | |
| Totals | | | 500 | .72 | 301(3) | 830 | 1.20 | |

a. Water rights appear deficient.
b. Location variance with DSHS records.

NAS WHIDBEY ISLAND

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Polnell Point | | | | | | 20 | .03 | a. |
| COMSTA Well | | | | | | 15 | .02 | |
| Well No. 5 | | | | | | 100 | .14 | |
| Rocky Point | | | | | | 64 | .09 | |
| Well No. 4 | | | | | | 135 | .19 | |
| OLF Coupeville | | | | | | 34 | .05 | |
| Totals | | | | | | 368 | .52 | |

a. No information on specific locations or water rights.

NORTHGATE TERRACE 61750E

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 2 | 33N 01E 11C | G1-00642C | 80 | .12 | 210.5 | 140 | .20 | a., b. |
| Well No. 3 | 33N 01E 11D | G1-24154C | 85 | .12 | 109.5(s) | 140 | .20 | |
| Totals | | | 165 | .24 | 210.5(3) | 280 | .40 | |

a. Water rights appear deficient.
b. Location at variance with DSHS records.

OAK HARBOR, CITY OF 62650C

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 8 | 32N 01E 03C | G1*05858C | 200 | .29 | 320 | 180 | .26 | a. |
| Well No. 9 | 32N 01E 03C | G1*05901C | 200 | .29 | 320 | 180 | .26 | a. |
| Well No. 11 | 32N 01E 03B | G1-20916P | 160 | .23 | 256 | 180 | .26 | a. |
| 2 Wells | 32N 01E 03F | G1-22778C | 180 | .26 | 290 | | | b. |
| Well | 33N 01E 26Q | G1*08370C | 450 | .65 | 720 | | | b. |
| Well | 33N 01E 35A | G1-20915P | 100 | .14 | 160 | | | b. |
| Well | 33N 01E 36 | G1-20913P | 500 | .72 | 800 | | | b. |
| Well | 33N 01E 36 | G1-20914P | 300 | .43 | 480 | | | b. |
| Totals | | | 2,090 | 3.01 | 3,346 | 540 | .78 | |

a. DSHS shows these wells at 160 gpm each.
b. DSHS does not show these wells.

PARKWOOD MANOR MHP 662187

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 33K 01E 34B | G1-22003C | 50 | .07 | 80 | 60 | .09 | a. |
| Well No. 2 | 33N 01E 34B | G1-24138A | 85(4) | | | 60 | .09 | |
| Totals | | | 50(4) | .07 | 80 | 120 | .18 | |

a. DSHS location at great variance.

PENN COVE WATER DISTRICT 669501

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 2 | 32N 01E 22L | G1*04766C | 100 | .14 | 88 | 150 | .22 | a. |
| | | | | | 72(s) | | | |
| Well No. 1 | | | | | | 150 | .22 | b. |
| Totals | | | 100 | .14 | 88(3) | 300 | .44 | |

a. DSHS shows capacity at 140 gpm, each well.
b. Cannot tie a water right to this well.

ROLLING HILLS GLENCAIRN COMM. SERV. 1 74000F

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 32N 01E 20H | G1-20767C | 115 | .17 | 184 | 115 | .17 | |
| Well No. 2 | 32N 01E 20H | | ___ | ___ | ___ | 115 | .17 | a. |
| Totals | | | 115 | .17 | 184 | 230 | .34 | |

a. Cannot find water right for Well No. 2.

SANDY HOOK YACHT CLUB ESTATES 76050W

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well | 28N 03E 14 | G1*06053C | 40 | .06 | 62 | 182 | .26 | |
| Well | 28N 03E 14K | G1*09114C | 150 | .22 | 2 | | | |
| | | | ___ | ___ | 62(s) | ___ | ___ | |
| Totals | | | 190 | .28 | 64 | 182 | .26 | |

SARATOGA WATER, INC. 763000

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 30N 03E 19K | | | | | 30 | .04 | a., b. |
| Well No. 2 | 30N 03E 19K | | | | | 30 | .04 | |
| Totals | | | | | | 60 | .08 | |

a. Cannot tie to water right.
b. DSHS has Well No. 1 capacity at 45 gpm.

SCATCHET HEAD WATER DISTRICT 76470X

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 28N 03E 15E | G1-20574C | 90 | .13 | 101.1 | 300 | .43 | a., b. |
| Well No. 2 | 28N 03E 15C | G1-23621C | 125 | .18 | 140 | 125 | .18 | a. |
| Totals | | | 215 | .31 | 241.1 | 425 | .61 | |

a. Variance in location and capacity with DSHS records.
b. Appears water right is deficient.

SEA VIEW WATER CO. 77148Y

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 3 | 32N 01E 06R | G1-23347A | 120(4) | | | 100 | .14 | a. |
| Well Nos. 1 & 2 | 32N 01E 07A | G1-00670C | 100 | .14 | 65 | 160 | .23 | |
| Totals | | | 100(4) | .14 | 65 | 260 | .37 | |

a. Right listed under H.L. Morgan.

SIERRA COUNTRY CLUB, INC. 789759

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 32N 01W 25B | G1*09197C | 95 | .14 | 150 | 90 | .13 | a. |
| Totals | | | 95 | .14 | 150 | 90 | .13 | |

a. DSHS shows location to be 32N 01W 25N.

SOUTH WHIDBEY STATE PARK SP8204

| Source I.D. | Location | Water Right: Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2): GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| | 30N 02E 29M | G1*06459C | 18 | .03 | 10 | 19 | .03 | |
| Totals | | | 18 | .03 | 10 | 19 | .03 | |

W.B. WATERWORKS NO. 1 466703

| Source I.D. | Location | Water Right Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2) GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Well No. 1 | 29N 02E 22G | G1-22510C | 225 | .32 | 45 | 75 | .11 | a. |
| Well Nos. 2, 3, & 4 | 29N 02E 22G | G1-24539C | 225 | .32 | 105 | 150 | .22 | a. |
| Totals | | | 450 | .64 | 150 | 225 | .33 | |

a. DSHS shows wells located in 29N 02E 22H.

WHIDBEY WEST WATER SYSTEMS 363146

| Source I.D. | Location | Water Right Control No. | GPM (cfs) | MGD | AF/YR(s) | Inservice Cap. (2) GPM | MGD | Variances |
|---|---|---|---|---|---|---|---|---|
| Westwood Well #4 | 32N 01E 05M | G1-23859A | 50(4) | | | 52 | .07 | a. |
| Even Downs Well #3 | 32N 01E 06A | G1-20615C | 130 | .19 | 34 | 132 | .19 | |
| Sandy Bubbles Well #2 | 33N 01E 31R | G1-23860A | 50(4) | | | 50 | .07 | a. |
| Sunset Beach Well #1 | 33N 01E 32F | G1-23850A | 50(4) | | | 50 | .07 | a. |
| Totals | | | 130 | .19 | 34 | 284 | .40 | |

a. DSHS shows capacities as: No. 4 - 30 gpm; No. 2 - 30 gpm; No. 1 - 30 gpm.

(1) DSHS I.D. Number.
(2) In-service capacity represents wells that are equipped and on-line.
(3) Supplemental rights (s) not included in totals.
(4) Application amount not in total.

# APPENDIX F

## SERVICE AREA AGREEMENTS

# APPENDIX F

## INTRODUCTION

The Coordination Act requires that:

> "The service area boundaries of public water systems within the critical water supply service area shall be determined by written agreement among the purveyors and with the approval of the appropriate legislative authority." (RCW 70.116.070(1)).

In Section VI of the Regional Supplement, procedures are set forth to establish future service areas and a standard agreement is also provided.

In this Appendix, service area agreements entered into by new or expanding water systems, Class 1 water systems, municipal water systems, and water districts are incorporated as an element of the CWSP. Agreements are to be incorporated using the following procedures:

1. A utility submits a proposed future service area to the County and to adjacent water systems. The submittal to the County must include either a completed standard Service Area Agreement, signed by an appropriate official, or a copy of other agreements reached with adjacent water systems establishing that those water systems have no objection to the proposed service area.

2. County staff determines that no apparent service area conflict exists and recommends approval by BICC.

3. The BICC adopts a resolution approving the proposed service area, conditioned upon review and approval by DSHS and the County, of an appropriate planning document in accordance with Chapter 248-54 WAC.

4. Upon approval of a water system plan, the County updates Appendix F by entering the BICC resolution number and date of plan approval in the spaces provided in the following table.

APPENDIX F

ISLAND COUNTY CWSP
STATUS OF SERVICE AREA DESIGNATION OF PARTICIPATING PURVEYORS

| WFI | Purveyor | Class | Service Area Mapped | Service Area Agreement Filed | Date of BICC Approval/Resolution |
|---|---|---|---|---|---|
| MAJOR SYSTEMS, EXPANDING OR NON-EXPANDING | | | | | |
| Cities | | | | | |
| 155509 | Town of Coupeville | 1 | X | | |
| 45950W | City of Langley | 1 | X | | |
| 62650C | City of Oak Harbor | 1 | X | | |
| Districts | | | | | |
| 04950P | Bayview Beach Water Dist. | 2 | X | | |
| 107483 | Camano Vista Water Dist. | 2 | ? | | |
| 13900C | Clinton Water Dist. | 1 | X | | |
| 162562 | Crockett Lake Water Dist. | 1 | X | | |
| 264508 | Freeland Water Dist. | 1 | X | | |
| 435508 | Lagoon Point Water Dist. | 1 | X | | |
| 46650K | Ledgewood Beach W.D. | 2 | X | | |
| 480205 | Long Beach Water Dist. | 2 | X | | |
| 669501 | Penn Cove Water Dist. | 1 | X | | |
| 72150R | Rhodena Beach Water Dist. | 2 | | | |
| 76470X | Scatchet Head Water Dist. | 1 | X | 3/10/88 | |
| 96042Q | Swantown Water Dist. | 2 | X | | |
| Other Class 1 Systems | | | | | |
| 00410R | Admiral's Cove, Inc. | 1 | X | | |
| 10580Q | Camaloch Assn. | 1 | X | | |
| 10600T | Camano Co-op Water & Power | 1 | X | 1/12/88 | |
| SP130F | Camano Island State Park | 1 | X | | |
| 107507 | Camano Water Assn. | 1 | X | | |
| 37680C | Chateau St. Michelle | 1 | | | |
| 16274J | Crosswoods Water Co. | 1 | | | |
| 20250L | Dugualla Community, Inc. | 1 | X | | |
| SP285T | Fort Ebey State Park | 1 | X | | |
| SP2757 | Fort Casey State Park | 1 | X | | |
| 33150P | Hillcrest Village Water Co. | 1 | X | | |
| 499547 | Madrona Beach Community Water System | 1 | X | | |
| 034207 | NAS Whidbey Island | 1 | X | | |
| 592000 | New Utsalady Water System | 1 | X | | |
| 61750E | Northgate Terrace | 1 | X | | |
| 662187 | Parkwood Manor MHP | 1 | | | |
| 74000F | Rolling Hills Glencairn Community | 1 | X | | |

| WFI | Purveyor | Class | Service Area Mapped | Service Area Agreement Filed | Date of BICC Approval/Resolution |
|---|---|---|---|---|---|
| 76050W | Sandy Hook Yacht Club Est. | 1 | X | 1/27/88 | |
| 763000 | Saratoga Water, Inc. | 1 | X | | |
| 771486 | Sea View Water Co. | 1 | | | |
| 789759 | Sierra Country Club, Inc. | 1 | X | | |
| SP8204 | S. Whidbey State Park | 1 | | | |
| 466703 | W. B. Waterworks #1 | 1 | X | | |
| 363146 | Whidbey West Water System | 1 | X | | |
| | OTHER WATER SYSTEMS, EXPANDING | | | | |
| | North Whidbey (Class 2) | | | | |
| | Fircrest Water Assn. | | X | | |
| | Harris Custer Estates Water Assn. | | X | 3/1/88 | |
| | Indian Ridge Water Co. | | X | | |
| | Shirona Water System | | X | | |
| | Wildwood Water System | | X | | |
| | North Whidbey (Class 3 and 4) | | | | |
| | Cliff View Water Coop | | | | |
| | Strawberry Pt. Water Assn. | | X | | |
| | Central Whidbey (Class 3 and 4) | | | | |
| | Fort Casey Inn | | X | | |
| | South Whidbey (Class 2) | | | | |
| | Inglewood Park Water Sys. | | X | | |
| | Skyline West Comm. Club | | X | | |
| | Useless Bay Shores | | X | | |
| | W&B Waterworks Nos. 2 & 3 | | X | | |
| | Windmill Heights Community | | X | 3/11/88 | |
| | South Whidbey (Class 3 and 4) | | | | |
| | Beverly Beach Division #3 | | X | | |
| | Groom, J.D. | | X | | |
| | Camano Island (Class 2) | | | | |
| | Camano City Comm. Club | | X | | |

AWSP - Abbreviated Water System Plan
WSP - Water System Plan
Q - Planning Questionnaire

# APPENDIX G

## MINIMUM DESIGN STANDARDS

# APPENDIX G

## PROPOSED NEW
## CHAPTER 13.03A (REVISED 8/1/89)
## MINIMUM STANDARDS FOR WATER WORKS

### 13.03A.010 STANDARDS INCLUDED BY REFERENCE

Unless superseded by more stringent provisions herein, all water system design, construction, and operation shall be in accordance with applicable federal, state, and local regulation. These include, but are not limited to:

A. Minimum Design Specifications - Chapter 248-54 WAC "Rules and Regulations of the State Board of Health Regarding Public Water Systems," and the current edition of "Sizing Guidelines for Public Water Systems," prepared by the Department of Health (DOH).

B. General Material Specifications and Construction Standards - except as provided in these Minimum Standards, approved plans and specifications, or by waiver granted in writing by the County or DOH, selection of materials and construction of water system facilities in Island County shall conform to good engineering practices such as those set out in the following:

(1) Applicable Municipal ordinance;

(2) "Standard Specifications for Road, Bridge, and Municipal Construction."

(3) Washington State Department of Transportation/American Public Works Association (DOT/APWA), latest edition;

(4) Standards of the American Water Works Association (AWWA);

(5) "Recommended Standards for Water Works." Great Lakes-Upper Mississippi River, Board of Sanitary Engineers, 1972 (Ten State standards); (or the latest edition) and,

(6) Recommendations of the individual manufacturer of materials or equipment.

C. Well Construction and Maintenance, Chapter 173-160 WAC, "Minimum Standards for Construction and Maintenance of Water Wells"; and Chapter 248-54 WAC.

## 13.03A.020 APPLICABILITY

A. These standards apply to design and construction of new Class 1, 2, 3, and 4 public water systems, as defined in 13.03.030.

B. As of the effective date of these standards, existing water systems are not required to utilize these minimum standards for repair or replacement of facilities, or addition of services within approved plans and specifications, so long as no expansion of service area is involved. If existing facilities must be repaired or replaced to serve an expanded service area, the new construction shall meet these minimum standards. However, adherence to these standards for repair and replacement is encouraged to provide better public water service throughout the County.

C. If municipalities extend new water service to customers outside of the city limits, the design standards adopted by the municipality for outside city service must at least meet the minimum design standards described in this Chapter.

D. Per WAC 248-57-200, Fireflow regulations apply to the following new and expanding public water systems:

(1) Those having more than 1,000 services. (See WAC 248-54-580.)

(2) Those with less than 1,000 services located within the boundaries of a critical water supply service area and subject to the requirement for a coordinated water system plan. (See WAC 248-54-580 and 248-56-700.)

Note: Public water systems in existence prior to September 21, 1977, which are owner operated and serve less than ten single family residences; serving no more than one industrial plant; or are non-municipally owned with no plans for water service area are exempt from the planning requirement.

## 13.03A.030 DEFINITION

A. "Classes of Public Water Systems" - (WAC 248-54-015)

(1) "Class 1 System" - a public water system having 100 or more permanent services.

(2) "Class 2 System" - a public water system having 10 through 99 permanent services.

(3) "Class 3 System" - a public water system serving a transitory population of 25 or more on any one day.

(4) "Class 4 System" - a public water system which is not a Class 1, 2, or 3 system.

B. "Development Classifications" - (WAC 248-57-100) specific geographical areas within the existing and future service area of a public water system, identified for the purpose of determining the appropriate level of fire protection.

C. "Expanding Water System" - (WAC 248-57-100) an existing water system which is undertaking new construction to provide water service to additional service connections. A utility, with plans and specifications approved by DOH and the Island County Health Department, may install up to its approved number of service connections, utilizing existing mains, without being considered an expanding system.

D. "Fire Flow" - the rate of water delivery needed for the purpose of fighting fires in addition to requirements for normal domestic maximum instantaneous demand as referenced in guidelines published by the department entitled, "Design Standards for Public Water Supply."

E. "Franchise" - a non-exclusive grant by the Board of County Commissioners, pursuant to Chapter 36.55 RCW, to purveyors, persons, or private or municipal corporations to use the right-of-way of the County roads for utility purposes.

F. "Future Service Area" - (WAC 248-56-200) a specific area for which water service is planned by a public water system, as determined by written agreement between purveyors provided for in WAC 248-56-730.

G. "Industrial Use" - for the purposes of applying fireflow standards herein, an industrial structure or building shall be one in which a product is manufactured or fabricated, and where the use has an Occupancy Hazard Classification Number (OHCN) of 3, 4, or 5 as listed in the National Fire Protection Association (NFPA) Manual 1231.

H. "Permanent Population" - (WAC 248-54-015) that population served by a public water system for three or more consecutive months.

I. "Permanent Service" - (WAC 248-54-015) a drinking water connection which serves a permanent population.

J. "Planning Jurisdiction" - (WAC 248-57-100) the city, town, county or other entity acting as the responsible agency for preparation and adoption of land use plans, policies or standards affecting development.

K. "Public Water Systems" - As defined in WAC 248-54-015, any water supply system intended or used for human consumption or other domestic uses, including source, treatment, storage, transmission, and distribution facilities, where water is being furnished to any community, collection, or number of individuals, but excluding a water supply system serving one single-family residence."

L. "Purveyor" - (WAC 245-54-015) the federal agency, state agency, county agency, city, town, municipal corporation, firm, company, mutual, cooperative, association, corporation, partnership, district, institution, person or persons owning or operating a public water system or his authorized agent.

M. "Service" - (WAC 248-54-015) - A connection to a public water system designed to serve a single family residence, dwelling unit or equivalent use. If the facility has group home or barracks-type accommodations allowing three or more persons to occupy the same room, three persons will be considered equivalent to one service.

N. "Service Area" - an area determined by the boundaries of parcels of land either provided with service connections or identified for service in approved plans and specifications of the water system.

O. "Water Main" - any transmission or distribution pipe which carries water supplied to a service connection.

## 13.03A.040 APPROVAL AND CERTIFICATIONS REQUIRED

A. Upon water system development, and/or franchise application, the following certifications shall be submitted to the Island County Health Department.

(1) Water System Plan if required (WAC 248-54-065).

(2) Water Rights - A Water Rights Certificate or a registered water rights claim is required for all systems withdrawing or using more than 5000 gallons per day. Copies documenting existing or pending Water Rights shall be submitted.

(3) Engineering Report - if required by Chapter 248-54 WAC, a copy of any engineering reports, with letters of approval, from the appropriate authority.

(4) Construction Documents - a copy of specifications, maps, and drawings for the water system which shall contain the following information as a minimum:

(a) Location and size of all mains and service lines.

(b) Location of all valves, fire hydrants, blowoffs, air release valves, check valves, and other equipment.

(c) Well site location, pollution control area and associated Auditor's File Number, buildings, culverts, ditches, streams, ponds, and other physical features within or affecting the control area must be shown.

(5) Well site approval(s) and recorded declaration of covenant.

(6) Pump test results, inorganic chemical analysis results, and bacteriological test results for all wells to be used by public water systems before said wells may be put on-line to the system. This applies to wells for new systems and/or new wells hooking on-line to existing systems. Requirements of the adopted sea water intrusion policy shall be included.

(7) Operating maintenance and management agreement in accordance with WAC 248-54-196, Small Water System Management Program.

(8) Engineering report, plans and specifications, or registered engineers approval and seal, if required by Chapter 248-54 WAC.

(9) All water storage tanks or reservoirs shall be shown and capacities given. Pressure tanks shall comply with the ASME Code for pressure vessels.

(10) Elevations shall be shown for the well, tank inlet, water full level, and water normal operating level. Elevations for the area served by the distribution system will be indicated by contour lines and/or spot elevations to enable evaluation of the system.

(11) Pumping specifications, including the horsepower of the pump motor, normal operating head pressure, and the delivery capacity to the pump in gallons per minute at normal operating head.

(12) A copy of the hydraulic analysis which determined the design of the system shall be furnished to the County Health Department and DOH.

(13) When no new subdivision is involved, but a franchise is needed, the information must be delivered and/or waiver approved by the County Engineer prior to publication of the legal notice for the hearing for the granting of the franchise.

(14) In other cases, all the applicable information and approvals are necessary prior to public use of the water system.

B. Fire Flow Planning - (per WAC 248-57-400 Application)

(1) Water system plans prepared by those public water systems identified in WAC 248-57-200 shall include a section in their plans addressing fire flow, hydrant and system reliability standards in accordance with this chapter, Chapter 11.01 ICC, WAC 248-57-500, 248-57-600, and 248-57-700. The section shall include a map entitled development classifications which shall delineate the existing and future service area of the water system into the following categories:

(a) Rural - lot sizes 2.5 acres or greater.

(b) Residential - where any lot is less than 2.5 acres, (including all single and multi-family structures less than 4,000 square feet, and mobile homes and recreational vehicle parks.)

(c) Commercial and multi-family residential structures with a floor area 4,000 square feet or greater.

(d) Industrial Uses.

(2) Assignment of the above categories shall be based upon:

(a) Existing development, and

(b) Future development potentials for a minimum of 10 years as identified in proposed or adopted land use plans and policies applicable within the existing and future service area.

(3) The development classifications outlined in above shall be determined by any method acceptable to the planning jurisdiction(s), provided that the criteria used are consistent with this chapter.

(4) The water system plan shall identify and schedule improvements needed in order for the water system to be capable of supplying required fire flow for new and expanding public water systems consistent with these regulations.

## 13.03A.050 FRANCHISE REQUIREMENT

A. All owners/operators of water systems which propose to have lines in County road rights-of-way in excess of 500 lineal feet must comply with State statutory franchise requirements and as outlined in ordinances passed by the County Board of Commissioners authorizing such use of the roads and rights-of-way. Minimally, all work performed in a County right-of-way shall require a permit

from the County Engineer. Construction within incorporated areas remains subject to municipal permitting requirements. If requirements of the franchise are more stringent than the adopted minimum standards, the franchise shall have precedence.

B. Applications for franchises should be made on the form available from the County Engineer's Office. A non-refundable fee is to be submitted with application. All information required by this standard must be submitted to the County Engineer's Office prior to scheduling a public hearing before the Board of County Commissioners (required by law) for granting the franchise.

C. Publication of legal notice of the hearing is required for 2 weeks. The franchise applicant will be billed for any expenses incurred over and above initial non-refundable application fee after the franchise is granted or denied.

## 13.03A.060 INSPECTION REQUIREMENT

A copy of the construction report for public water system projects as required in WAC 248-54-035 must be submitted to the Island County Health Department within 60 days of completion and prior to the use of any project.

## 13.03A.070 WELL SITES

A. New wells shall be located so that the pollution control area does not infringe upon existing or proposed County road right-of-way. A variance to this requirement may be granted by DOH, as per WAC 248-54-125. For existing County roads, the right-of-way shall be considered to be 60 feet as a minimum, and as shown by deed where the deeded right-of- way is greater. Public wells must also conform to WAC 248-54-125, Source Protection.

B. All new Public Water System wells shall be inspected and approved by the Island County Health Department or in accordance with WAC 248-54-097.

C. A copy of the recorded easement and/or covenants establishing the appropriate pollution control zone shall be furnished to the Island County Health Department. (Per WAC 248-54-125).

## 13.03A.080 MINIMUM DESIGN REQUIREMENTS

A. Pressure - water systems shall meet minimum pressure requirements of Chapter 248-54 WAC. Water systems supplying fire flow shall do so with a minimum residual head pressure of 20 psi during normal maximum instantaneous demand conditions.

B. Pipe Sizing - all piping sizes shall conform to WAC 248-54-135. However, in no case shall water mains be less than 6 inches diameter, except in the following cases:

(1) Branch lines into cul-de-sacs or other such locations where further expansion of the system is very improbable. Such lines shall be of the size designated in approved plans and specifications by the certifying engineer, but shall not be less than two inches in diameter. If two-inch diameter line is used, it is limited to a maximum length of 300 feet. Greater lengths are permissible if such is certified by a professional engineer.

(2) Service lines which run from the main directly to either right-of-way edge.

C. Lead-Free Materials - all pipe material for new water systems shall be constructed with "lead-free" materials. The lead content for joint compound materials (solder and flux) used for installation of pipe and fittings shall be less than 0.2 percent in order to be considered "lead-free." The lead content for all installed pipe and fittings shall be less than 8 percent in order to be considered "lead-free." (Per WAC 248-54-131)

D. Flow Measurement -

(1) All water mains installed for new or expanding water systems shall be provided with individually metered service lines if:

(a) The mains are installed as part of a new water system.

(b) The mains are added to expand an existing water system which is individually metered.

(c) The mains are added to expand an existing water system which is unmetered and does not have master meters installed on all sources of supply (including new sources).

(d) Minimally, all expanding water systems shall include in their planning a feasibility and benefit analysis of individual metering of all services.

(2) New water mains need not be provided with metered service lines if:

(a) The installation is for replacement only and not for expansion of service area.

(b) The mains are added to serve residential customers by expansion of an existing unmetered system, provided master meters are installed on all sources of supply (including new sources).

(3) Commercial or Industrial users connecting to new water mains will not be exempt from the metering requirement. Commercial, industrial, and residential water consumption may be measured by a master meter for service to a multi-unit complex, under single ownership.

It is recommended that all utilities consider the use of meters as a means of water conservation.

E. Measurement of Groundwater Sources - all new groundwater sources developed to service public water systems shall be provided with a device for measurement of depth to water and a meter for flow measurement and consumption records. Installation of these devices is also recommended for existing groundwater sources. Air tube installations, if used, shall be of one-half inch diameter rigid tubing and of copper, high density, polyethylene or other material which will not impart taste, odor, or toxic substances to the water.

F. Isolation Valving - valves shall be installed in a manner which permits isolation of lines. In all fireflow systems such valves shall minimally be installed at every hydrant location.

G. Air and Air-Vacuum Relief Valves - in order to minimize problems associated with air entrainment, the purveyor shall wherever possible provide for installation of air or combined air-vacuum relief valves at appropriate points of high elevation in the system. All piping shall be wherever possible sloped to permit escape of any entrained air. Combination air release/air vacuum valves shall have a maximum operating pressure of at least 300 psi.

H. Blow-off Assembly - a blow-off assembly shall be installed on all dead end runs and at designated points of low elevation within the distribution system. The blow-off assembly shall be installed in the utility right-of-way except where an access and construction easement is provided for in writing to the water utility. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system. The following table of minimum blow-off assembly sizes shall be utilized in accordance with the following distribution main sizes:

| Distribution Main Size | Minimum Blow-off Assembly Size Required |
|---|---|
| 6-inch or less | 2-inch |
| Above 6-inch and up to 12-inch | 4-inch |
| Greater than 12-inch | determined upon review by DOH on a case-by-case basis |

I. Storage - sizing of storage facilities shall be adequate to provide for equalizing storage, plus the larger of standby or fire storage requirements. Equalizing and standby storage volumes shall be determined using "Sizing Guidelines for Public Water Supplies", DOH. Minimum fire storage volumes shall be determined by the required fire flow and duration in the utility's service area, and by the use classification of structures or buildings served by the system. Installation of storage facilities may be phased in certain cases as provided in 13.03.100.H. Siting of storage facilities should consider locations which provide gravity flow.

In areas where the existence of salt water intrusion or numerous low yield wells has been documented, the oversizing of storage facilities may be required in order to reduce peak demand impacts upon the aquifer.

J. Facility Placement -

(1) In unincorporated areas, utilities placed within the County right-of-way on new roads or in roadways, where existing topography, utilities, or storm drains are not in conflict, shall be located as follows:

The preferred location for water lines parallel to the road is six (6) feet within the County right-of- way line. Water lines are to be located on the north and east side of streets. Otherwise, when it is demonstrated to the satisfaction of the County Engineer that it is not reasonable to follow this location, the alternative is:

(a) Along County arterial and collector roads - 17 feet from the centerline of the road; and

(b) Along County local access roads - no closer than 4 feet from the edge of the pavement.

(c) When conditions require, as approved by County Engineer.

Water mains over six (6) inches in diameter shall not be located in the shoulder without specific written approval of the County Engineer.

Where existing utilities or storm drains are in place, new utilities shall conform to these standards as nearly as practical and still be compatible with the existing installations. For incorporated areas, City ordinances and utility placement standards shall apply.

(2) New utility easements must be a minimum of 15 feet in width, unless subject easement is contiguous to an access easement or public right-of-way. In such case, the minimum easement width shall be 7.5 feet. Access

shall be provided to all public water system lines and their appurtenances and public fire hydrants that are maintained by public agencies or utilities.

(3) All water lines of non-magnetic material shall have a magnetic sensitive detector tape and/or suitable plastic indicator tape located 12 inches continuously above the water line for its entire length.

L. Pipe Cover -

(1) The depth of trenching, installation of pipes, and backfill shall be such as to give a minimum cover of 30 inches over the top of the pipe from finished grade. This standard shall apply to transmission, distribution, and service piping to the meter. Remaining depth of trench to be filled in accordance with applicable construction standards identified in the General Materials Specifications 13.03.010.B. Compaction on County road rights-of-way shall adhere to appropriate Island County Road Department requirements. Materials capable of damaging the pipe or its coating shall be removed from the backfill material.

(2) All water lines crossing the roadway shall be laid perpendicular to the centerline of the road, unless an alternative is approved by the County Engineer. The top of pipe for such water lines shall be three (3) feet minimum below the pavement surface. Conduits may be required by the County Engineer where materials used for the water lines are susceptible to damage by traffic loads, vibrations, etc., or a combination of these factors. Pipe encasements may be installed under the roadbed for future utility pipe installations.

M. Separation Distances -

(1) Transmission and distribution water piping shall be laid at least 10 feet horizontally from any existing or proposed on-site waste disposal piping, drain fields, and/or wastewater gravity or force mains. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the Health Department may allow deviation on a case-by-case basis, if supported by data from the design engineer.

Closer spacing may be permissible for water mains near gravity sewer piping which is constructed to water main standards and which has been pressure tested to ensure water tightness prior to backfilling.

(2) Other utilities, such as telephone or electrical, may be installed to within 3 feet horizontal separation.

## 13.03A.090 FIRE HYDRANTS

A. Design of Hydrants - hydrants, where required, shall be provided as specified in WAC 248-57-600.

B. Spacing -

(1) All hydrants in fireflow system shall be spaced so as to ensure that all structures or building sites served by the system shall be reached by unobstructed hose lays of no greater than 500 feet to all parts of any structure.

(2) All water mains and transmission lines shall be equipped with at least capped tees to facilitate future hydrant installation. Said Tees are to be installed at the following maximum spacing intervals measured along improved roadways.

(a) Residential - 900 ft. maximum;

(b) Commercial/industrial/multi-family - not-to-exceed 300 feet maximum.

(c) Shorter intervals may be required by the Fire Marshal if necessary to meet the above 500 foot hose lay standard.

(3) Where geographically or otherwise possible, spacing intervals for hydrants or tees shall commence at street intersections.

## 13.03A.100 FIRE FLOW

A. New water systems, and expansion of existing water systems, shall be designed and constructed to provide for fire flows in a manner consistent with the standards outlined in WAC 248-57-700 and 248-57-800 when:

(1) The water system development or expansion proposed is intended to serve uses which meet the development use classifications described in 13.03.100 (c).

(2) The service area associated with the proposed construction includes residential properties which have approved land development proposals for (or other clear indication of) development potentials at densities greater than one unit per 2.5 acres.

B. Nothing herein shall preclude the Fire Marshal's authority to establish, with cause, fire protection requirements for any building or structure on improved property, utilizing Uniform Fire Code, NFPA Standards, ISO Standards or Island County Building Standards, as appropriate.

C. Minimum fireflows to be provided by new or expanding public water systems shall minimally be determined in accordance with WAC 248-57-400, based upon Use Classification of properties to be served, as identified in Section 13.03.030.B., as follows:

| | | |
|---|---|---|
| (1) | Rural-where all lot sizes are 2.5 acres or larger | none |
| (2) | Residential units, where any lot is less than 2.5 acres in size. | 500 gallons per minute for 30 minutes |
| (3) | Commercial and Multi-family structures greater than 4,000 sq. ft. | 750 gallons per minute for 60 minutes |
| (4) | Industrial Uses | 1,000 gallons per minute for 60 minutes |

* Minimum fireflows are in addition to requirements for normal domestic use.

** Commercial and industrial buildings may be subject to higher flow requirements when evaluated on an individual basis by the local fire protection authority.

*** Additional fireflow requirements above these minimums, may be established by the Fire Marshal for the properties served by the water system. The obligation of the water purveyor to provide fireflow service shall then be established by a written agreement between the purveyor and property owner, prior to approval.

D. Assignment of the above categories (Use Classifications) shall be based upon:

(1) Existing development, and

(2) Future development for a minimum of 10 years as identified in adopted land use plans, ordinances, and policies applicable within the existing and future service area.

E. The development classifications outlined in (C) above shall be determined by any method acceptable to the planning jurisdiction(s), provided that the criteria used are consistent with this Chapter.

F. All plans for new or expanding water systems shall identify and schedule improvements needed in order for the water system to be capable of supplying required fire flow consistent with these regulations.

G. Construction Schedule Requirements - prior to final plat or development permit approval, all required fire protection facilities must be either:

(1) Constructed in accordance with approved plans and specifications and certified "as-built" as provided in these standards, or

(2) Bonded for completion subject to release of bond after certification of inspection, or

(3) Identified in a Phased Construction Plan approved by the Fire Marshal, in accordance with 13.03.100(H).

H. Phased Construction -

(1) Provision of fire flow service may be approved by the Fire Marshal based on a phased construction plan submitted in writing by the applicant. The construction schedule shall include plans and specifications for all facilities. The plans and specifications shall be approved by the County and DOH. A financing plan shall also be provided showing improvements required, estimated cost, cost to each benefitted property, and a provision for escrow account, or other means approved by the County, to accumulate funds required for completion. The approved phased construction plan shall be recorded with the deed in the County Auditor's office and made a provision of the plat, subdivision, or land use permit.

The phased construction plan shall identify initial facilities to be constructed, including source, storage, pumping, hydrant location(s), and mains, and shall contain a certification by a registered engineer of initial fire flow service level in gallons per minute at each hydrant. A schedule of completion of all remaining facilities shall be provided which is consistent with the schedule of site improvements. The schedule shall also indicate fireflows provided by each phase of construction.

(2) When Subdivisions/Development/Buildings served by existing water systems or an extension of said existing systems is proposed, and any parcel thus served is less than 2.5 acres in size, incremental improvement toward complete compliance may be stipulated, reflecting concurrence of the Health Department, the Engineering Department, and the Fire Marshal.

## 1313.03A.110 VARIANCE

The County and DOH may approve a relaxation of certain standards included herein, if justified by compelling public interest. However, this may only be done in accordance with applicable State law WAC 248-54-055.

## 13.03A.120 SEVERABILITY CLAUSE

Severability Clause: if one of these sections is found to be invalid it does not invalidate the entire document.

## 13.03A.130

Island County Code 13.03, as adopted by Ordinance PW 1-79 on September 10, 1979, and revised by Ordinance PW 1-80 on June 5, 1980, is hereby repealed.

## 13.03A.140 EFFECTIVE DATE

Effective date of these standards shall be _____.

# APPENDIX H

## REGIONAL WATER ASSOCIATIONS SAMPLE FORMAT DOCUMENTS

# APPENDIX H

## REGIONAL WATER ASSOCIATIONS SAMPLE FORMAT DOCUMENTS

In this Appendix, examples of documents used to establish a Regional Water Association are presented. These examples are based on formation of a non-profit corporation and, therefore, Articles of Incorporation and Bylaws are included.

Each Regional Water Association is advised to consider these documents as presented for discussion. Revisions are likely to be needed to address the particular needs of each Regional Water Association, as determined by its members. Regional Water Associations are also advised to seek legal advice prior to adopting and filing incorporation documents.

# ARTICLES OF INCORPORATION

## REGIONAL WATER ASSOCIATION OF CAMANO ISLAND, INC.

### ARTICLE I

The corporate name of this corporation shall be "REGIONAL WATER ASSOCIATION OF CAMANO ISLAND, INC."

### ARTICLE II

The Corporation is and shall be formed as a non-profit Corporation under the laws of the State of Washington (RCW 24.04).

### ARTICLE III

The Corporation shall exist perpetually.

### ARTICLE IV

The principle place of business of the Corporation shall be _____ _____.

### ARTICLE V

This Corporation is formed for the following purposes, to-wit: (1) to exchange information regarding policy, purchasing, employment, and operational matters in which mutual problems exist or may exist; (2) to combine and coordinate efforts of the members in the solution of mutual problems; and (3) to provide joint action on matters of mutual concern including, but not limited to, purchasing, employment, policy, water quality monitoring and laboratory services, planning and construction of joint facilities, regional sources, and operational problems, to the end that the service to, and assets of, the members may be preserved and enhanced for the benefit of those people they provide service to.

## ARTICLE VI

Any public water supply which operates on Camano Island shall be eligible for membership in this Corporation. A water utility can be removed as a member by the affirmative vote of two-thirds of the delegates for non-payment of dues and/or repeated violation of local, State, and federal laws.

## ARTICLE VII

Each Corporate member shall appoint a delegate who will cast its vote on all items of business. In the delegates absence, the member shall have the right to appoint an alternative delegate to cast its vote when properly identified in the Corporation.

## ARTICLE VIII

1. The officers of the Corporation shall consist of a President, a Vice President, and a Secretary-Treasurer.

2. A water utility, upon being accepted into this Corporation, shall be known as a member.

3. The persons duly appointed by each Corporate member to carry out the business of this Corporation shall be known as delegates.

4. The total number of delegates shall be known as the Board of Trustees.

5. Election of officers shall take place at the annual meeting and assume office at the next regular meeting.

## ARTICLE IX

Unless provided for by these Articles or other action of the delegates, Roberts Rules of Order shall govern meetings and actions of this Corporation. The President shall have the power to limit any debate to five minutes.

## ARTICLE X

Each duly appointed delegate shall have one vote on all items of business at regular or special meetings of the Corporation relating to general administration and business and does not obligate individual members to legal or financial responsibility without their written concurrence. The Board of Trustees shall have the general direction and

control of all property, business, and policies of the Corporation. They shall define and limit the powers and duties of all committees, officers, and agents of the Corporation. The Board of Trustees shall fix all salaries of officers, agents, and employees of the Corporation. The Board of Trustees shall keep an accurate record of their proceedings, which shall be kept by the Secretary-Treasurer among the permanent records of the Corporation.

The trustees who shall manage the affairs of the Corporation for a period of six months from the original date of formation hereof or until the trustees are elected by the members shall be the following subscribers: (1) _____, (2) _____, (3) _____, (4) _____, (5) _____, (6) _____.

In Witness whereof we herewith set our hands and seals this _____ day of _____ 19___.

1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

State of Washington
County of Island

Before me, a Notary Public, personally appeared _____, _____, _____, _____, _____, _____, who acknowledged that they signed the within and foregoing Articles of Incorporation, for the uses and purposes therein mentioned.

Witness my hand and official seal this _____ day of _____ 19___.

_____
Notary Public in and for the State of Washington,
residing at:

# BY LAWS

## REGIONAL WATER ASSOCIATION OF CAMANO ISLAND, INC.

## ARTICLE I

At the regular meeting of this Association, the following order shall be observed:

Sec. 1. Reading of minutes of last regular meeting.
Sec. 2. Report of Secretary-Treasurer.
Sec. 3. Report of President.
Sec. 4. Report of Special Committees.
Sec. 5. Unfinished business.
Sec. 6. New business.
Sec. 7. Approval of bills to be paid.
Sec. 8. Election and installation of officer.

## ARTICLE II

The President shall preside over all meetings of the Association and shall perform such other duties as may be assigned to him by the Association. Roberts Rules of Order shall be used for the conduct of all meetings.

The Vice President shall, in the absence or disability of the President, perform all duties assigned to the President.

The Secretary-Treasurer shall collect all money due the Association, deposit and disburse same in such a manner as the Association and/or Board of Trustees shall direct, shall notify all delegates of meetings, and shall keep minutes of all meetings of the Association and of the Board. All checks, drafts, acceptance, bonds, and notes of debentures shall bear counter-signatures of the Secretary-Treasurer and the President or the Vice President of the Association.

## ARTICLE III

A majority of delegates of this Association shall constitute a quorum. Should there not be a quorum represented at any regular or special meeting, the meeting may be adjourned from time to time until a quorum shall be represented there at, or a notice of a second meeting may be given as provided for special meeting, in which case those utilities represented at such second meeting shall constitute a quorum. A majority vote of utilities represented in a quorum shall be necessary and sufficient to transact any business.

## ARTICLE IV

Sec. 1. There shall be one regular meeting of this Association held each month.

Sec. 2. There shall be one regular meeting of the Association which shall be known as the annual meeting. The annual meeting shall be held the _____ of _____ each year, unless otherwise scheduled.

## ARTICLE V

Sec. 1. A special meeting of this Association can be called at any time on order of the President or any three delegates. Each member shall be notified by regular mail, specifying time, date, and item of business, at least five days prior to any special meeting.

Sec. 2. The President shall have the authority to call the Board of Trustees into an emergency meeting.

## ARTICLE VI

All officers of the Association and all officers, directors, trustees, councilpersons, or other persons duly representing a member shall be entitled to full floor privileges at any meeting. However, only a duly appointed delegate shall be entitled to vote.

## ARTICLE VII

No encumbrance shall be incurred against this Association which exceeds the current treasury without prior approval by a special meeting of the Association called for such purpose.

## ARTICLE VIII

Sec. 1. The officers of this Association shall be elected at the annual meeting and shall serve for one year or until their successors are duly elected and qualified. Nominations for the officers of this Association may be made by means of a nominating committee appointed by the President, but nominations shall also be requested from the floor. An elimination vote shall be held if more than two candidates are nominated. Elections shall be by majority vote, with each delegate casting one vote.

Sec. 2. Any vacancy in the officers of the Association shall be filled at the next regular meeting by the majority vote of delegates present.

## ARTICLE IX

The Board of Trustees shall have the authority to budget the annual service fees necessary to meet the operating expenses of the Association.

Annual service fees for the calendar year shall be due the _____ of _____ of each year, and must be paid as a condition to the exercise of any membership privilege therein.

## ARTICLE X

Prior to the annual meeting, the Board of Trustees shall elect a committee to audit the records of the Association and report their findings at the annual meeting.

## ARTICLE XI

An affirmative vote of two-thirds of the delegates will be necessary on all items of business, unless herebefore specified.

## ARTICLE XII

These Articles may be amended or new articles adopted by a two-thirds vote of the delegates present at any regular or special meeting called for that purpose; provided the proposed amendments or new articles have been mailed to each member utility at least 30 days previous, or the amendments have been presented at a previous regular meeting of the Association.

The above By Laws were read and approved the _____ day of _____ 19___.

# APPENDIX I

## WATER INTERTIE AGREEMENT

## APPENDIX I

## WATER INTERTIE AGREEMENT

This Agreement made and entered into this _____ day of _____, 19_____ by and between the _____ (hereinafter referred to as _____), and _____ (hereinafter referred to as _____), witnesseth that:

The definitions of certain terms, as used later in this Agreement, are as follows:

INTERTIE: A connection, either made or potential, between water mains of the two parties to this Agreement, at specifically identified points, where water may be transferred from the supplies of one system to the transmission or distribution facilities of the other.

SURPLUS PRODUCTION CAPACITY: Volumetric rate of available water supply from the sources of the supplying water system, which can be transferred through an intertie after all service requirements to the customers of the supplying system are met.

ISOLATION VALVE: A positive shut-off fitting which shall be installed at the point in either water system which is used to accept or deliver water through the intertie. The isolation valve shall also be designed so as to maintain cross connection control. Each isolation valve is defined as part of the system connected to the intertie and not part of the intertie. Each system has sole responsibility for providing and operating its respective isolation valve.

MINIMUM REQUESTED CAPACITY: A minimum intertie flow capacity requested by either party. Intertie facilities shall be designed so as to afford not less than the minimum flow capacity requested by either party to this Agreement. The availability of sufficient flow to the intertie shall be certified by the supplying utility. The minimum requested capacities shall be the principal basis of negotiating cost sharing of construction of intertie facilities. Flows in excess of minimum requested capacity may be available.

NOW, WHEREAS, _____ and _____ are responsible for operating and maintaining a public water system in accordance with the rules and regulations of the State of Washington and Island County, and

WHEREAS, the parties recognize the responsibility of public water utilities to provide for the highest reliability of service to their customers at reasonable cost, and

WHEREAS, the parties further recognize that water resources are finite and vulnerable, and the prudent use and management of these resources requires cooperation among water utilities, and

WHEREAS, both _____ and _____ have water system facilities which can be interconnected so as to be mutually beneficial to both utilities,

NOW, THEREFORE, it is agreed that _____ and _____ will provide for an intertie of water mains at the specific locations and with the terms and specifications as provided in the following appendices to this Agreement:

A. _____

B. _____

C. _____

D. _____

It is further agreed that the following terms and conditions shall apply to the construction and operation of each intertie:

1. Water shall be made available only from surplus production capacity, after all needs of the customers of the supplying utility are satisfied at the time of intertie operation. Neither party shall be liable for failure to deliver water to the other party at any time; and

2. Each utility shall be responsible for installing and operating an isolation valve, which is identified as the point of delivery and does not include the building or vault and appurtenances; and

3. Costs of providing joint use facilities such as pumps, buildings, and other appurtenances shall be shared on the basis of mutual benefit which may be determined in each case by establishing a minimum requested capacity for each utility; and

4. Unit cost of supplied water shall be based on a rate determined by evaluation of production and transmission cost components applying to water delivered. A water rate shall be established by each party at the time of this Agreement and shall remain in effect until March 1 of the succeeding year. The rates may be renewed annually thereafter; and

5. The company requesting water shall submit a written request to the supplying company, and the supplying company must give written permission prior to opening the valve between the two systems. Should, however, a situation arise

necessitating the supply of water immediately, a verbal request shall initially be sufficient, followed by the above written request. Each party shall designate, in writing, an authorized person(s) to evaluate such a verbal request and determine whether such a request should be granted.

6. The use of any intertie will be governed by the terms of this Agreement and the provisions of the applicable attachment. Termination of use of any intertie by either party shall be preceded by not less than 12 months' written notice.

ATTACHMENT A

## SAMPLE INTERTIE SPECIFICATION OUTLINE

**NAME OF INTERTIE:** _____

**DATE:** _____

1. Description
2. Design Criteria
3. Plans and Specifications
4. Financial Agreement
5. Terms of Operation

# APPENDIX J

## SAMPLE SATELLITE SYSTEM MANAGEMENT AGREEMENTS AND PRELIMINARY SURVEY CHECKLIST

Included in this Appendix are:

- Satellite System Management Agreement
- Transfer of Ownership Agreement
- Preliminary Survey Checklist

## SATELLITE SYSTEM MANAGEMENT AGREEMENT

CONTRACT NO. _____,

This is an Agreement between _____,
hereinafter called the Utility, and _____
Address _____
City _____ State _____ Zip _____,
hereinafter called the Contractor. This Agreement is for the provision of Contract/Support Services as prescribed in paragraph I below.

I

### UTILITY SERVICES

A. Scope of Services - The services to be provided are descried below or on Attachment 1 (describe services, work methods, location or work, and times of performance in appropriate order).

B. Compensation - All services shall be performed by the Utility on either a Lump Sum or Negotiated Fee basis as described below or on Attachment 2, List of Charges for Services.

II

### AGREEMENT AND PARTIES

The parties hereto agree that Clauses I to _____, as attached, shall apply as the terms of this Agreement and by reference are incorporated herein. The parties agree that all changes or modifications hereto shall be in writing. This Agreement is in lieu of all others expressed or implied.

_____ _____
Utility Date

_____ _____
Contractor Date

## III

## RECORD OF CHANGE/MODIFICATION

| Letter Date | Topic | Signatory | Accepted by Utility |
|---|---|---|---|

(Copies of all letters or modifications must be signed by the Utility and attached hereto and a copy returned to the Contractor.)

## IV

## STANDARD CLAUSES

### IV[A]

Situs: The parties hereto agree that the situs of this Agreement and the law governing its interpretation is the State of Washington and the laws of that State.

### IV[B]

Professional, Paraprofessional, and Secretarial Fees: The fees for service provided the Utility shall be based on the salary schedules as set forth by the Utility and in effect on the date of this Agreement, and by reference are incorporated herein. All sums billed to client under this clause shall be payable in full 30 days following receipt of billing.

### IV[C]

Travel Expenses: Travel expenses associated with tasks covered under this contract will be billed on the basis of _____¢ per mile.

### IV[D]

Past Due Billings: The applicant agrees that any sums billed, not disputed in written form setting forth specific exceptions and unpaid after 30 days from the billing date, shall bear interest at _____% for the first 30 days past due, and _____% annually thereafter until collected in full together with legal fees, court costs, and administrative charges as necessary to effect collection.

V

## LIABILITY AND CANCELLATION RIGHTS

The liability of the Utility is limited to its applicable insurance coverage. In any event, the Contractor shall provide the Utility, by entering into this contract, all necessary authorization for access, egress, billing rights, contracting rights, and hold harmless clauses from injury or damage associated with Utility action in conducting the defined Scope of Services.

Either party hereto may cancel this Agreement by rendering written notice duly posted to the Utility, or to the Contractor at the address noted hereon. However, the duration of Contract Services are required to extend for 1 year renewable periods unless previously agreed to. Notice of termination must be received 60 days prior to the desired termination date.

VI

## ATTACHMENTS INCLUDED BY REFERENCE IN THIS CONTRACT

# TRANSFER OF OWNERSHIP AGREEMENT

## CONTRACT NO. _____,

This is an Agreement between _____,
hereinafter called the Utility, and _____
Address _____
City _____ State _____ Zip _____,
hereinafter called the Applicant. This Agreement is for the transfer of ownership of the _____ water system to the Utility.

## I

## TRANSFER OF OWNERSHIP

The terms of this contract are herewith binding on the owner(s) and all customers of the _____ water system. Effective as of the date of this contract, the ownership and operation responsibility for the _____ water system is transferred at no cost to the Utility. All existing and future customers will be required to abide by the General Terms, Conditions, and Policies of the Utility. In addition, the documents identified below and appended in this contract are binding and in force for this transfer:

1. Property Title
2. Easements
3. Utility Franchises (examples)
4. Transfer of Water Rights
5. Bill of Sale

## II

## OUTSTANDING LIENS OR LITIGATION

The seller warrants that there are no liens or taxes or other purposes outstanding at the time of this purchase against the property of the said system or lawsuits pending against the said system.

## III

## USER CHARGES

The seller warrants that there have been no promises of any beneficial rates to any customer presently or in the future which may be served by this system.

## IV

## AGREEMENT AND PARTIES

The parties hereto agree that Clauses I to _____ as attached shall apply as the terms of this contract and by reference are incorporated herein. The parties agree that all changes or modifications hereto shall be in writing. This contract is in lieu of all others expressed or implied.

| | |
|---|---|
| _____ | _____ |
| Utility | Date |
| _____ | _____ |
| Contractor | Date |

## PRELIMINARY SURVEY CHECKLIST

Section VI of the Regional Supplement describes a Utility Service Review Procedure (USRP) and prequalification of Satellite System Management Agencies (SSMA). When either a proposed new water service or an existing water utility is identified for Satellite System Management, the applicant must request a determination of and service requirements by the SSMA.

When the SSMA is to assume ownership of a system, it will require a new system to be constructed, and existing systems to be upgraded, to meet minimum standards.

After a formal request is made for service, the SSMA will make a preliminary survey of items in the following checklist which shall be used to estimate costs of improvement, operation, and maintenance. The applicant will review the survey to verify accuracy. The applicant may also choose to authorize, either by contract or with the SSMA, an engineering feasibility study. If the applicant approves the feasibility study or checklist findings, and authorizes the SSMA to proceed, the identified improvements may be made and the SSMA may assume operational responsibility according to the SSMA agreement.

## SATELLITE SYSTEM
## PRELIMINARY SURVEY CHECKLIST

SYSTEM NAME: _____

CONTACT: _____ PHONE: _____

SSMA NAME: _____

CONTACT: _____ PHONE: _____

| | Yes | No | N/A |
|---|---|---|---|
| 1. SOURCE No./Location _____ | | | |
| A. Construction | | | |
| 1. Concrete slab around casing | | | |
| 2. Casing extends 6 inches above floor | | | |
| 3. Sanitary well seal installed | | | |
| 4. Water level measuring device | | | |
| 5. Electrical controls within approved control panel | | | |
| 6. Source protected against freezing | | | |
| 7. Control valving and electrical controls operating properly | | | |
| 8. Well log available | | | |
| 9. Surface seal at least 18 feet deep | | | |
| B. Quantity | | | |
| 1. 4 hour pump test conducted | | | |
| 2. Water rights equal or exceed pumping capacity | | | |
| 3. Water rights in the owners name | | | |
| 4. Master meter present and operating properly | | | |
| 5. Pumping capacity equal to peak day demands [(0.55 gpm) x (# services) = peak day demands] | | | |
| Pump Setting _____ Present Static Level _____ | | | |
| Normal Pumping Level _____ Seasonal Variation _____ | | | |
| C. Quality | | | |
| 1. Satisfactory sanitary control area of at least 100 feet | | | |
| 2. Satisfactory bacteriological test results within last 3 years | | | |
| 3. Satisfactory chemical test results within last 3 years | | | |
| 4. Satisfactory turbidity or radionuclide test results within last 3 years | | | |
| 5. Treatment equipment and procedures adequate | | | |
| 6. Chlorination equipment in separate, vented room | | | |
| 7. Adequate chlorine contact time | | | |

Contaminants Needing Removal _____

Possible Source of Contamination _____

D. Improvements Needed _____

_____

_____

| | Yes | No | N/A |
|---|---|---|---|
| 2. PUMPS No./Location _____ | | | |
| Purpose _____ | | | |
| A. Pumping Equipment | | | |
| 1. Operating properly | | | |
| 2. Pump properly sized | | | |
| 3. Pump rating: HP _____ Flow _____ Head _____ | | | |
| 4. Pump protection | | | |
| a. Hand-off-automatic switch | | | |
| b. Operation light present | | | |
| c. Pump operation timer | | | |
| d. Start and stop pump controls adequate | | | |
| e. Low liquid level shutoff | | | |
| f. Low pressure shutoff | | | |
| 5. Pump discharge piping | | | |
| a. Pressure gauge with shutoff | | | |
| b. Check valve | | | |
| c. Pump control valve | | | |
| d. Shutoff valve | | | |
| e. Sampling tap | | | |
| f. Master water meter | | | |
| Recording _____ Flow Indicator _____ | | | |
| 6. Pump mounting adequate | | | |
| 7. Equipped with auxiliary power or power connection | | | |
| 8. Equipment with phase protection | | | |
| 9. Any irregular noise or vibration from pump or motor | | | |
| 10. Satisfactory amperage check for pump motor | | | |
| 11. Have pump or motor ever been rebuilt? If so, when? _____ | | | |
| B. Pumphouse | | | |
| 1. Cement slab floor | | | |
| 2. Adequate floor drain | | | |
| 3. Vented | | | |
| 4. Heated | | | |
| 5. Insulated | | | |
| 6. Adequate lighting | | | |
| 7. Free from electrical hazards | | | |
| 8. Pumphouse locked | | | |
| 9. Is overall condition of pumphouse satisfactory | | | |
| 10. Any leaks from piping | | | |

C. Improvements Needed _____

_____

_____

| | Yes | No | N/A |
|---|---|---|---|
| 3. STORAGE No./Location _____ | | | |
| A. Gravity Storage | | | |
| 1. Capacity: _____ gallons | | | |
| 2. Screened ventilation provided | | | |
| 3. Tank outlet through bottom | | | |
| 4. Tank inlet and outlet separate | | | |
| 5. Overflow pipe provided | | | |
| 6. Tank drain through bottom | | | |
| 7. Tank drain separate from inlet and outlet piping | | | |
| 8. Watertight and lockable hatch | | | |
| 9. Exterior ladder usable and access controlled | | | |
| 10. Interior ladder provided | | | |
| 11. Visual level gauges present and operating properly | | | |
| 12. Roof watertight | | | |
| 13. Any visible leaks | | | |
| 14. Interior paint adequate | | | |
| 15. Exterior paint adequate | | | |
| 16. Liquid level controls operate adequately | | | |
| 17. Low level alarm provided | | | |
| 18. Site adequately fenced | | | |
| 19. Top of ground level reservoir at least 24 inches above normal ground surfaces | | | |
| 20. Does drain and overflow discharge in an acceptable location | | | |
| 21. Valve to isolate from system | | | |
| 22. Is altitude valve present and operating properly | | | |
| B. Hydropnuematic Tank System | | | |
| 1. Tank Size _____ | | | |
| a. ASME approved with pressure relief | | | |
| b. Manway | | | |
| c. Water level gauge | | | |
| d. Air release valve | | | |
| e. Protective coating adequate | | | |
| f. Bypass piping provided | | | |
| 2. Air makeup adequate | | | |

C. Improvements Needed _____

_____

_____

| | Yes | No | N/A |
|---|---|---|---|
| 4. DISTRIBUTION SYSTEM No./Location _____ | | | |
| A. Construction | | | |
| 1. Type of pipe: PVC _____ AC _____ Iron _____ | | | |
| 2. Adequate depth of cover | | | |
| 3. Is majority of piping looped | | | |
| 4. Is all pipe diameter 6 inches or larger | | | |
| For smaller pipe: (except service lines) | | | |
| Pipe diameter _____ Lineal Feet _____ (est.) | | | |
| Pipe diameter _____ Lineal Feet _____ (est.) | | | |
| Pipe diameter _____ Lineal Feet _____ (est.) | | | |
| 5. Adequate fire flows available | | | |
| 6. Are fire hydrants ___ or standpipes ___ installed | | | |
| 7. Adequate separation distances between fire hydrants | | | |
| 8. Isolation valves on all fire hydrants | | | |
| 9. 30 psi minimum pressure at all services | | | |
| 10. More than one pressure zone? _____ How Many ___ | | | |
| Pressure Zone _____ Elevation Range _____ | | | |
| Pressure Zone _____ Elevation Range _____ | | | |
| Pressure Zone _____ Elevation Range _____ | | | |
| 11. Are pressure reducing stations operating satisfactorily | | | |
| 12. Are booster stations operating satisfactorily | | | |
| 13. Are there any individual pressure reducing or booster systems. If so, who maintains them? | | | |
| _____ | | | |
| B. Quality and Reliability | | | |
| 1. Satisfactory bacteriological results within last yr. | | | |
| 2. Satisfactory chloride and conductivity results within last 3 years | | | |
| 3. Any customers within individual wells | | | |
| 4. Adequate cross connection control | | | |
| 5. Blow-off valves at deadend lines or at low elevations | | | |
| 6. Adequate number of valves for repairs | | | |
| 7. Any leaks | | | |
| C. Individual Services | | | |
| 1. Are all services metered | | | |
| 2. Do all services have a corporation and curb stop | | | |
| 3. Is meter installation satisfactory | | | |
| 4. Are services compatible for meter installations | | | |
| 5. Type of service pipe | | | |

D. Improvements Needed _____

_____

_____

## CHECKLIST PRIOR TO CONSTRUCTION

A. Preliminary

| | | | |
|---|---|---|---|
| ____ | 1. | Application Form completed and fee paid | Applicant |
| ____ | 2. | Application approved and plans ordered | SSMA |
| ____ | 3. | Paid first installment of extension fee $_____ | Developer |

B. Required Before Plans are Started

| | | | |
|---|---|---|---|
| ____ | 1. | Final plat filed with County | Applicant |
| ____ | 2. | Road plan and profile filed with engineer | Applicant |

C. Required Before Extension is Staked in Field

| | | | |
|---|---|---|---|
| ____ | 1. | Plans and specifications | Engineer |
| ____ | 2. | Department of Social and Health Services or County for approval of plans | Engineer |
| ____ | 3. | Application for State and/or County permits | Applicant |
| ____ | 4. | Approval of contractor | SSMA |
| ____ | 5. | Performance Bond | Applicant |
| ____ | 6. | Certificate of insurance | Applicant |
| ____ | 7. | Easements | Applicant |
| ____ | 8. | County and State permits | Applicant |
| ____ | 9. | Property boundary stakes in place | Applicant |
| ____ | 10. | Estimated inspection fees paid $_____ | Applicant |

D. Required Before Construction Begins

| | | | |
|---|---|---|---|
| ____ | 1. | Final installment of extension fee paid $_____ | Applicant |
| ____ | 2. | Notice to engineer to stake | SSMA |
| ____ | 3. | Construction stakes in place | Engineer |
| ____ | 4. | 48-hour notice of construction start | SSMA |
| ____ | 5. | Start card notice (72 hour) for well construction | SSMA |

E. Required Before any Service Connected

| | | | |
|---|---|---|---|
| ____ | 1. | Approval of construction | SSMA |
| ____ | 2. | Easement paid | Applicant |
| ____ | 3. | Bill of Sale | Applicant |
| ____ | 4. | All extra charges paid | Applicant |
| ____ | 5. | Acceptance of work | SSMA |
| ____ | 6. | Additional inspection fees paid $_____ | Applicant |

F. To be Done 1 Year After Acceptance

| | | | |
|---|---|---|---|
| ____ | 1. | Final inspection just prior to end of year | SSMA |
| ____ | 2. | Release of performance bond | SSMA |

G. Miscellaneous

| | | | |
|---|---|---|---|
| ____ | 1. | Bill of sale recorded | Attorney |
| ____ | 2. | Easements recorded | Attorney |
| ____ | 3. | As-built drawings furnished | Engineer |
| ____ | 4. | Letter of availability of water for plat | SSMA |
| ____ | 5. | Excess fees refunded $_____ | SSMA |

H. Assigned Design Engineer - _____

# APPENDIX K

## GROUNDWATER RESOURCE EVALUATION

HARTCROWSER

*Earth and Environmental Technologies*

# *Appendix K*

## *Groundwater Resource Evaluation*
## *Coordinated Water System Plan*
## *Island County, Washington*

*September 9, 1988*

*J-1939*

*1910 Fairview Avenue East Seattle, Washington 98102-3699 206.324.9530*

CONTENTS

APPENDIX K - GROUNDWATER RESOURCE EVALUATION
COORDINATED WATER SYSTEM PLAN
ISLAND COUNTY, WASHINGTON

SECTION K-I

## INTRODUCTION

This report presents the results of our assessment of the groundwater resources of Island County prepared for use in the Coordinated Water System Plan (CWSP) for the County. The purpose of the assessment is to estimate the annual replenishment to groundwater storage (which in turn defines the upper limit for additional available groundwater in Island County) and to provide input on the amounts, locations, and general number of wells needed to develop these additional supplies for public water systems. The level of effort for this project was consistent with a regional planning study. Greater precision and detail will be produced in the upcoming Groundwater Management Plan (GWMP). The GWMP will add to this CWSP project the information necessary for management of the groundwater resources of Island County. This goal was met through an evaluation of existing data on the geology, hydrology, climate, and water use.

The project area consisted of Whidbey and Camano Islands. Whidbey was divided into three regions: north, central, and south. The division of these regions was based on natural boundaries between hydrologic systems. These regions (as well as the region of Camano) were further divided into nine subareas in order to allow for analysis of semi-autonomous hydrologic parts of the County. Exhibit K-1, at the end of this section, shows the boundaries of these regions and subareas. The other small islands of the County were not considered in our evaluation.

The report is divided into eight sections. Section K-I is the introduction. Section K-II is an executive summary that can be read as a "stand alone" document as it contains a summary of methods, assumptions, and results. Section K-III reviews the general considerations and a description of the methods of analysis used to obtain the results of the evaluation and a brief discussion of the weaknesses of the data base used for the project. Sections K-IV through K-VII discuss in detail each of the four main regions of the County: Camano, North Whidbey, Central Whidbey, and South Whidbey. The report is concluded with Section K-VIII - References.

Exhibits pertinent to each section are included at the end of each section. Each section on a region has two exhibits, one showing well and cross section locations as well as water quality information and a second showing hydrogeologic cross sections.

This report was prepared under subcontract to Economic and Engineering Services, Inc. (EES) for use in their engineering evaluation for Island County's Coordinated Water System Plan. It was authorized by EES through subcontract work order 4-121, dated April 4, 1987.

The project was managed and the work conducted by Mark Utting of Hart Crowser, Inc. John Segerson of EES was the Project Manager and provided direction as to the needs of the CWSP process. The United States Geologic Survey (USGS) provided information critical to this report before it was generally available to the public. The cross sections presented in this report have been adapted from their unpublished work.

This report has been prepared for the exclusive use of Island County and their consultants EES, for specific application to the referenced project, according to generally accepted hydrogeological practices. No other warranty, express or implied, is made.

SECTION K-II

## EXECUTIVE SUMMARY AND CONCLUSIONS

An assessment of the groundwater resources and potential for additional development was performed as part of the Coordinated Water System Plan (CWSP) for Island County. The assessment provides a hydrogeologic overview of the groundwater system of the County and input for long-range planning for the future public water supply of the County. The information provided by the CWSP groundwater assessment includes:

- Description of the distribution and properties of the various aquifers (including depth and well yield);
- Estimation of the total amount of annual replenishment to the groundwater in each of nine subareas of the County;
- Quantification of the groundwater currently appropriated in each subarea;
- Assessment of the amount of groundwater not appropriated in each subarea and on an island-wide basis this water may be potentially available for additional development, but probably at rates less than total non-appropriation;
- Evaluation of existing and future areas of saltwater intrusion as well as iron and manganese water quality problems;
- General recommendations for additional development (locations, aquifers, and well yields) with emphasis on regional public water supply; and
- Discussion of issues pertinent to the County's groundwater supply.

The CWSP groundwater evaluation was conducted as a compilation, review, and evaluation of existing data. Considerable information has been collected and assessed as part of this project. Much of this information came from the files of the USGS and from reports they have prepared over the past 20 years. Additional sources of information were: soils maps of the County, previous reports prepared by consultants and others, climatological data obtained from various sources, well log and water right information on file with the Washington State Department of Ecology (Ecology), a summary table of the water supply systems of the County prepared as another part of the CWSP process, and information contained in the files of the Island County Health and Planning Departments. No new data were collected as part of the process.

The level of effort for the CWSP groundwater evaluation was commensurate with a regional planning effort. Site-specific and precise quantitative assessment were neither intended nor produced. More detailed information and evaluation will be needed for management (as opposed to planning) of regional groundwater. A more detailed assessment for the upcoming

Groundwater Management Plan (GWMP) will be produced based on the information in this report, USGS data, and other sources of information. The results of the GWMP evaluation may supersede some of the quantifications and recommendations of this CWSP effort.

The County has been divided into four major hydrologic regions for the purpose of this evaluation. Each of these regions have been divided into two or three subareas (Exhibit K-1). The results of the evaluation are presented in four main sections (K-IV through K-VII, one for each region) and a summary table (Table K-1) accompanied by a supporting section on the general considerations and methods of analysis that pertains to all of the regions. Each regional section plus the methods and considerations section (Section K-III) can be read as a "stand alone" report. The Executive Summary and Conclusions (Section K-II) and Table K-1 give the general results and conclusions of the county-wide assessment. Each section should be consulted for details on the specific results and conclusions for each region and subarea.

The following are the main conclusions and recommendations of the evaluation:

- Island County has potential for considerable expansion of its groundwater supply. A mass balance-recharge analysis indicates that a range of 25 to 50 million gallons per day (mgd) is currently inappropriate. The lower end of the range of 25 mgd represents potential additional withdrawal that may be possible if groundwater development is correctly managed through proper well placement and pumping. The upper end of the range represents the amount that could be possible if verified by comprehensive monitoring and additional, site- and area-specific evaluation. Development at this rate will likely cause some environmental changes that may or may not be socially, physically, or economically unacceptable. All groundwater in the Island County system is currently "used" for some purpose, i.e., maintaining the saltwater interface; discharge to springs, streams, or wetlands; pumpage from wells; or discharge to the Puget Sound. Any removal of water from the system will have some effect, many of which will be insignificant. Removal of too much by wells will cause effects that will be significant. Society will have to judge whether these effects are acceptable. Planners and engineers should consider both ends of ranges and use the lower end of the range to be conservative. As additional development exceeds the 25 mgd range, new development may be increased toward the 50 mgd figure, if monitoring and analysis indicate that environmental changes are acceptable. Specific recommendations for development and management will come from the Groundwater Management Plan currently in preparation for the County. Total groundwater available for development with proper management will likely be between the upper and lower amounts given in the recommended range.

- Areas for large capacity regional water supply wells or large capacity regional well fields do not appear to be present within Island County. Typically, 1,000 gallons per minute (gpm) is used as the minimum

pumping rate for a regional supply well design. A well producing 250 gpm or more is considered a high producer in Island County. Areas capable of supplying 250+ gpm to a well are present but are neither extensive nor numerous. Many such areas identified so far are near coastal areas and cannot be exploited because of existing or future saltwater intrusion potential.

- Additional groundwater will need to be developed through a series of low yield wells (often under 50 gpm but locally 100 to 250+ gpm). These wells should be placed inland, generally greater than one mile from the coast to minimize saltwater intrusion. Many of these wells will be finished below sea level and will require that their pumping water level remain at or above mean sea level to minimize saltwater intrusion potential. Pump placement and pumping rate guidelines may be produced by the GWMP.

- Groundwater producing units within the County have been divided into five main aquifers, designated E through A (top to bottom) to be consistent with the nomenclature of published and soon-to-be-released reports and the numerical groundwater model of the USGS. Aquifers E and D are generally above sea level and are typically only partially saturated. Groundwater can only be produced from saturated deposits. Thus, even if the deposit is 90 feet thick, only the bottom, saturated portion (often 10 feet or less) can be used to supply a well. Aquifer C lies just above to below sea level and often is the most heavily used aquifer in a region. Aquifers B and A, when present, lie well below sea level and are often tapped by only a few wells within a subarea. These two aquifers are not always present beneath a subarea. Fine-grain deposits, not capable of supplying a well, may be present in their place.

- Saltwater intrusion is the main water quality issue in the County and often is the limiting factor in increasing groundwater development. Too many wells in coastal areas, especially near points and headlands, have induced saltwater intrusion or have reduced water levels to below sea level making future saltwater intrusion likely. Increased development will require that wells be placed inland to reduce the potential for this common problem.

- The occurrence of high iron and/or manganese levels in groundwater appears to be widespread in Island County. Levels exceeding secondary water quality standards are frequent (generally 30 percent or more of reporting systems) and do not appear to be associated with a particular aquifer or location. Iron and manganese do not represent a significant health risk but usually are a source of problems with taste, odor, or staining in water supplies.

- Camano Island has an estimated annual replenishment of groundwater storage of 2 to 10 mgd based on a mass balance analysis. Additional potential for development will likely be less than this range.

- Northern Camano (the area north of the "panhandle" of South Camano) has the best potential for additional development with an estimated 1 to 7+ mgd of potential additional supply based on recharge of 6 to 12+ mgd and appropriation of 4.93 mgd. The central upland is the recommended area for additional development with potential well yields of under 50 gpm likely and local yields of 250+ gpm possible. Saltwater intrusion has already occurred in the northeast part of the area, in Aquifer D, near Livingston Bay and east of Triangle Cove. Several other coastal area wells report water levels below mean sea level indicating the potential for saltwater intrusion in the future. Iron and/or manganese exceeding state standards were reported in approximately 38 percent of the 85 wells in our database.

- Southern Camano (the narrow peninsula that forms the "panhandle") has little potential for development of any significant additional supply because of limited recharge, narrow land mass with all well locations close to the coast, and relatively heavy existing use. An estimated 1 to 2+ mgd of non-appropriated groundwater may be developed from Aquifer C with careful development, based on recharge of 2 to 3 mgd and appropriation of 0.72 mgd. Development of this water at full rate will likely require abandonment and replacement of existing wells as the saltwater interface moves inland as a result of increased pumping. All additional development should be confined to the central "spine" of the peninsula. Potential well yields are likely to be much less than 50 gpm because of limited available drawdown in existing and future wells. Saltwater intrusion has already occurred throughout much of the subarea. Coastal areas not yet experiencing saltwater intrusion report well water levels below mean sea level indicating the potential for saltwater intrusion in the future. Iron and/or manganese concentrations exceeding state standards were reported in approximately 43 percent of the 23 wells in our database.

- Whidbey Island has unappropriated recharge of 23 to almost 40 mgd based on a mass balance analysis.

- The Northern subarea of North Whidbey (north of Ault Field and Dugualla Bay) has unappropriation recharge (and therefore the upper end potential for development) of an estimated 1/2 to 1 mgd of additional supply based on recharge of 1 to 1-1/2 mgd and appropriation of 0.44 mgd. Inland areas at least one mile from the coast are recommended for additional development with potential well yields from Aquifers C and D of under 50 gpm likely. Saltwater intrusion is not currently a problem in the subarea. Coastal wells have not (with the exception of one well in our database) reported water levels below mean sea level indicating that saltwater intrusion is not likely in the immediate future. Iron and/or manganese exceeding state standards were reported in approximately 28 percent of the 25 wells in our database.

- The Eastern subarea of North Whidbey (east of Oak Harbor and south of Dugualla Bay) has unappropriated recharge (and therefore the upper end potential for development) of an estimated 1 to 1-1/2 mgd of additional supply based on recharge of 2 to 2-1/2 mgd and appropriation of 0.86

mgd. The central upland area, at least one mile from the coast is recommended for additional development with potential well yields of under 50 gpm likely but with some areas capable of 100 gpm. Aquifer C has the best potential for this development but Aquifer D may also have development potential. Saltwater intrusion is not currently a problem in the subarea with only one well reporting chloride levels in excess of 100 mg/L. Several coastal wells between Polnell and Strawberry Points have reported water levels below mean sea level indicating that saltwater intrusion may be a problem in the future. Iron and/or manganese exceeding state standards were reported in approximately 32 percent of the 33 wells in our database.

- The Southwestern subarea of North Whidbey (south of Ault Field and west of Crescent Harbor) has no potential for development of any significant additional supply because current appropriations are up to 7 times the estimated recharge indicating a potentially critical situation. A higher yield zone northwest of Oak Harbor was identified but additional development is not recommended because of the overdraft identified in the subarea. We estimate recharge on the order of 1 to 1-1/2 mgd and appropriation of 7.76 mgd. Saltwater intrusion has already occurred over many parts of the subarea, as a result of the overdraft situation. Many coastal areas not yet experiencing saltwater intrusion report water levels below mean sea level indicating the potential for saltwater intrusion in the future. Iron and/or manganese exceeding state standards were reported in approximately 40 percent of the 87 wells in our database.

- The Northern subarea of Central Whidbey (south of Penn Cove and north of Admiralty Bay) also appears to have an overdraft situation and therefore has no potential for development of any significant additional supply. Current appropriations are up to 2 times the estimated recharge. A few additional wells may be placed in the southern part of the subarea if careful monitoring indicates that additional saltwater intrusion is not induced. Yields of 50 gpm to possibly 100+ gpm are possible from Aquifer C. We estimate a total recharge on the order of 1 to 1-1/2 mgd and use of 2.36 mgd. Saltwater intrusion has already occurred over many coastal parts of the subarea, especially on the east coast between Harrington and Race Lagoons, along Penn Cove and near Admiralty Bay. Several coastal areas not yet experiencing saltwater intrusion report water levels below mean sea level indicating the potential for saltwater intrusion in the future. Iron and/or manganese exceeding state standards were reported in approximately 30 percent of the 27 wells in our database.

- The Southern subarea of Central Whidbey (the isthmus south of Admiralty Bay and north of Freeland) may have the potential for development of an estimated 0 to 2 mgd of additional supply based on recharge of 1 to 3+ mgd and appropriation of 1.12 mgd. The central upland areas, on the approximate north-south axis, are recommended for development with potential well yields of under 50 gpm likely but with some areas capable of 250 gpm. Aquifer C has the best potential for this development. Aquifer B may also have potential but saltwater intrusion

may be of concern. Saltwater intrusion is currently a problem in parts of the subarea with several wells reporting chloride levels in excess of 100 mg/L in the Greenbank-Dines Point area and along Admiralty Inlet north and south of Lagoon Point. Several coastal wells have reported water levels below mean sea level indicating that saltwater intrusion may be a problem in the future. Iron and/or manganese exceeding state standards appears to be less common in this subarea, compared to other parts of the County. Excessive levels were reported in only 8 percent of the 25 wells in our database.

- The Northwestern subarea of South Whidbey (east of Holmes Harbor, north of Useless Bay, and west of Langley) has good potential for development of additional supply based on recharge of from 7 to almost 13 mgd and appropriation of 1.55 mgd. An estimated 5 to 11+ mgd are currently unappropriated from this area. The central upland area, at least one mile from the coast, is recommended for development with potential well yields typically under 50 gpm but locally 100+ gpm. Aquifer C has the best potential for this development. Aquifer B may also have potential, but saltwater intrusion may be of concern. Saltwater intrusion is not currently a problem in the subarea with only one well in our data base (near Freeland) reporting chlorine levels in excess of 100 mg/L for Aquifer C. A few wells drilled along Holmes Harbor, near Rocky Point, reported brackish or saline water during drilling and were abandoned or pulled back. Some coastal wells have reported water levels below mean sea level indicating that saltwater intrusion may be a problem in the future. Iron and/or manganese exceed state standards in a reported 30 percent of the wells in our database.

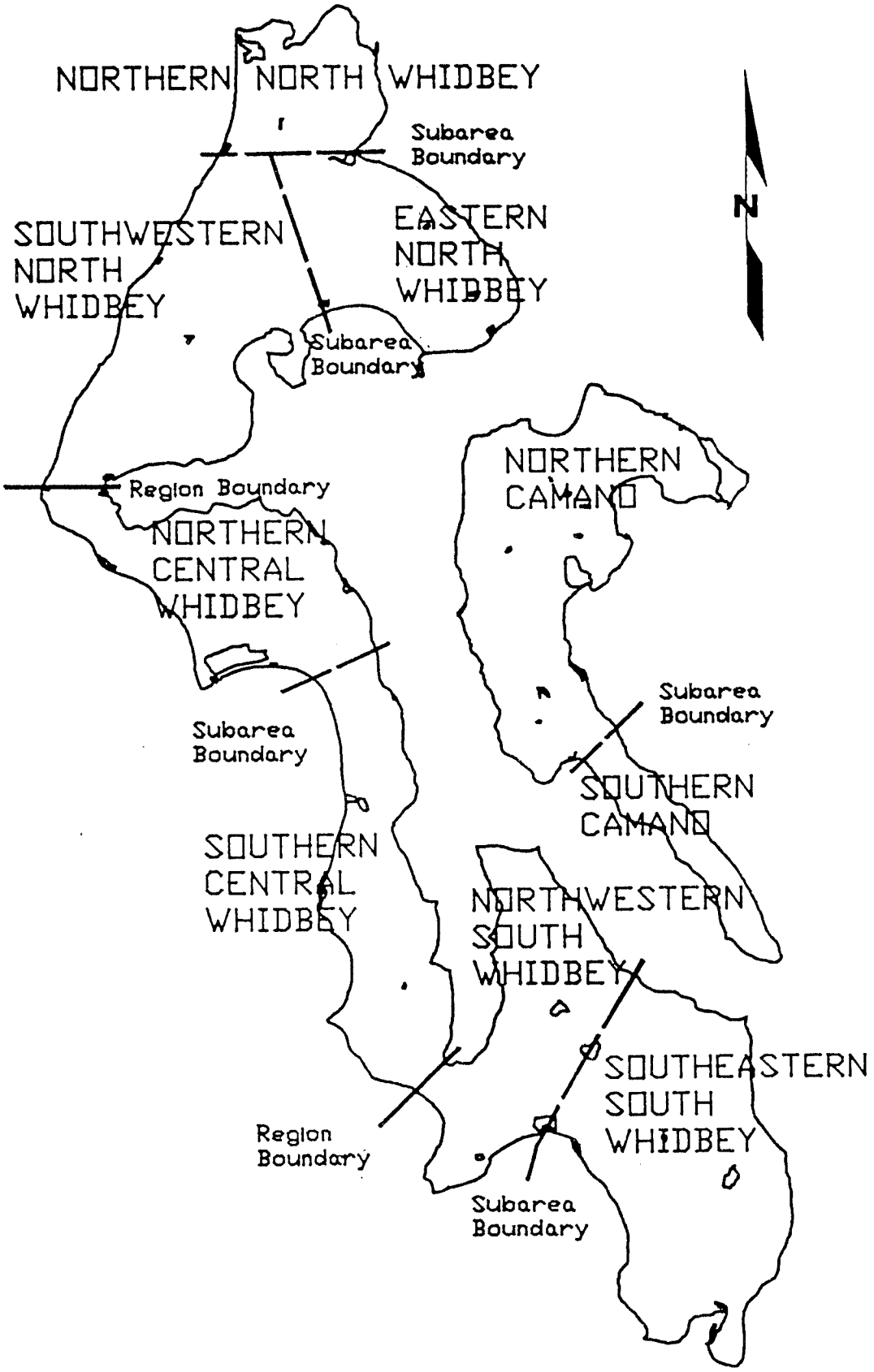
- The Southeastern subarea of South Whidbey (west of Useless Bay, and south of Langley) has good potential for additional development. Annual unappropriated groundwater in the system is in the range of 16 to almost 23 mgd based on recharge of 18 to 25+ mgd and appropriation of 2.38 mgd. The central upland area, at least one mile from the coast is recommended for development with potential well yields typically under 50 gpm but locally 250+ gpm. Aquifer C has the best potential for this development with a higher yield zone located near Langley. Development of a regional supply well field is not recommended for this area as saltwater intrusion would be likely from such a system at this location. Aquifer B may also have potential where higher yield zones can be identified. Saltwater intrusion is not currently a problem in the subarea with no wells in our database reporting chloride levels in excess of 100 mg/L. Some coastal wells have reported water levels below mean sea level indicating that saltwater intrusion may be a problem in the future. Iron and/or manganese exceed state standards in a reported 30 percent of the wells in our database.

Table K-1 - Summary of Aquifer and a for the Entire Subarea

| Subarea | Aquifer | Presence | Current Appropriation in mgd | Unappropriated Annual Replenishment to Storage in mgd (upper bounds of additional development) |
|---|---|---|---|---|
| Northern Camano | E | West Only | | |
| | D | All | | |
| | C | West Only?? | | |
| | B | Central, Rest?? | 4.93 | 1 to 7-1/2 |
| | A | No Data | | |
| Southern Camano | E | South Only | | |
| | D | All?? | | |
| | C | All | | |
| | B | No Data | 0.72 | 1 to 2-1/2 |
| | A | No Data | | |
| Northern North Whidbey | E | East and Central | | |
| | D | East and Central | | |
| | C | All | | |
| | B | West, Rest?? | 0.44 | 1/2 to 1 |
| | A | Not Likely | | |
| Eastern North Whidbey | E | All,Discontinuous? | | |
| | D | All,Discontinuous | | |
| | C | All | | |
| | B | Maybe | 0.86 | 1 to 1-1/2 |
| | A | No Data | | |
| Southwestern North Whidbey | E | Most,Discontinuous | | |
| | D | All | | |
| | C | All | 7.76 | 0 |
| | B | Maybe | | |
| | A | Maybe | | |
| Northern Central Whidbey | E | Not Present | | |
| | D | Mostly East | | |
| | C | All | 2.36 | 0 |
| | B | All? | | |
| | A | Maybe | | |
| Southern Central Whidbey | E | N. Central Only | | |
| | D | East and North | | |
| | C | All | 1.12 | 0 to 2 |
| | B | Discontinuous | | |
| | A | Maybe | | |
| Northwestern South Whidbey | E | Not Present | | |
| | D | In East Only | | |
| | C | All | 1.55 | 5 to 11+ |
| | B | Probably All | | |
| | A | Maybe Not | | |
| Southeastern South Whidbey | E | Southeast, Only | | |
| | D | Most Areas | | |
| | C | All | 5.65 | 16 to 23 |
| | B | Maybe | | |
| | A | No Data | | |
| Camano Island | | | 5.65 | 2 to 10 |
| Whidbey Island | | | 16.47 | 22 to 38+ |

Note: Mass balance for island totals doe

# Region and Subarea Location Map




*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-1*

SECTION K-III

# GENERAL CONSIDERATIONS AND METHODS OF ANALYSIS

## 1. GENERAL CONSIDERATIONS

A variety of analytical methods were used for this evaluation. A primary focus was to use much of the data and conclusions developed by the USGS in their unpublished modeling study of Island County as well as the supporting data available in other USGS reports, listed in the references (Section K-VIII). Every attempt was made to limit duplication of their efforts wherever possible. No new data were collected to augment the existing data, although major data gaps were identified during the course of the evaluation. The precision of the recommendations is dependent on the quality of the available data. Limitations of the data and the necessary new information needed to refine the recommendations are discussed at the end of this section.

The county was divided into four major regions for the purpose of this report:

- Camano Island
- North Whidbey
- Central Whidbey
- South Whidbey

These four regions (Exhibit K-1) represent hydrogeologic areas that act generally autonomously. That is, hydraulic events in a region (such as pumping or saltwater intrusion) have little or no effect outside the region. The divisions are based on natural separations such as isthmuses (Point Partridge to Penn Cove and Holmes Harbor to Mutiny Bay) and surrounding water (Saratoga Passage-Port Susan). These separations isolate hydraulic response to one region.

Each region has been further divided into subareas that respond semi-autonomously. Major hydraulic events (such as full scale development) within the subarea may have some measurable impact on nearby subareas but smaller events are unlikely to be detectable. The subarea boundaries are based on both groundwater and surface water divides. The nine subareas that comprise the four regions are included on Exhibit K-1.

The general approach in our evaluation was to define the geology, hydrology, water quality, and water appropriations for each region of the county. Estimates of the total groundwater available in each subarea were based on analysis of:

- Geology (aquifers and their distribution, as well as surficial deposits and their impact on recharge);

- o Hydrology (how precipitation enters the ground and then flows through the various aquifers to discharge at sea, spring, or well); and

- o Water quality (primarily the impacts of saltwater intrusion induced by improper development of the groundwater resources).

A mass balance analysis was then used where:

Total annual replenishment to the groundwater system - Current appropriation = Additional withdrawal available

Total groundwater available was based on recharge to the system which defines the upper limit of how much can be used. Estimates of the total water currently used in the County were based on total appropriations on record with the Washington State Department of Ecology (Ecology). The effects of additional development were then assessed with respect to saltwater intrusion. The difference between availability and appropriation represented additional groundwater that is optimally available.

Development of all the "additional withdrawal available" will likely be impractical. This total figure assumes that all wells pumping from the system will be optimally placed and pumped and that environmental effects caused by pumping all recharge can be tolerated. Typically, this situation does not occur: many (if not all) existing well owners will not want to give up their existing wells that may not be at optimal locations. Elimination of discharge to wetlands, springs, and streams will also not likely be acceptable. In short, the groundwater system is in a dynamic balance. Removal of water from one part of the system will cause changes in other parts of the system. Evaluation of the acceptability of these changes is beyond the scope of this report and will have to be decided as development occurs.

We have used a "realistic" approach in our analyses. This approach is a balance between conservative and optimistic. In many cases (such as estimating aquifer recharge) many of the values for the parameters used in the analysis were selected from a range of values estimated from existing data. Since no field measurements were taken as part of this project, the conservative approach would be to use the low end of the range while the optimistic approach would be to use the high end. Since the complete analysis uses several sets of estimated parameters, using only the conservative (or optimistic) end of the ranges would give misleading results. Using all the conservative input values would indicate that no additional groundwater could be developed, while using only optimistic values would overestimate the amount of additional supplies that were available such that saltwater intrusion would certainly occur if these amounts were pumped.

Our "realistic" approach uses a range of parameter estimates that falls in the middle between totally conservative and totally optimistic. The results are recommendations that are expressed as ranges (i.e., 16 to

23 mgd appear available for additional development). The lower end of the range represents the amount of water that is probable, while the upper end represents additional yield that may be possible, but only with management that may indicate replacement of the existing wells with a new system of optimally placed wells, verification through additional monitoring, field data collection, and analysis. The upper end of the range may appear to represent the use of all recharge to a region or subarea. This may or may not be the case as the uncertainty of the input data could under-estimate total recharge. Monitoring and analysis will be the final indicator of total recharge and total available for use.

## 2. AQUIFER PROPERTIES AND DISTRIBUTION

The distribution and properties of an aquifer control how much water a well can yield and in part how much water can be developed from a region or subarea. The distribution, type of deposit, and hydraulic properties of an aquifer are all controlled by its geologic history. Major aquifers in Island County typically consisting of layers of sand and occasionally gravel, were deposited by glacial and interglacial processes over the last million plus years. (Bedrock aquifers are present beneath the northern portion of North Whidbey Island but yield only small amounts of water to wells. They do not play a significant role in groundwater development in Island County.) The geologic history of an aquifer deposit controls the aquifer parameters of permeability, transmissivity, storativity, thickness, and areal extent. Areally extensive, thick, coarse-grained deposits with large transmissivities (many tens to hundreds of 1,000 gpd/ft) generally yield more water than limited, thin, fine-grained deposits with small transmissivities (a few 1,000 gpd/ft).

The unconsolidated deposits of Island County comprise a complex sequence of interbedded glacial and interglacial deposits often associated with fluvial (river) processes. Previous attempts by earlier workers to define the aquifers of Island County by geologic units have proven unsuccessful because of the complex nature and apparent similarity of some of the deposits. Aquifers are now defined by the USGS based on hydraulic connection, stratigraphy, and topographic position. Each aquifer (designated A through E) contains deposits of several formations. Because the aquifers have been fluvially deposited, their properties vary over distance. The distribution of aquifers used by both the USGS in their reports and models, and by us in this report, do not necessarily imply that the aquifers are present and uniform at all the locations shown. Rather they vary in properties and may not be present at some of the locations indicated on the exhibits.

### A. Methodology

In order to develop an understanding of the presence and distribution of the aquifers in the County we reviewed the existing data with emphasis placed on the unpublished work of the USGS.

Draft cross sections produced by Jones (1987) were reviewed and compared with: well logs on file with Ecology, The Shoreline Atlas for Island County, several USGS geologic reports, and various consultants reports. In order to maintain continuity with the soon-to-be-published modeling study of the county, we have used the alphabetic aquifer designations used by Sapik (in-press).

## 3. WELL AND AQUIFER YIELD

Potential well yield is the amount of water that a single, properly designed and constructed well can produce. Potential aquifer yield is defined as the amount of water that can be withdrawn from an aquifer using as many wells as needed, causing environmental changes (such as saltwater intrusion) that are acceptable. Potential well yield is often realized while potential aquifer yield is unlikely to be achieved as wells are not usually placed at optimal locations, of optimal design, nor operated at optimal pumping schedules. Based on full-development programs in other parts of the country where saltwater intrusion is a factor, the cost for total, safe (non-degrading) development of Island County aquifers would be prohibitive.

We have estimated potential well yields for each of the subareas so that possible regional supply areas can be identified. Regional supply areas typically require well yields of 1,000+ gpm. In Island County, where well yields can be quite a bit less than in other parts of western Washington, we have used a 250 gpm minimum limit for potential regional supply wells. Several of these wells completed in an area may be viable as a regional supply well field.

### A. Methodology

We used the specific capacity method to estimate short-term (one week) potential well yield. Where well driller's records included data for either pump- or bail-testing, the potential yield was estimated by:

$$Q = 2/3 * Sc * Ad$$

Where:

Sc is the short-term specific capacity (equal to the pumping rate divided by the drawdown during a one- to four-hour test). Ad is the available drawdown (the difference between the static water elevation and the elevation of the well screen or mean sea level where the pump could be located). The two-thirds factor allows for reduced water levels during dry periods and decreased specific capacity during long-term pumping.

For some of the 450 wells included in a five-year water quality database compiled by the USGS, transmissivities (where listed) were converted to approximate specific capacities using the method of Walton (1962). In cases where the well was finished below sea

level, available drawdown was taken as the difference between the static water level and sea level. Limiting drawdown to sea level allows the calculation of potential yield where saltwater intrusion is not likely to be induced by over pumping. In some cases, the potential yield is less than the actual current yield, where wells operate such that the pumping water level is below sea level.

Yield from each individual aquifer has not been calculated as part of this project as the necessary information has not been collected for the County. We have estimated potential total yield from each subarea (discussed above).

## 4. EXISTING WATER APPROPRIATIONS

Water that is currently being used either through human activities or through necessary natural discharge, represents water that is already allocated and not available for additional groundwater development. Water wells with registered rights represent a major type of existing use. Recorded water rights information is available from the files of the Department of Ecology. This type of water use is readily quantified. Unrecorded water rights are also a type of existing water use. As they are unrecorded, it is only possible to estimate their total impact on total water use. Since this type of use is usually small relative to total groundwater use, errors caused by overlooking unregistered wells are typically offset by over estimating registered-right water well use. Typically most registered wells are pumped at less than their allocated rights over the course of a year. Since our analysis assumes that wells are pumped at their registered rates, the errors of not counting unregistered wells and over estimating use by registered wells tend to be self canceling. In some cases, the impact of unregistered wells may be significant on a local scale. Therefore, further studies focused on smaller areas may require compilation of unregistered wells.

Groundwater discharge to the surrounding water of Island County represents another type of "existing water use" in Island County. This discharge is necessary to maintain the balance between the saltwater-freshwater interface within the aquifers. Overuse of this discharge can lead to saltwater intrusion. This discharge is not quantified in our water budget. Instead we are assuming that while additional withdrawals are increased, monitoring will also be increased as the upper range of the recommended withdrawal rate is approached. In this way performance of the system will indicate whether discharge is adequate to maintain the saltwater-freshwater interface at positions that are acceptable. The USGS model has been designed to estimate the position of the interface.

Discharge to maintain surface water flows is not a significant factor in Island County. There are no mandated minimum river or stream flows (thereby requiring groundwater discharge) in Island County. Wetlands are caused either by low permeability soils in recharge areas and/or

discharge of groundwater in discharge zones. No effort was made to assess the groundwater component in the County's wetlands.

A. Methodology

Department of Ecology water right records were reviewed and groundwater rights for annual use totaled for each subarea. Effort was made to separate supplementary rights and avoid false duplication. Individual (unrecorded) rights were not totaled and the assumption was made that the effects of this type of use were canceled by the incomplete use of registered rights.

## 5. WATER QUALITY AND SALTWATER INTRUSION

Saltwater intrusion is the major water quality issue in the County. Many coastal communities have experienced degradation of their water supplies through over pumping and/or poor well placement. Saltwater intrusion can be minimized or reduced with proper management (an eventual result, we hope, of this and other related projects). Management options include: limiting total groundwater development to rates less than the estimated recharge to the aquifer, properly locating wells inland away from high pumpage areas, designing and operating wells to keep in-casing water levels at or above sea level, and monitoring in the aquifer for early indications of degradation. The effects of saltwater intrusion are reversible. The time and cost required for this process, however, make prevention the preferable policy.

Natural constituents can also be of concern. The most common natural contaminants in Island County include iron and manganese. These metals have only state secondary water quality standards and are not considered harmful when exceeding the standards. Typically, shallow groundwater will have lower concentrations of natural contaminants than deeper groundwater. This situation was not observed in the County as is discussed later.

A. Methodology

Several sources of information were used to assess saltwater intrusion and other types of water quality problems. Chloride and electrical conductivity data collected by the USGS on 450 wells in the County for the period 1978 through 1983 were compiled into a database and wells indicating more than 100 mg/L chloride were identified as having indications of saltwater intrusion. A similar evaluation was also made for data in older published reports, while excessive levels of iron and manganese were also identified in the Island County Water System Inventory.

## 6. RECHARGE

Recharge to the groundwater system in all of Island County comes from precipitation. Recharge occurs when more precipitation enters the

ground than is removed by either runoff or evapotranspiration, and flow gradients in the underlying groundwater system have a downward component. Both of these conditions are met in most of the County such that more than 90 percent of the land surface acts as recharge area. Surface deposits and their associated ground cover have an impact on runoff and evapotranspiration rates. However, because recharge rates are generally smaller than the infiltration capacity of the surface soils, and evapotranspiration by most of the vegetation typical of the County is controlled by limitations in the moisture holding capacity of the soil, recharge occurs over practically all areas except the extreme coastal and associated near-shore marsh areas.

The rate of recharge is controlled by precipitation, evapotranspiration of water by plants, runoff, and change in soil moisture storage. None of these parameters is known with much certainty in Island County, thus a wide range of recharge estimates exists for each subarea. The uncertainty is higher in the southern part of the County where precipitation data are contradictory. NOAA weather service annual rainfall maps (which interpolate between official weather stations) disagree by as much as 100 percent with several published and unpublished reports for semi-official stations on South Whidbey Island. Both sources of data have credibility and were therefore used in our evaluation, resulting in a wide range of recharge rates for South Whidbey.

Infiltration of septic effluent from drain fields and return flow from irrigation are also types of recharge. In order to remain somewhat conservative in our analysis, these flows were not quantified. Use of these flows in calculating total recharge may be inappropriate for long-term planning in that changing land use pattern may result in removal of some or all of this potential recharge. In addition, some drain field water is evapotranspirated and lost from the system. We have assumed all appropriated water is consumed as is legally possible and that long-term planning is better based on "natural" recharge alone.

Evapotranspiration was estimated for the County using the Thornthwaite method to estimate potential evapotranspiration. Actual evapotranspiration was estimated based on the assumption that the soil has an average moisture holding capacity of 6 inches. This "water depth" of 6 inches is based on an average soil depth of about 3 feet and a field capacity of 0.15.

Runoff was assumed to be small but not negligible. Estimates of runoff were made based on the Dunne and Black (1968) mechanism generating stormflow. Using our experience, and the number of small intermittent and perennial streams indicated on the topographic maps, we estimated the approximate range as a percentage of precipitation contributed runoff.

A. Methodology

A mass balance for recharge was used where:

Recharge = Precipitation - Evapotranspiration - Runoff - Storage Change

A range of precipitation data was obtained from climatological data collected by the Weather Service, Rainfall data reported in Anderson (1968), unpublished USGS collected data (Jones, personal communication, 1987), and unpublished records collected of the Island County Extension Service (Meehan, personal communication, 1987). Evapotranspiration was calculated using published climatological data. Runoff was estimated based on the methods described above. Storage change (soil moisture) was assumed to be zero over the long-term average. That is, dry years cancel out wet years over the long run.

The results give the daily recharge rate averaged over the year. For example, a recharge rate of 1 mgd indicates that 365 million gallons are recharged over the year and not that 1 million gallons are recharged each and every day. Typically, most recharge will occur over the wetter months of December through May.

7. DATA GAPS

During the course of this evaluation several weaknesses in the available data were noted. We believe that it is necessary to augment the existing data in order to increase the accuracy of the estimates made in this report. When the following data are collected and reviewed, the current assessment should be revised and modifications made where appropriate.

A. Precipitation

Precipitation data are not adequate to make the necessary recharge calculations for Island County. In some cases there appear to be major discrepancies among data sources. The official weather bureau isohyetal map disagrees by up to 100 percent with data collected and published from several semi-official meteorological stations on Whidbey. The data for North Whidbey generally agree but the differences increase toward the south. In several locations on South Whidbey, rainfall is reported in the 38 to 40 inches per year range, while the "official" map indicates values in the low twenties range. Incorrect assessment of rainfall could lead to large errors in estimating additional groundwater available for development. In our analysis we have used the range of rainfall values to generate a range of recommendations for additional withdrawal. Additional rainfall data (requiring five to ten years to collect) will allow for a refinement of the additional withdrawal range. We understand that the Island County Extension Service is in the process of collecting these data.

B. Surficial Geology

The surficial geology of Island County has only been partially mapped (one quadrangle). This information is fundamental in interpreting the hydrogeology of an area. Typically, this type of basic information is produced by the USGS. As of now, we understand that no maps are being produced nor are there plans for any major mapping in the future. Surficial geology is important in defining the geologic units (both at and near the surface), estimating recharge, and identifying areas that may have sensitivity in supplying infiltrated precipitation to groundwater systems feeding saltwater intrusion areas.

C. Water Levels

Accurate water level data (especially near coastal areas), including relative elevation of the well head or other water level measuring point, are not abundant for Island County. Collection of these data is vital in estimating flow rates in the aquifers and evaluating saltwater intrusion. The data now available can be used to give a general sense of flow but more data points, especially for deeper aquifers, are needed. The collection of additional data will allow for a refined quantification of groundwater resources in the County.

D. Aquifer Designation

We have used the definition of the aquifers produced by the USGS (A through E) in our assessment. These unit definitions were produced for input to the soon-to-be-released numerical groundwater model and report on the County. These definitions were adequate for the purposes of this report, but discrepancies between some of the plotted well logs and the continuous aquifers generated by the USGS were noted. Future refinement of flow in critical areas will require a review of the aquifer designations and modification where appropriate. For example, in some areas on the unpublished cross sections, aquifers were projected through silt zones noted on well logs. Such projections are required for a modeling effort, but may not be appropriate for future detailed reviews of areas sensitive to saltwater intrusion.

## SECTION K-IV

## CAMANO ISLAND

Camano Island has unappropriated replenishment of storage (and therefore an upper bound of potential for development) of 2 mgd to perhaps a much as 10 mgd of additional groundwater supply. Most of this quantity appears available in the northern subarea of the island. The narrowness of the southern peninsula makes additional groundwater development difficult, without producing additional saltwater intrusion problems.

The island has been divided into a northern and southern subarea for the purpose of this report, based on topography and separation of groundwater flow systems. The Southern subarea consists of the narrow peninsular area south of an imaginary line between Eiger Bay and Mountain View Beach (Exhibit K-1). The Northern subarea comprises all of the area north of this line. Each subarea is discussed below, separately.

Groundwater use and development in one subarea does not generally effect the adjacent subarea, except perhaps near the subarea boundary. Hydrologic changes near a boundary may cause an impact across the boundaries established for this report. These boundaries are not absolute as they shift with changes in the water balance.

Summary data and assessments for Camano Island are included in Table K-1, while well and cross section locations are shown on Exhibit K-2. Hydrogeologic cross sections are shown on Exhibit K-3.

### 1. NORTHERN CAMANO

Northern Camano has the best potential for development of additional supplies on Camano Island. Approximately 1 to 7+ mgd of unappropriated annual replenishment to storage may be available for additional use. A large number of smaller wells, locally to 250+ gpm, but typically under 50 gpm, placed inland at least one mile, and adequately separated from each other, will be needed to maximize the additional development. The central portion of the Island is likely the best area for placement of well fields for a small scale regional supply.

#### A. Principal Aquifers and Well Yields

Four of the five main aquifers in Island County have been identified in Northern Camano. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is only present in the west portion of the subarea, lying at elevations of 150 to 350 feet above mean sea level. Although the sand and gravel deposits that comprise this unit are up to 90+ feet thick, only the lower portion is usually saturated limiting its suitability to domestic well use. The aquifer typically has a

saturated thickness of less than 10 feet, although well data in Section 25 indicate as much as 30 feet of saturated thickness. From a properly designed and constructed well are generally less than 50 gpm. There are insufficient data to estimate representative aquifer transmissivities in this area.

Aquifer D appears to lie beneath all of Northern Camano and acts as one of the main aquifers in the region. It lies at an elevation of 200 feet above to 100 feet below mean sea level. Wells tapping this aquifer are generally 50 to 200 feet deep. Although the USGS reports a thickness of greater than 150 feet of the saturated and unsaturated sand and gravel deposits that comprise this unit, it is usually only partially saturated to a thickness of 10 to 40 feet, where lying above sea level. Local well yields can exceed 250 gpm (such as near T31/R3 Section 19) but are typically less than 50 gpm. Transmissivities range from 20,000 to 50,000 gpd/ft in the high yield areas. In the lower yield areas they are likely to be on the order of a few 1,000 gpd/ft.

Aquifer C forms the other main aquifer in the northern Camano subarea especially on the west portion of the Island. It lies at an elevation of 100 feet above to 100 feet below sea level. Wells tapping this aquifer are generally 150 to 350 feet deep. The aquifer consists of a saturated thickness of sand (and occasionally gravel) on the order of 20 to 40 feet. Theoretical maximum well yields are generally limited by static water levels that are near sea level such that most wells should not be pumped at more than 50 gpm. Yields of 200+ gpm appear physically possible from some wells but only with the likelihood of lowering the pumping water level below sea level and increasing the potential for saltwater intrusion. Transmissivities on the order of 3,000 to 10,000 gpd/ft are indicated by the limited data.

Aquifer B is present beneath the central portion of northern Camano (near Carp and Smith Lakes), and may be present beneath other portions of the subarea. Wells deep enough to verify its presence and properties, have not been drilled throughout the area. The USGS test well drilled near Kristoferson Lake indicated that aquifer B was not present beneath the north-central part of the subarea. The aquifer typically lies at an elevation of 150 to 250 feet below mean sea level. Wells tapping this aquifer are generally greater than 400 feet deep. Water bearing zones in this aquifer are generally 10 to 20+ feet thick. Theoretical well yields are generally less than 50 gpm as transmissivities are typically less than 5,000 gpd/ft.

No data are available on Aquifer A in the northern Camano area. It was not observed in the USGS test well drilled to a depth of almost 600 feet near Kristoferson Lake. Aquifer A may or may not be present in other parts of the subarea. If so, its properties may be similar to those reported for this aquifer in other subareas.

B. Water Quality and Saltwater Intrusion

Northern Camano Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is currently a problem in the north and east parts of the subarea, and is most apparent in Aquifer D. Many wells in the area surrounding Livingston Bay have reported saltwater intrusion problems as have wells east of Triangle Cove. Many wells in these areas not yet experiencing saltwater intrusion have reported water levels below mean sea level and therefore have the strong potential for saltwater intrusion in the future. These areas are outlined on Exhibit K-2.

Other parts of the Northern Camano subarea have not reported widespread saltwater intrusion. Several wells in coastal areas have reported both static and pumping water levels below mean sea level and are therefore susceptible to future saltwater intrusion. In addition, all wells in coastal areas should be considered as having high potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and/or manganese problems are very common in the subarea with 38 percent of the 85 class I, II, III and IV wells in our database reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese levels do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Northern Camano subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Northern Camano subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The lower end of the additional development range represents the amount that is very likely feasible while the upper end of the range may be possible but only with optimal well placement, verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 6 to 12+ mgd recharge the groundwater system of Northern Camano Island. The analysis, shown in Subappendix K-A, is based on rainfall of 23 to 29 inches per year, runoff of approximately 5 percent of year. Runoff is indicated by the perennial and intermittent streams in the subarea. The recharge area on Northern Camano is estimated to range from 32 to 35 square miles.

(2) Existing Appropriations

A summation of existing water rights indicates that approximately 4.93 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as explained in Section K-III.

(3) Additional Use

The difference between recharge and use indicates that 1 to 7+ mgd of unappropriated replenishment of groundwater storage may be available for additional development. Many low yield wells will be needed to develop this additional supply. Aquifers D and C appear to have the best potential for this development. Since well yields in these aquifers are typically less than 50 gpm, many tens of wells will be needed. Locally wells can produce 250+ gpm and in these locations fewer wells will be needed. The center portion of the subarea (for example T32N/R2E Sections 25 and 36, T31N/R2E near the boundaries of Sections 1 and 2, 11 and 12, as well as 13 and 14) is the best location for development, as:

a) The potential for saltwater intrusion is probably at its lowest in this area; and

b) Few public supply wells are located in this area with which to interfere.

Other areas can be developed but wells placed closer to the coast will increase the potential for saltwater intrusion.

Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride (or electrical conductivity). Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

## 2. SOUTHERN CAMANO

Southern Camano has little potential for development of additional supplies. Approximately 1 to 2+ mgd may possibly be available for additional use but a) a large number of smaller wells (pumping at well under 50 gpm), properly placed at the center of the peninsula, with adequate spacing, and b) elimination many if not all existing coastal wells will be needed to maximize the additional development.

### A. Principal Aquifers and Well Yields

Three of the five main aquifers in Island County have been identified in Southern Camano. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present in the southern portion of the subarea only, lying at elevations of 100 to 200 feet above mean sea level. The saturated portion of the aquifer is typically 0 to 10 feet thick, which is usually too thin for drilled wells making it of little value for water supply use. The few wells that tap this aquifer are generally less than 75 feet deep. Yields from a properly designed and constructed well are generally much less than 50 gpm. There are insufficient data to estimate representative aquifer transmissivities.

Aquifer D appears to lie beneath all of Southern Camano but has insufficient saturated thickness to act as a main aquifer in the region. It lies at an elevation of 20 to 150 feet above mean sea level, at a depth of 100 to 200 feet. Our database contains no information on wells tapping this aquifer in Southern Camano. The sand and gravel deposits that comprise this unit are probably only partially saturated to a thickness of less than 10 feet. Wells finished in this aquifer are likely to have yields much less than 50 gpm. Transmissivity data are not available but estimated values are likely to be less than 1,000 gpd/ft.

Aquifer C forms the primary aquifer in the Southern Camano subarea. It lies from approximate sea level to 100 feet below sea level. Wells tapping this aquifer are generally 150 to 400 feet deep. The fine to medium sand aquifer has a typical saturated thickness of 30 to 60 feet. Theoretical maximum well yields are generally limited by static water levels that are near sea level such that most wells should not be pumped at more than 50 gpm. Many wells appear to have static water levels below sea level and therefore have theoretical yields of 0. Some of the wells have the physical capability of producing 100 gpm or more but only by lowering the pumping water level even more below sea level and increasing the potential for saltwater intrusion. Transmissivities are on the order of 3,000 to 20,000 gpd/ft.

No data are available on Aquifers A and B in the Southern Camano subarea. These aquifers may or may not be present. If so, their properties may be similar to those reported in other areas. The narrowness of the peninsula and their positions below sea level would make them unsuitable for major development because of the potential for saltwater intrusion.

B. Water Quality and Saltwater Intrusion

Southern Camano Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not considered serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion has been observed in much of the subarea. Wells throughout the area have reported saltwater intrusion problems. Many wells in these areas not yet experiencing saltwater intrusion have reported water levels below mean sea level and therefore have the strong potential for saltwater intrusion in the future. These areas are outlined on Exhibit K-2. All wells in coastal areas have high potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese problems are very common in the subarea with 43 percent of the 23 class I, II, III and IV wells in our database reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Southern Camano subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Southern Camano subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The lower end of the additional development range represents the amount that is very likely feasible while the upper end of the range may be possible but only with optimal well placement, verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 2 to 3 mgd recharge the groundwater system of Southern Camano Island. The analysis, shown in Subappendix K-A, is based on rainfall of 25 to 32 inches per year, runoff of approximately 0 to 3 percent of precipitation, and evapotranspiration of 18 to 20 inches per year. A lack of runoff is suggested by the absence of perennial and intermittent streams in the subarea. The 3 percent rate was used as a conservative factor. The recharge area on Southern Camano is estimated to range from 5 to 6 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 0.72 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells is likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

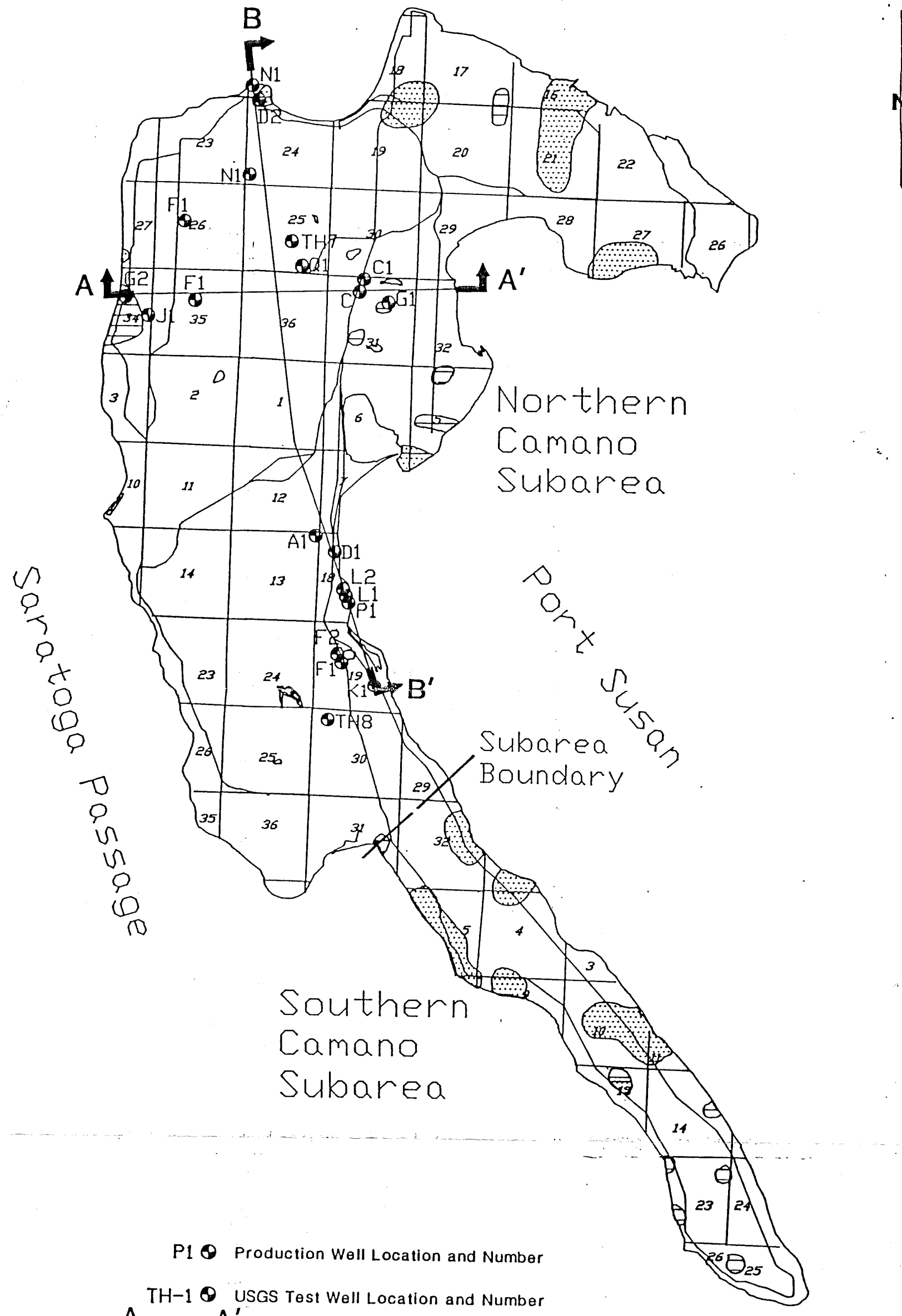
(3) Additional Use

The difference between recharge and use indicates that 1 to 2 mgd of unappropriated replenishment of groundwater storage may be available for additional development. Only a widely spaced network of low yield wells (much less than 50 gpm) is recommended to develop this additional supply. Aquifer C appears to have the only potential for this development and this zone may already be over-stressed by pumping concentrations that are not properly located. Many tens of wells will be needed to properly develop the remaining supply. The center portion (the "spine" of the peninsula) is the best location for development, as the potential for saltwater intrusion is probably at its lowest in this area. Other areas can be developed but wells placed closer to the coast will increase the potential for saltwater intrusion.

Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

# *Well/Cross Section Location and Water Quality Map*

## *Camano Island*

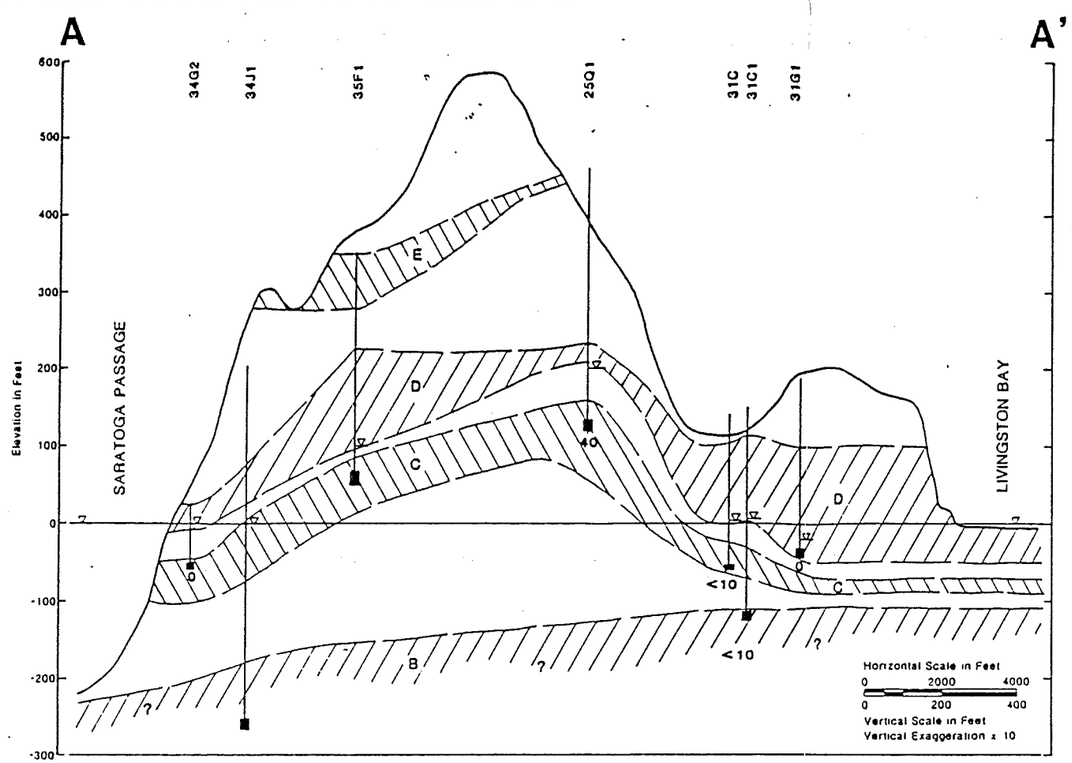


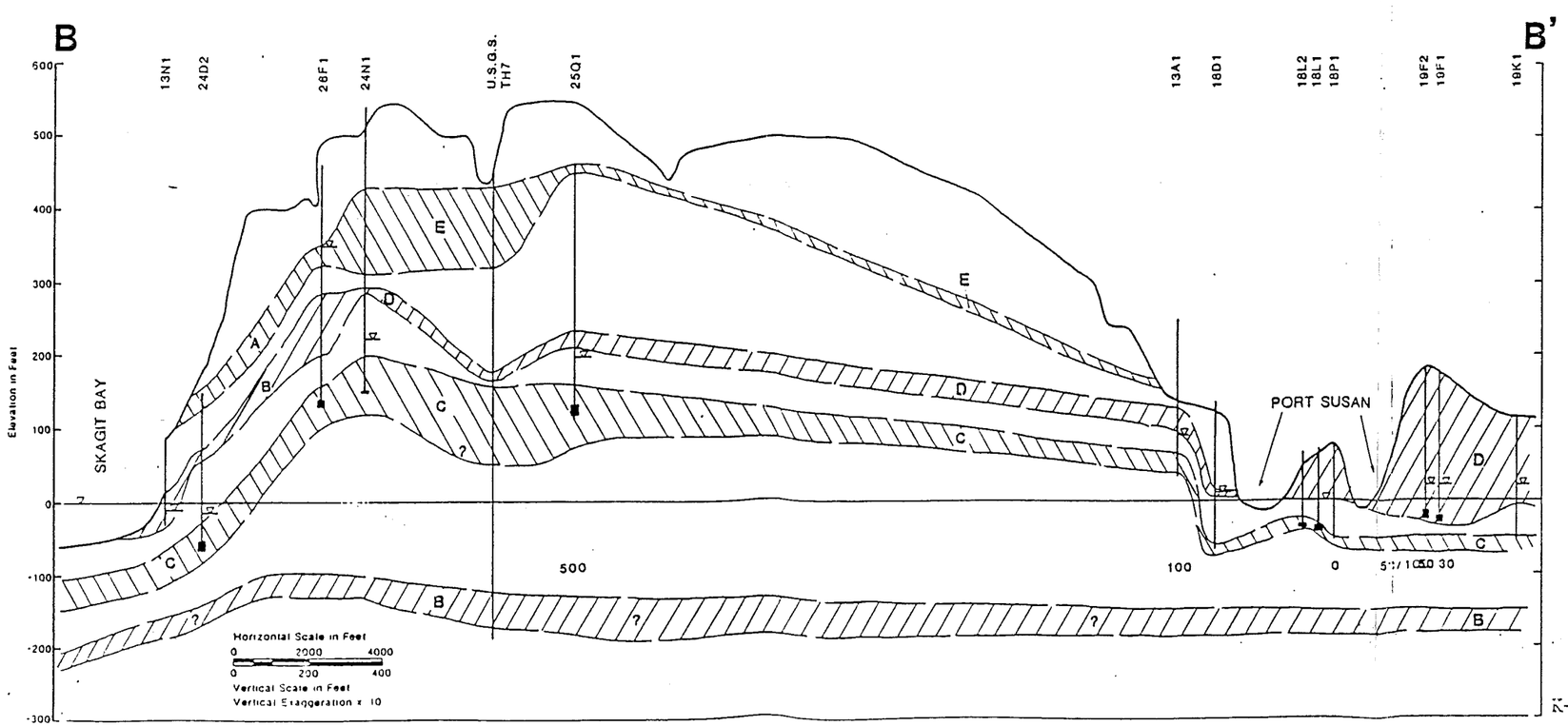

K-IV-8

*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-2*

# *Hydrogeologic Cross Sections A-A' and B-B'*

## *Camano Island*




32Q3 — Well Number
Well Location
Water Level
Screened Section
100 — Theoretical Maximum One-week Well Yield in gpm

A — Aquifer Location and Designation

Note: Hydrogeologic Cross Sections were adapted from unpublished USGS Cross Sections.



*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-3*

## SECTION K-V

## NORTH WHIDBEY ISLAND

North Whidbey Island has unappropriated replenishment of storage (and therefore an upper bound of potential for development) of about 2 to 2-1/2 mgd of additional groundwater supply. All of this development should be planned for the Northern and Eastern subareas as the Southwestern subarea appears to be overappropriated at this time. No one area was identified as capable of supplying a major portion of this total. Rather a series of lower yield wells or well fields, distributed throughout the Eastern and Northern subareas, will be needed to maximize development.

North Whidbey has been divided into Northern, Eastern, and Southwestern subareas for the purpose of this report, based on topography and general groundwater divide. The boundaries between these subareas are not absolute, especially as far as deeper aquifers are concerned. Groundwater use in one subarea can affect groundwater flow and quantities available in adjacent subareas, thereby moving the "boundary." Quantities recommended for additional development are related to the total available for the entire North Whidbey area. Because the Southwestern subarea appears to be highly overappropriated, the recommendations for the other subareas may need reduction if over use in the Southwestern portion draws significant groundwater flow from beyond the indicated boundary.

The boundary for the Northern subarea runs approximately east-west through the low land from Dugualla Bay. The boundary between the Eastern and Southwestern subareas runs approximately northwest-southeast between Crescent Harbor and Ault Field. The subareas are shown on Exhibit K-1. Because the properties of the aquifers, representative well statistics, and water quality are different in each of the subareas, each is discussed below separately.

Summary data and assessments for North Whidbey Island are included in Table K-1, while well and cross section locations are shown on Exhibit K-4. Hydrogeologic cross sections are shown on Exhibit K-5.

### 1. NORTHERN NORTH WHIDBEY ISLAND

Northern North Whidbey has about 1/2 to 1 mgd of unappropriated replenishment of aquifer storage (and therefore an upper bound) of additional groundwater supplies of similar magnitude. The presence of shallow bedrock and lack of significant high yield zones indicates that a series of low yield wells (generally under 50 gpm) or well fields will be needed for full development. These wells will need to be located inland and require careful design and operation to minimize saltwater intrusion problems.

#### A. Principal Aquifers and Well Yields

Three of the five main aquifers in Island County have been identified in Northern North Whidbey Island. Each of these aquifers

is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present beneath the east and center parts of the subarea. Our records do not include any wells that tap this aquifer as the sand that comprises the aquifer is mostly unsaturated. No doubt, some shallow domestic wells are completed in this aquifer but it does not act as a major water supply aquifer in the subarea. The aquifer lies at an elevation of 150 to 250 feet above mean sea level and is therefore not susceptible to saltwater intrusion. The few wells that tap this aquifer are probably in the range of 50 to 150 feet deep. Although the USGS reports that this aquifer is up to 30+ feet thick in some places, its usable, saturated thickness is under 10 feet. Well yields are probably on the order of 10 gpm, or less. Transmissivity data are not available but we estimate values of the order of a few 100 gpd/ft.

Aquifer D is one of the two main aquifer in the Northern North Whidbey subarea. It lies at an elevation of 50 to 200 feet above sea level and is not susceptible to saltwater intrusion. Wells tapping this aquifer are generally 50 to 200 feet deep. The aquifer typically has saturated water bearing zones of sand (and occasionally gravel) which are 10 to 20 feet thick. Theoretical maximum well yields are typically less than 50 gpm. No higher yield zones were located with our limited data base. Transmissivities are small, generally less than 5,000 gpd/ft.

Aquifer C is the other main aquifer in the subarea. It appears to lie beneath all of the Northern North Whidbey subarea except where bedrock outcrops or is near the surface, near Deception Pass. The aquifer lies at an elevation of 50 feet above to 50 feet below mean sea level. Wells tapping this aquifer are generally 75 to more than 200 feet deep. Water bearing zones in this aquifer are generally 10 to 30+ feet thick. Theoretical well yields are generally less than 50 gpm although some areas (such as the one identified in T33N/R2E Section 5) are capable of 100+ gpm. In many areas, static water levels near sea level limit available drawdown and therefore, well yield. Transmissivities are variable, ranging from less than 3,000 gpd/ft up to 20,000+ gpd/ft.

Aquifer B may be present beneath the Northern North Whidbey subarea but our database indicates that no wells have been drilled deep enough to encounter it. The USGS test wells drilled just to the south of the subarea reported Aquifer B at an elevation of 300 feet below sea level and its presence nearby indicates that it may also lie at a similar elevation beneath Northern North Whidbey. Its properties and possible distribution are not known.

Bedrock is likely to lie at relatively shallow depths beneath the subarea. It was reported in the USGS test well at elevations below 550 feet below mean sea level. Reported geologic faulting to the

south of the subarea boundary has brought bedrock to shallower depths and even surface exposure in the extreme north of the subarea near Deception Pass. Bedrock is not a good aquifer in the area and yields only domestic quantities of water to wells. Its shallow presence likely precludes Aquifer A beneath the Northern North Whidbey area.

B. Water Quality and Saltwater Intrusion

Northern North Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is currently not a problem in the Northern North Whidbey subarea. Chloride levels exceeding 100 mg/L have not been reported in any of the wells in our database.

Saltwater intrusion has not occurred because groundwater use is relatively low, as is indicated by relatively high static water levels in Aquifer C. Only one well in our database has reported a groundwater level below mean sea level. Low hydraulic gradients and proximity to Skagit Bay make the Dugualla Bay area potentially susceptible to future saltwater intrusion, especially as groundwater use increases. The susceptible area is shown on Exhibit K-4. All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and/or manganese problems are very common in the subarea with approximately 28 percent of the class I, II, III and IV wells in our database (25 wells for the subarea) reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Northern North Whidbey subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Northern North Whidbey subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The analysis indicated that

only 1/2 to 1 mgd are potentially available for additional development.

(1) Recharge

A mass-balance analysis indicates that approximately 1 to 1-1/2 mgd recharge the groundwater system of the Northern North Whidbey area. The analysis, shown in Subappendix K-A, is based on rainfall of 19 to 22 inches per year, runoff of approximately 0 to 3 percent of precipitation, and evapotranspiration of 16.5 to 18.5 inches per year. Runoff is probably close to zero but may approach a few percent of precipitation because of the bedrock in the northern part of the subarea. The recharge area on Northern North Whidbey is estimated to be from 9 to 11 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 0.44 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

The difference between recharge and appropriation indicates that a small amount, 1/2 to 1 mgd, of additional groundwater may be available for development. This water is best developed from individual wells with yields of 50 gpm or less, or small well fields, located inland at least one mile from the coast and completed in Aquifers C and D. No major high yield areas were identified or are recommended for the additional supply development.

All new development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

2. EASTERN NORTH WHIDBEY ISLAND

Eastern North Whidbey may have potential for development of 1 to 1-1/2 mgd of additional groundwater supplies. Many tens of smaller wells (locally to 100+ gpm, but typically under 50 gpm), located inland at least one mile from the coast, properly spaced, will be needed to maximize the additional development. Full development will likely

require abandonment of coastal wells and replacement by inland, optimally located new wells.

A. Principal Aquifers and Well Yields

Four of the five main aquifers in Island County appear to lie beneath Eastern North Whidbey Island. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present throughout much of the subarea, although it appears to be thin and discontinuous. Aquifer E wells are typically 30 to 150 feet deep and tap mostly sand deposits with a saturated thickness that varies from 0 to about 20 feet thick. The aquifer lies from 250 feet above mean sea level to sea level. Well yields are typically less than 50 gpm. Transmissivity data indicate typical values of less than 5,000 gpd/ft.

Aquifer D is present beneath all of the subarea. It comprises the second most important aquifer in the eastern North Whidbey subarea. The aquifer lies at an elevation from 200 feet above mean sea level to sea level, making saltwater intrusion possible in the coastal areas along Crescent Harbor where it is lowest. The wells tapping this aquifer are typically 50 to 200 feet deep. The saturated, water bearing zones in this aquifer are typically 0 to 20 feet thick. Theoretical maximum well yields are typically less than 50 gpm although a few localized zones can produce 100+ gpm. Transmissivities are generally less than 5,000 gpd/ft.

Aquifer C forms the main aquifer in the Eastern North Whidbey subarea. It lies at an elevation of 150 feet above to 200 feet below sea level. The wide range in elevations is likely the result of a complex history of glacial erosion and deposition. Wells tapping this aquifer are generally 150 to 300 feet deep. The aquifer consists of fine to medium sand with occasional gravel zones and has a typical saturated thickness of 10 to 40 feet. Theoretical maximum well yields are typically less than 50 gpm but in areas with high static water levels (such as the center uplands) yields of 100+ gpm are possible because of relatively high available drawdown. Transmissivity data are insufficient for evaluation, but based on similar deposits in other areas, we estimate a range of 5,000 gpd/ft to 30,000+ gpd/ft.

Aquifer B has been reported in two deep wells drilled in the subarea. The aquifer appears to lie at elevations of 100 to 200 feet below mean sea level. Wells tapping this aquifer are generally 350 to more than 450 feet deep. Water bearing zones in this aquifer appear to be small, under 10 feet thick. Theoretical well yields are unknown but likely to be less than 50 gpm as static water levels near sea level are often the limiting factor. Transmissivities may be small, under 5,000 gpd/ft, as the aquifer appears to have thin

(10 feet or so) water bearing zones, of only low to moderate permeability.

Aquifer A may not be present beneath the Eastern North Whidbey area. It was not observed in the 850-foot USGS test well, drilled to an elevation of 440 feet below sea level in the middle of the subarea. The properties and possible distribution of the aquifer are not known.

B. Water Quality and Saltwater Intrusion

Eastern North Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into fresh water supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not considered serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is not a major problem within the Eastern North Whidbey subarea. Only one well in our database indicates saltwater intrusion and this is located at Davis Landing. There are also several wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas, between Strawberry and Polnell Points. The potential intrusion areas are outlined on Exhibit K-4. All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese concentrations exceeding recommended state standards appear to be typical of those throughout the County. A total of 11 out of 33 (or about 32 percent) of the class I, II, III and IV wells in our database reported iron and/or manganese exceeding the State Recommended Drinking Water Standard. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Eastern North Whidbey subarea and are not considered health hazards.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Eastern North Whidbey subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The lower end of the

additional development range represents the amount that is very likely feasible while the upper end of the range may be possible but only with optimal well placement (including abandonment of most, if not all, coastal wells), verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 2 to almost 2-1/2 mgd recharge the groundwater system of the Eastern North Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 21 to 24 inches per year, runoff of approximately 0 to 5 percent of precipitation, and evapotranspiration of 18 to 20 inches per year. No perennial and only a few intermittent streams are mapped for the area so runoff may not be significant. There are, however, several swamps and ponds in the area and these may play a role in runoff generation by producing near-surface, saturated, soil areas that can generate runoff during the wetter times of the year. In order not to overestimate recharge we have added a conservative runoff factor of 3 percent of precipitation for the subarea. The recharge area on Eastern North Whidbey is estimated to be about 15 to 18 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 0.86 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

The difference between recharge and use indicates that 1 to 1-1/2 mgd of unappropriated replenishment of storage may be available for additional development. Many low yield wells will be needed to develop this additional supply. Localized, higher yield wells (100+ gpm) may be possible from Aquifer C in the central part of the subarea where static water levels are higher, although exploration will be needed to define these zones. The preferred location for additional wells is at least one mile or more from the coast. Aquifer D has some potential for additional development but well yields are likely to be low, under 50 gpm.

Since well yields are typically less than 50 gpm, many tens of wells will be needed. Where higher yield wells of 100+

gpm can be established, somewhat fewer wells will be needed. Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

## 3. SOUTHWESTERN NORTH WHIDBEY ISLAND

Southwestern North Whidbey appears to have little potential for development of additional groundwater supplies as appropriations exceed the estimated recharge by as much as seven times. This ratio may be an overestimate as all of the appropriated water may not be consumed. Over-appropriations of this magnitude are likely to worsen the already considerable saltwater intrusion problems, if pumping continues at these high rates.

### A. Principal Aquifers and Well Yields

All five of the main aquifers in Island County have been identified in Southwestern North Whidbey subarea. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present beneath most the subarea. The sand and gravel that comprise the aquifer is mostly unsaturated and is tapped by only a few domestic wells. Although the USGS reports that this aquifer is over 90 feet thick in some places it appears to have saturated thickness of only 0 to 10 feet. The aquifer lies at an elevation of 150 to 50 feet above mean sea level and is not susceptible to saltwater intrusion. The few wells tapping this aquifer are typically less than 100 feet deep. Well yields are typically less than 50 gpm although higher yields of 100+ gpm are feasible at locations in the Oak Harbor area. Transmissivity data are limited but representative values are likely to be less than 1,000 gpd/ft.

Aquifer D is present beneath all of the subarea and forms one of the main aquifers, especially in the west. The sand and occasional gravel that comprise the aquifer are only partly saturated. Saturated, water bearing zones are typically only 5 to 20 feet thick. The aquifer lies at an elevation from 100 feet above mean sea level to sea level. Wells tapping this aquifer are typically 150 to 250 feet deep. Well yields are typically less than 50 gpm because of limited available drawdown but can exceed 100 gpm locally. Transmissivities range from under 5,000 gpd/ft to over 45,000 gpd/ft.

Aquifer C is the other main aquifer in the Southwestern North Whidbey subarea. It lies at an elevation of just about sea level to 250 feet below mean sea level. Wells tapping this aquifer are

generally 200 to 300 feet deep. The aquifer typically has saturated water bearing zones of sand and gravel from 20 to 50 feet thick. Theoretical maximum well yields are typically less than 50 gpm and are limited by static water levels that are near sea level in some areas, especially near the coast. Yields of 250+ gpm are possible in localized areas of higher transmissivity such as northwest of Oak Harbor (T32N/R1E parts of Sections 27, 33, and 34). Transmissivities are variable with values ranging from 1,000 gpd/ft to 30,000+ gpd/ft.

Aquifer B may lie beneath most, if not all, of the Southwest North Whidbey subarea. Only a few wells are completed in Aquifer B, but several deep wells have verified its presence and indicated its properties throughout the area, e.g., USGS test well drilled near the Ault Field, as well as a few supply wells in the area. The aquifer typically lies at an elevation of 250 to 400 feet below mean sea level. Wells tapping this aquifer are generally 300 to 500 feet deep. Water bearing zones in this aquifer are discontinuous and up to 40 feet thick. Theoretical well yields are generally less than 50 gpm as transmissivities are less than 5,000 gpd/ft and water levels are close to sea level, limiting available drawdown.

Aquifer A is probably present beneath the Southwestern North Whidbey subarea as it was observed in the two USGS test wells drilled in the area. Its properties and possible distribution are not known as no hydrologic testing was conducted on this aquifer in these wells.

B. Water Quality and Saltwater Intrusion

Southwestern North Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron or manganese is not considered as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is currently a problem in much of the coastal and some inland areas of all sea level and below aquifers in the Southwestern North Whidbey subarea. Chloride levels exceeding 100 mg/L were reported in many wells along the coast, especially along the west coast and along the entrance to Penn Cove (Exhibit K-5). Saltwater intrusion has already begun at these coastal locations and may exist at other areas not covered in our database. Continued over pumping as is indicated in the recharge-use analysis will probably exacerbate the situation producing more saltwater intrusion.

There are also several wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas and are outlined on Exhibit K-4.

All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and/or manganese problems are very common in the subarea with approximately 40 percent of the class I, II, III and IV wells in our database of 87 wells reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Southwestern North Whidbey subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Southwestern North Whidbey subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The analysis indicated that no additional supplies are available for this subarea as apparent use already exceeds recharge.

(1) Recharge

A mass-balance analysis indicates that approximately 1 to 1-1/2 mgd recharge the groundwater system of the Southwestern North Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 16 to 20 inches per year, runoff of approximately 0 to 5 percent of precipitation, and evapotranspiration of 15 to 18 inches per year. Runoff is probably close to zero but may approach a few percent as indicated by the intermittent streams and swampy areas mapped in the subarea. The recharge area on Southwestern North Whidbey is estimated to range from 21 to 24 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 7.76 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in

Section K-III. If not, then this use estimate may be too high.

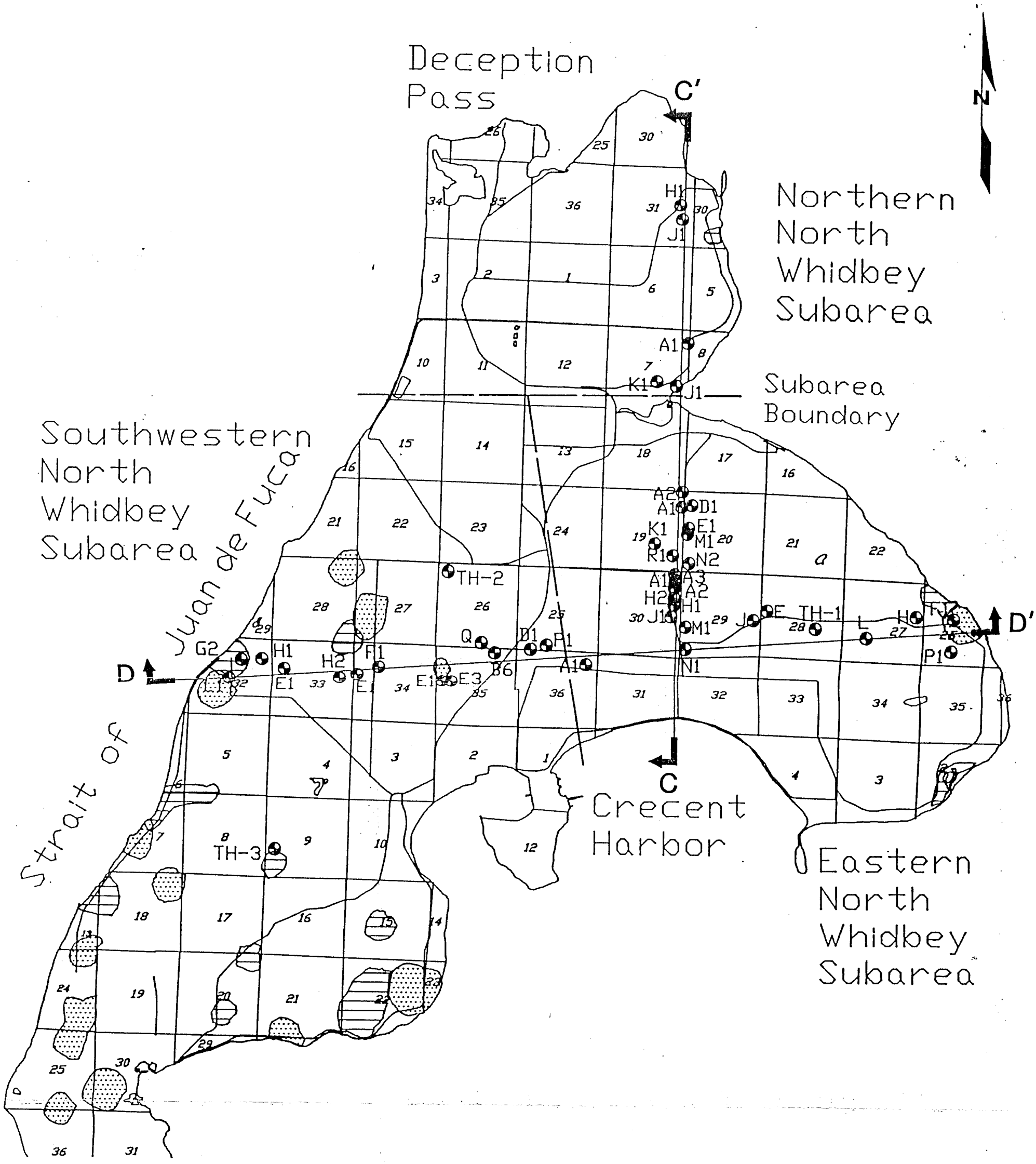
(3) Additional Use

The difference between recharge and appropriation indicates that no additional groundwater may be available for development. The current appropriations are as much as seven times the estimate for recharge. If all the appropriated water is consumed at the registered rate then water will be removed from the system at a rate far greater than replenishment. Such removal will likely cause increased saltwater intrusion, a condition that already exists in many parts of the subarea.

Any new development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

# *Well/Cross Section Location and Water Quality Map*

## *North Whidbey Island*

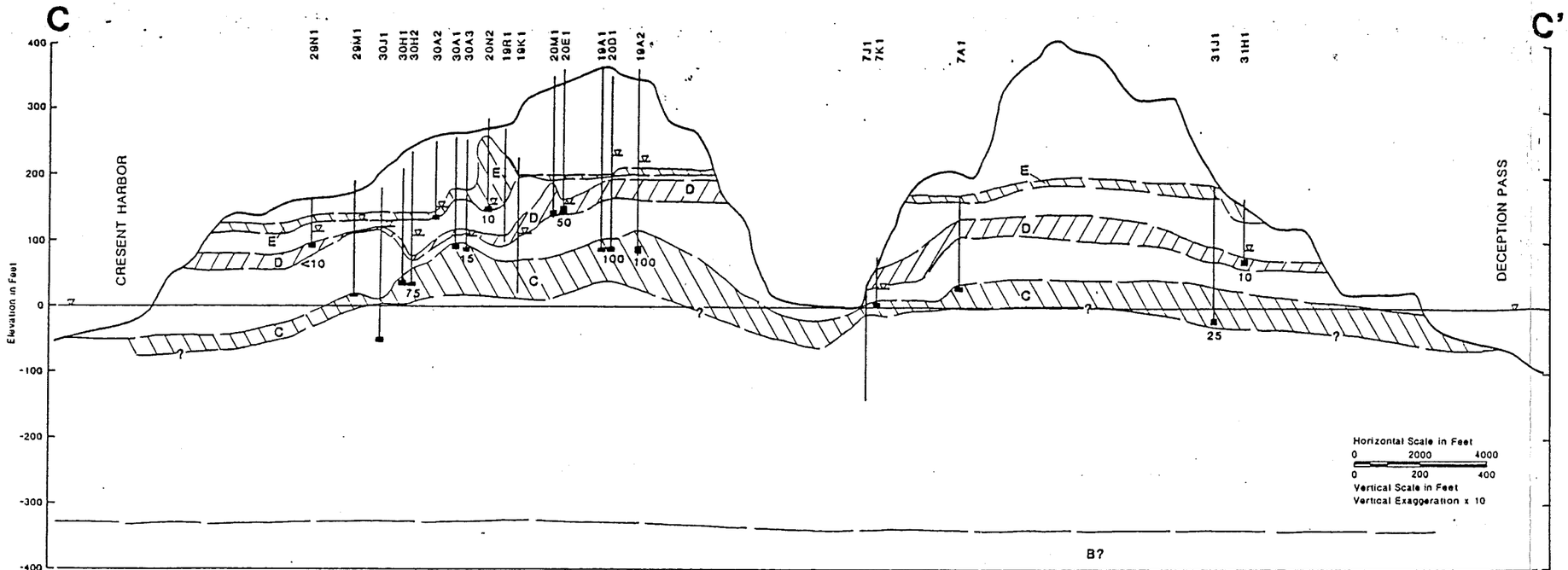


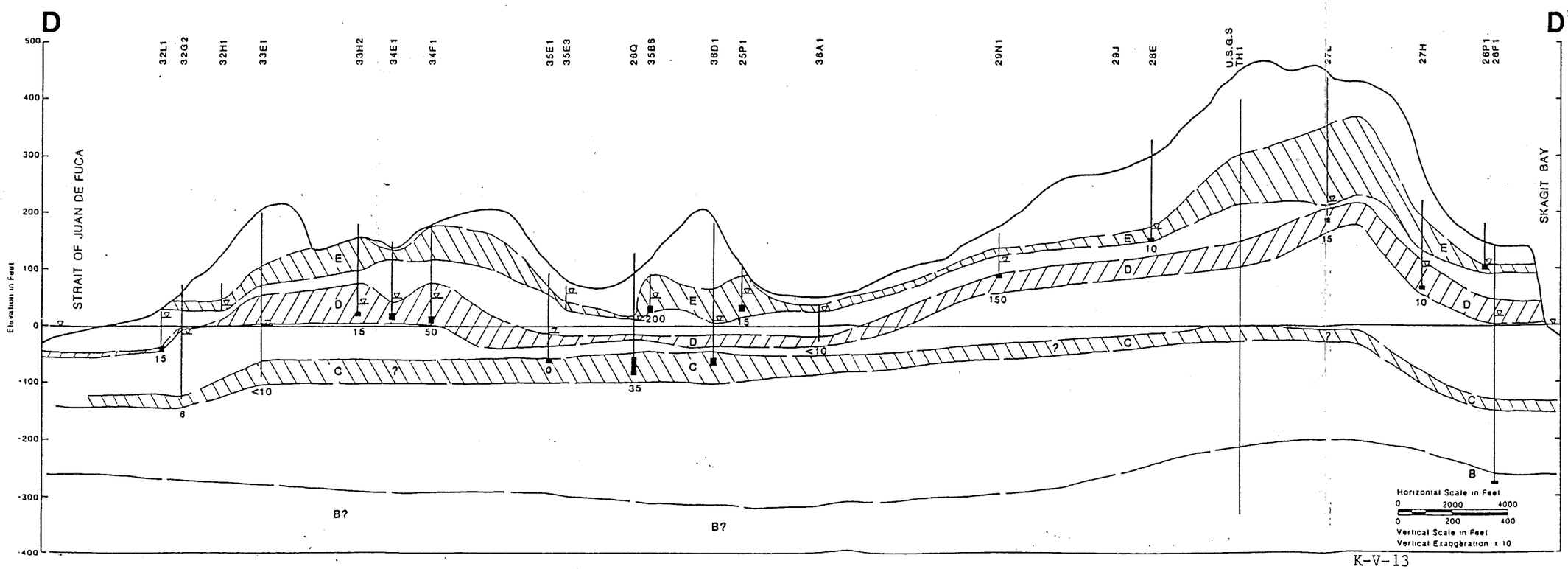

K-V-12

*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-4*

# Hydrogeologic Cross Sections C-C' and D-D'

## North Whidbey Island




12H1 Well Number
Well Location
Water Level
Screened Section
50 Theoretical Maximum One-week Well Yield in gpm
A Aquifer Location and Designation

Note: Hydrogeologic Cross Sections were adapted from unpublished USGS Cross Sections.

*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-5*

## SECTION K-VI

## CENTRAL WHIDBEY ISLAND

Central Whidbey Island has potential for only limited development. The estimated unappropriated replenishment of groundwater storage is about 0 to 2+ mgd. This range defines the upper bound of additional groundwater supply. Any development should be planned for the Southern subarea as the Northern subarea appears to be over appropriated at this time. No one portion of the Southern subarea of Central Whidbey appears capable of supplying a major portion of this total. Rather a series of lower yield wells or well fields, distributed throughout the center of the Southern Central Whidbey isthmus will be needed to maximize development.

The Central Whidbey region has been divided into Northern and Southern subareas for the purpose of this report, based on topography and general groundwater divide. The boundary runs approximately east-west from Admiralty Bay to Saratoga Passage, at the top of the narrow isthmus at Sections 19 and 20 in T31N/R2E. This boundary is shown on Exhibit K-1. Because the properties of the aquifers, representative well statistics, and water quality are different in each of the subareas, each is discussed below separately.

Summary data and assessments for Central Whidbey Island are included in Table K-1, while well and cross section locations are shown on Exhibit K-6. Hydrogeologic cross sections are shown on Exhibit K-7.

### 1. NORTHERN CENTRAL WHIDBEY ISLAND

Northern Central Whidbey appears to have little potential for development of additional groundwater supplies as appropriations exceed the estimated recharge by as much as two times. A few additional wells may possibly be located at the southern end of the subarea for a small additional yield but careful design and operation will be necessary to minimize additional saltwater intrusion problems.

#### A. Principal Aquifers and Well Yields

Four of the five main aquifers in Island County have been identified in Northern Central Whidbey subarea. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer D is present beneath the east and far west parts of the subarea. The sand and gravel that comprise the aquifer are mostly unsaturated. It is tapped by only a few wells. The USGS reports that this aquifer is over 90 feet thick in some places and is present beneath much of Northern Central Whidbey, but our analysis indicates that it is only saturated to a thickness of 0 to 40 feet. The aquifer lies at an elevation of 50 feet above to 50 feet below

mean sea level. The few wells tapping this aquifer are typically 150 to 250 feet deep. Well yields are typically less than 50 gpm.

Transmissivity data are not available but representative values are likely to be on the order of a few 1,000 gpd/ft.

Aquifer C is the main aquifer in the Northern Central Whidbey subarea. It lies at an elevation of 10 feet above to 100 feet below mean sea level. Wells tapping this aquifer are generally 200 to 300 feet deep. The aquifer typically has saturated water bearing zones of sand (and occasionally gravel) up to 20 feet thick. Theoretical maximum well yields are typically less than 50 gpm and are limited by static water levels that are near sea level in some areas, especially near the coast. Yields of 100+ gpm are possible in localized areas of higher transmissivity such as near the central part of subarea near the Coupeville Naval Air field. Transmissivities are variable with values ranging from 1,000 gpd/ft to 30,000 gpd/ft.

Aquifer B appears to lie beneath most, if not all, of the Northern Central Whidbey subarea. Only a few wells are completed in Aquifer B, but several deep wells have verified its presence and properties, throughout the area. The USGS test well drilled near the Naval Air field as well as a few supply wells in the area indicated that this aquifer is present. The aquifer typically lies at an elevation of 100 to 200 feet below mean sea level. Wells tapping this aquifer are generally 350 to 450 feet deep. Water bearing zones in this aquifer are generally thin, less than 10 feet thick. Theoretical well yields are generally less than 50 gpm as transmissivities are less than 5,000 gpd/ft and water levels are close to sea level, limiting available drawdown.

Aquifer A is probably present beneath the Northern Central Whidbey subarea as it was observed in the USGS test wells drilled in the area. Its properties and possible distribution are not known.

B. Water Quality and Saltwater Intrusion

Northern Central Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the state recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion has been reported in many coastal areas of sea level and below aquifers in the Northern Central Whidbey subarea.

Chloride levels exceeding 100 mg/L were reported in many wells along the coast, especially along Saratoga Passage between Harrington and Race Lagoons, along Penn Cove near Coupeville, and along Admiralty Bay near the ferry terminal. Saltwater intrusion has already begun at these coastal locations and may exist at other areas not covered in our database. Continued over pumping as is indicated in the recharge-use analysis will further degrade the situation.

There are also several wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas and are outlined on Exhibit K-6.

All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese problems are very common in the subarea with approximately 30 percent of the class I, II, III and IV wells in our data base (of 27 wells) reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Northern Central Whidbey subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Northern Central Whidbey subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The analysis indicated that no additional supplies are available for this subarea but some small amounts may be possible but verification through monitoring and more detailed analysis will be necessary.

(1) Recharge

A mass-balance analysis indicates that approximately 1 to 1-1/2 mgd recharge the groundwater system of the Northern Central Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 17 to 21 inches per year, runoff of approximately 0 to 3 percent of precipitation, and evapotranspiration of 18 to 20 inches per year. The range of precipitation is based on the uncertainty of the rainfall data for the area (see Section K-III). Runoff is probably close to zero but may approach a few percent as indicated by the perennial and intermittent streams mapped in the

subarea. The recharge area on Northern Central Whidbey is approximately 19 to 22 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 2.36 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

The difference between recharge and appropriation indicates that no additional groundwater may be available for development. The current appropriations are one to two times the estimate for recharge. If all the appropriated water is consumed at the registered rate then groundwater will be removed from the system at a rate greater than replenishment. Such removal will likely cause increased saltwater intrusion, a condition that already exists in many parts of the subarea.

All new development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

2. SOUTHERN CENTRAL WHIDBEY ISLAND

Southern Central Whidbey may have potential for development of 0 up to 2 mgd of additional groundwater supplies. A large number of smaller wells (locally to 100+ gpm, but typically under 50 gpm), properly placed along the central uplands of the isthmus that comprise the subarea, will be needed to maximize the additional development. In addition, existing coastal wells may have to be replaced by inland wells to realize full development.

A. Principal Aquifers and Well Yields

All five of the main aquifers in Island County appear to lie beneath Southern Central Whidbey subarea. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present throughout much of the subarea, in the upland areas. It is tapped by only a few wells and these are used

primarily for domestic purposes. Aquifer E wells are typically less than 50 feet deep and tap mostly sand deposits with a saturated thickness of less than 10 feet. The aquifer lies at 150 feet or more above mean sea level. Well yields are typically less than 50 gpm. Transmissivity data are not available but based on the nature of the aquifer, typical values are likely to be on the order of a few 1,000 gpd/ft.

Aquifer D is present beneath much of the subarea. The aquifer lies at an elevation of 150 to 80 feet above mean sea level, making saltwater intrusion within this aquifer impossible. The wells tapping this aquifer are typically 100 to 200 feet deep. The saturated, water bearing zones in this aquifer are typically under 20 feet thick in the south and east part of the subarea, while it is generally unsaturated in the southwest, between Lagoon Point and Mutiny Bay. Well yields are typically less than 50 gpm. Transmissivities are insufficient to quantify but are likely to be less than 5,000 gpd/ft.

Aquifer C forms the main aquifer in the Southern Central Whidbey subarea. It lies at an elevation of 50 feet above to 80 below mean sea level. Wells tapping this aquifer are generally 150 to 300 feet deep. The aquifer consists of fine to medium sand with occasional gravel zones and has a typical saturated thickness of 10 to 40 feet. Theoretical maximum well yields are typically less than 50 gpm and are limited by static water levels that are near sea level along most of the coastal areas. Several areas with localized theoretical yields of 250+ gpm were located indicating that local yields of 250+ gpm are possible in areas of higher transmissivity. Current higher yield areas lie in a small area near the southern Holmes Harbor area (T30N/R2E Section 33 and T2 9N/R2E Section 3) and near Lagoon Point (T30N/R2E Section 19) but concentrating heavy development in these coastal areas may induce saltwater intrusion. Transmissivities are variable with values ranging from less than 1,000 gpd/ft up to 60,000+ gpd/ft

Aquifer B is discontinuous but present beneath much of the Southern Central Whidbey subarea. The aquifer typically lies at an elevation of 100 to 200 feet below mean sea level. Wells tapping this aquifer are generally 300 to more than 400 feet deep. Water bearing zones in this aquifer are up to 40 feet thick but can be saline. Several wells were abandoned or pulled back to shallower depths because of saline water. Theoretical well yields are generally less than 50 gpm as static water levels near sea level are often the limiting factor. In many locations, static levels are below sea level indicating that theoretical yields are zero. Transmissivities are small with reported values of 100 gpd/ft to 3,000 gpd/ft.

Aquifer A may be present beneath the Southern Central Whidbey subarea. It was observed in the only deep well (below an elevation of 300 feet below sea level) drilled in the subarea. Its properties and possible distribution are not known.

B. Water Quality and Saltwater Intrusion

Southern Central Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is currently a problem in several parts of the Southern Central Whidbey subarea, which have already experienced chloride levels exceeding 100 mg/L. The area reporting the most widespread intrusion is near Greenbank, from a mile or so north to Dines point, along the coast up to almost a mile inland. Most wells reporting this condition are finished in Aquifer C. Other areas to report saltwater intrusion lie along the coast on the Admiralty Inlet side, north and south of Lagoon Point. These areas are shown on Exhibit K-6.

There are also several wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas. The potential intrusion areas are outlined on Exhibit K-6. All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese problems appear to be less common in the subarea (compared to other areas and subareas) with only 8 percent of the class I, II, III and IV wells in our database (25 wells) reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. The apparent lower concentration levels of iron and manganese many be coincidental as a larger database could present a different picture. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Southern Central Whidbey subarea and are not considered health hazards.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Southern Central Whidbey area. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing use equals the maximum amount available for additional development under optimal conditions. The lower end of the additional development range represents the amount that is very likely feasible while the upper

end of the range may be possible but only with optimal well placement (including replacement of many coastal wells), verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 1 to 3+ mgd recharge the groundwater system of the Southern Central Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 20 to 25 inches per year, runoff of approximately 3 to 7 percent of precipitation, and evapotranspiration of 18 to 20 inches per year. The large range of precipitation is based on the uncertainty and contradictory nature of the rainfall data for the area (see Section K-III). Runoff is indicated by the perennial and intermittent streams in the subarea. The recharge area on Southern Central Whidbey is estimated to range from 20 to 23 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 1.12 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

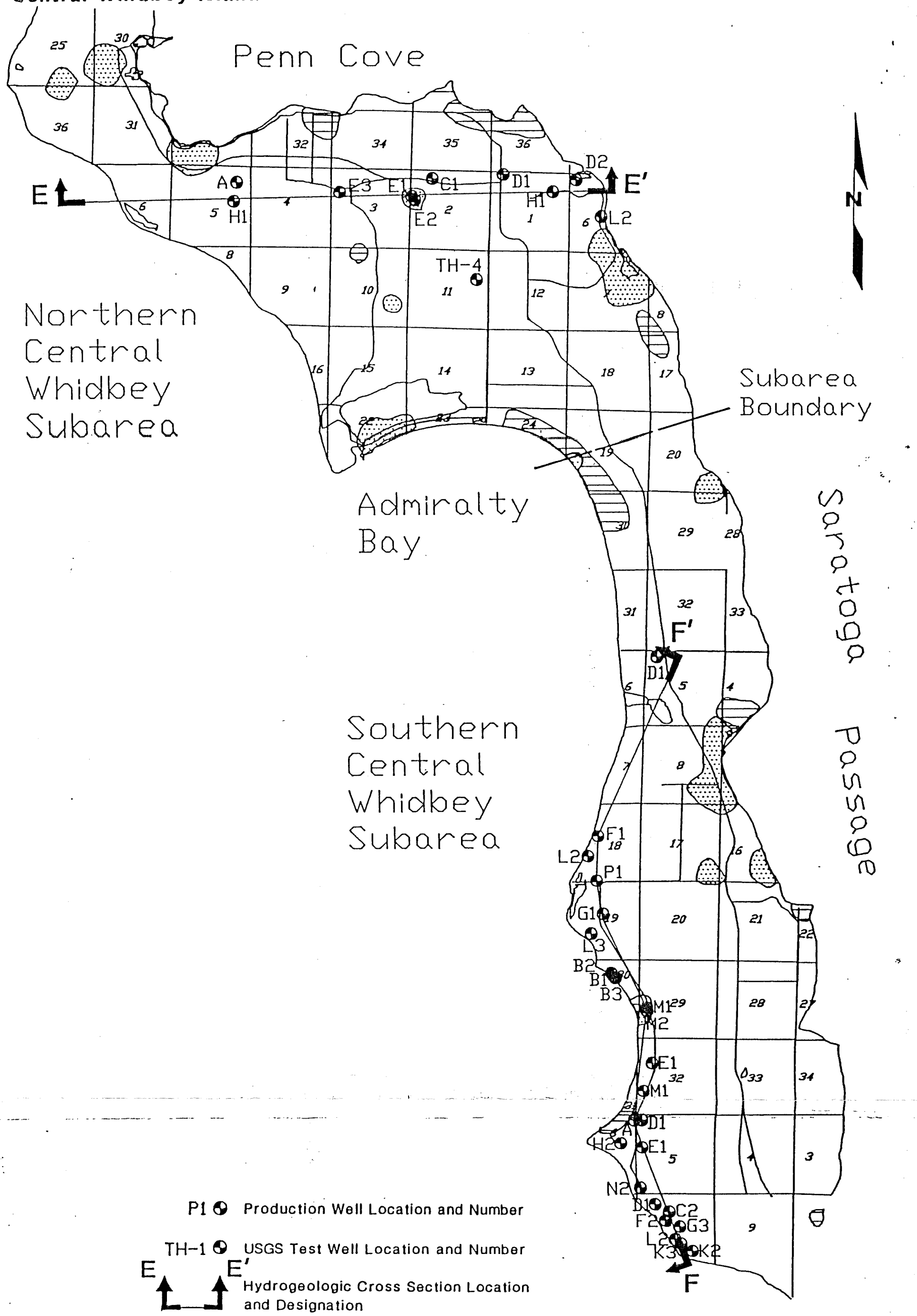
The difference between recharge and appropriation indicates 0 to 2+ mgd of replenishment to groundwater storage is currently unappropriated. This range defines the upper bounds of groundwater that may be available for additional development. Many low yield wells will be needed to develop this additional supply. Localized, higher yield wells (250+ gpm) are possible although exploration will be needed to define these zones. Aquifer C has the best potential for additional development, however, care will be required to minimize saltwater intrusion, as much of this aquifer lies below sea level. The preferred location for additional wells is along the center portion of the upland areas, at least one mile or more from the coast. Aquifer B does not appear to have good potential for additional development as saltwater intrusion and/or water levels near or below sea level are reported at many locations.

Since well yields are typically less than 50 gpm, many tens of wells will be needed. Where higher yield wells of 250+ gpm can be established, fewer wells will be needed. The

higher yield areas described above are not recommended for heavy development as saltwater intrusion may result. Rather, test well drilling in the central upland parts of the isthmus is recommended to located and assess high yield areas with lower potential for saltwater intrusion. Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

# Well/Cross Section Location and Water Quality Map

## Central Whidbey Island




P1 Production Well Location and Number

TH-1 USGS Test Well Location and Number

E E' Hydrogeologic Cross Section Location and Designation

Area with One or More Wells with Water Levels Below Mean Sea Level

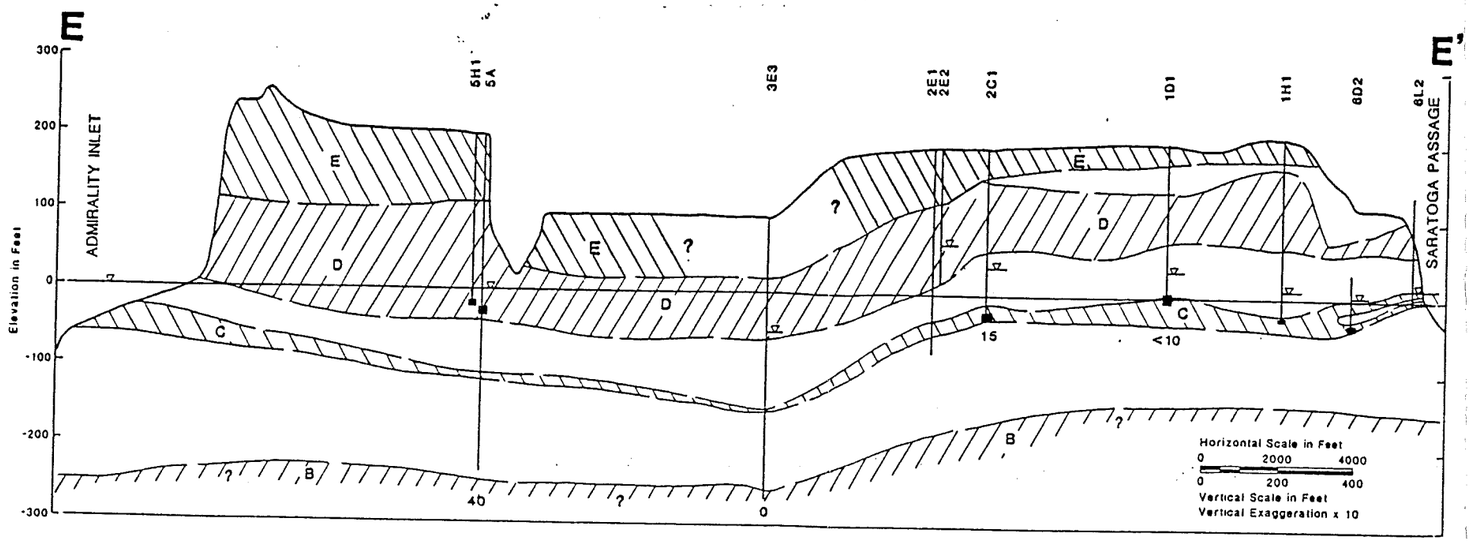
Area with One or More Wells Indicating Saltwater Intrusion (Cl ≥ 100 ppm)

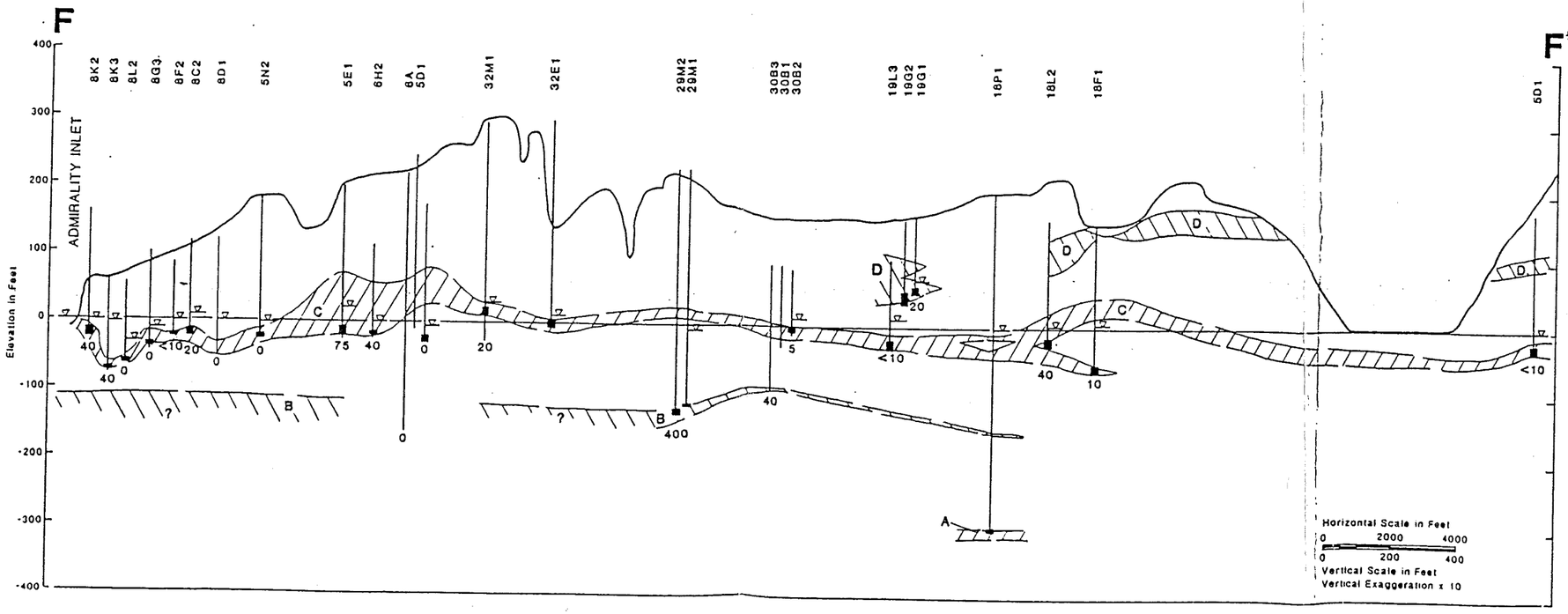


Hart Crowser, Inc.
J-1939 9/87
Exhibit K-6

# *Hydrogeologic Cross Sections E-E' and F-F'*

## *Central Whidbey Island*




10C2 Well Number
Well Location
Water Level
Screened Section
10 Theoretical Maximum One-week Well Yield in gpm

A Aquifer Location and Designation

Note: Hydrogeologic Cross Sections were adapted from unpublished USGS Cross Sections.



*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-7*

## SECTION K-VII

## SOUTH WHIDBEY ISLAND

South Whidbey Island has good potential for additional development. Currently, there appears to be an unappropriated replenishment of aquifer storage of about 21 to 34 mgd. This range defines the upper bound of additional groundwater supply. No one area appears capable of supplying a major portion of this total. Lesser portions of the total available for additional development can be produced from a series of wells or well fields distributed throughout South Whidbey Island. Full development will require optimal well placement which will include abandonment of some coastal wells.

The South Whidbey region has been divided into Northwestern and Southeastern subareas for the purpose of this report, based on topography and general groundwater divide. The boundary runs approximately from Useless Bay, through Lone Lake to the northeast corner of T30N/R3E Section 32. This boundary (shown on Exhibit K-1) is less defined than those separating the major regions and some of the subareas. Therefore, the separate quantities available for additional development in each subarea (discussed below) are not independent. Rather, the sum of these quantities is fixed and the distribution of additional water in each subarea can be reduced if heavy development occurs in the adjacent subarea. Because the properties of the aquifers, representative well statistics, and water quality are different in each of the subareas, each is discussed below separately.

Summary data and assessments for South Whidbey Island are included in Table K-1, while well and cross section locations are shown on Exhibit K-8. Hydrogeologic cross sections are shown on Exhibit K-9.

### 1. NORTHWESTERN SOUTH WHIDBEY ISLAND

Northwestern South Whidbey has good potential for development of additional supplies. Approximately 5 to 11+ mgd of unappropriated replenishment to groundwater storage may be available. A large number, perhaps 60 to 100 or more, of smaller wells (locally to 100+ gpm, but typically under 50 gpm), properly placed inland (preferably at least one mile) with adequate spacing, will be needed to maximize the additional development. The central portion of the subarea is likely best for placement of well fields for a small scale regional supply.

#### A. Principal Aquifers and Well Yields

Three of the five main aquifers in Island County have been identified in the Northwestern South Whidbey subarea. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer D is present in the eastern part of the subarea only, where it is thin and discontinuous. The USGS reports that this aquifer is present beneath much of Northwestern South Whidbey subarea, however, it appears to be unsaturated in all but the area tapped by the few wells that lie in the very northern portion of the subarea near Rocky Point. These wells are typically less than 100 feet deep. In this area it appears to be saturated to a thickness of less than 10 feet. The aquifer lies at an elevation of 250 to 75 feet above mean sea level. Well yields are typically less than 50 gpm. Transmissivity data are not available but representative values are likely to be on the order of a few 1,000 gpd/ft.

Aquifer C is the main aquifer in the Northwestern South Whidbey subarea. It lies at an elevation of 75 feet above to 50 feet below mean sea level. Wells tapping this aquifer are generally 150 to 300 feet deep. The aquifer typically has saturated thicknesses of sand (and occasionally gravel) on the order of 20 to 50 feet. Theoretical maximum well yields are typically less than 50 gpm and are limited by static water levels that are near sea level in some areas, especially the northern peninsula and along Holmes Harbor. In these cases the wells should be pumped at considerably less than 50 gpm. Yields of 250+ gpm are possible in localized areas of higher permeability, such as near Freeland, Rocky Point, and Mutiny Bay; but pumping at these rates may induce saltwater intrusion in coastal areas. Transmissivities are extremely variable with values as low as 2,000 gpd/ft to one estimate of 100,000 gpd/ft for a gravel zone north of Oliver Lake and an estimate of 300,000+ gpd/ft at one location on the Holmes Harbor coast.

Aquifer B is probably present beneath most if not all of the Northwest South Whidbey subarea. Only a few wells are completed in this aquifer, but several deep wells have verified its presence and properties. The USGS test well drilled north of Goss Lake as well as a few supply wells in the area indicated that this aquifer is present, although brackish water reported along Holmes Harbor would limit its usefulness. The aquifer typically lies at an elevation of 50 to 200 feet below mean sea level. Wells tapping this aquifer are generally 300 to more than 400 feet deep. Water bearing zones in this aquifer are generally 10 to 30 feet thick. Theoretical well yields are generally less than 50 gpm as transmissivities are probably low. No data are available to assess transmissivity in Aquifer B in this subarea.

Aquifer A is probably not present beneath Northwestern South Whidbey subarea. It was not observed in the USGS test wells drilled in the subarea. Its properties and possible distribution are not known.

B. Water Quality and Saltwater Intrusion

Northwestern South Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended levels. Saltwater intrusion into

freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron and/or manganese is not considered as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is not currently a problem in the main aquifer of the Northwestern South Whidbey subarea (Aquifer C). Chloride levels exceeding 100 mg/L were reported in only one well in our database, located near Freeland. Several deeper wells tapping Aquifer B were abandoned before completion because brackish water was encountered. These wells were drilled along Holmes Harbor and at the north peninsula area near Rocky Point.

There are also several wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas: Holmes Harbor, Freeland, Double Bluff and the northeast coast, west of Langley. The potential intrusion areas are outlined on Exhibit K-8.

All wells in coastal areas have the potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese problems are very common in the subarea with approximately 30 percent of the class I, II, III and IV wells in our data base reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Northwestern South Whidbey subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Northwestern South Whidbey area. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The lower end of the additional development range represents the amount that is very likely feasible while the upper end of the range may be possible but only with optimal well placement (including replacement of most coastal wells), verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 7 to almost 13 mgd recharge the groundwater system of the Northwestern South Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 25 to 35 inches per year, runoff of approximately 3 to 7 percent of precipitation, and evapotranspiration of 18 to 21 inches per year. The large range of precipitation is based on the uncertainty and contradictory nature of the rainfall data for the area (see Section K-III). Runoff is indicated by the perennial and intermittent streams in the subarea. The recharge area on Northwestern South Whidbey is estimated to range from 22 to 24 square miles.

(2) Existing Appropriation

A summation of existing water rights indicates that approximately 1.55 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

The difference between recharge and appropriations indicates that 5 to 11+ mgd may be available for additional development. Many low yield wells will be needed to develop this additional supply, although local, higher yield (250+ gpm) are possible with exploration. Aquifer C has the best potential for this development. Aquifer B may also have potential for additional development if higher transmissivity zones can be found inland from the coast. Since well yields in these aquifers are typically less than 50 gpm, many tens of wells will be needed; however where higher yield wells of 250+ gpm can be established, fewer wells will be needed. The center portion of the subarea is recommended for additional development. This location is recommended to reduce the potential for saltwater intrusion, not because of known higher yield zones. A few higher yield areas were located near Freeland, Rocky Point, and Mutiny Bay. Because of their proximity to the coast, heavy development in these areas is likely to induce saltwater intrusion and is therefore not recommended.

Areas outside of the interior region can be developed but wells placed closer to the coast will increase the potential for saltwater intrusion.

Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

## 2. SOUTHEASTERN SOUTH WHIDBEY ISLAND

Southeastern South Whidbey has good potential for development of additional supplies. Approximately 16 to almost 23 mgd of unappropriated replenishment of groundwater storage define the upper limit to additional development. A large number of smaller wells (locally to 250+ gpm, but typically under 50 gpm), properly placed inland (preferably at least one mile) with adequate spacing, will be needed to maximize additional development. Full development may require replacement of many coastal wells. The central portion of the Island is likely the best area for placement of well fields for a small scale regional supply.

### A. Principal Aquifers and Well Yields

Four of the five main aquifers in Island County have been identified in Southeastern South Whidbey subarea. Each of these aquifers is discussed below, along with estimates of theoretical, maximum, short-term (one week continuous pumping) well yields. The aquifers are discussed from shallowest to deepest.

Aquifer E is present in the southeastern part of the subarea, only. It is tapped by only a few wells and these are located near Deer Lake. These wells typically occur at elevations in excess of 300 feet above mean sea level and are less than 50 feet deep. The aquifer appears to be mostly unsaturated with a saturated thickness of less than 10 feet. Well yields are typically less than 50 gpm. Transmissivities data are not available but are likely to be on the order of a few 1,000 gpd/ft, but may be much higher in small localized gravel zones as reported for one well near Deer Lake.

Aquifer D is present beneath most if not all of the subarea. It serves as one of the major aquifers on the Southeast South Whidbey subarea, especially for domestic and small community well systems. The aquifer lies at an elevation of 300 to 50 feet above mean sea level, making saltwater intrusion impossible. The wells tapping this aquifer are typically 100 to 200 feet deep. The saturated, water bearing zones in this aquifer are typically less than 10 feet thick in the southern part of the subarea, while 20 to 30 feet in the northern part. Well yields are typically less than 50 gpm. Transmissivities are generally less than 5,000 gpd/ft.

Aquifer C forms another main aquifer in the Southeastern South Whidbey subarea. It lies at an elevation of 100 feet above to 50 feet below sea level. Wells tapping this aquifer are generally 100 to 300 feet deep. The aquifer, composed of fine to medium sand with

occasional gravel zones, has a typical saturated thickness of 10 to 50 feet. Theoretical maximum well yields are typically less than 50 gpm and are limited by static water levels that are near sea level near Useless Bay. Yields of 250+ gpm are locally possible in areas of higher transmissivity such as near Langley but concentrating heavy development in high transmissivity areas near coastal areas may induce saltwater intrusion. Transmissivities are variable with values as low as 2,000 gpd/ft up to 50,000+ gpd/ft.

Aquifer B may be present beneath most of the Southeastern South Whidbey subarea but data are only available where it is tapped extensively by wells in the Lone Lake area. Its presence has also been verified by the USGS test well drilled south of Langley. The aquifer typically lies at an elevation of 50 to 300 feet below mean sea level. Wells tapping this aquifer in the Lone Lake area are generally 200 to more than 300 feet deep. Other locations could require wells 400 or more feet deep. Water bearing zones in this aquifer are generally 20+ feet thick. Theoretical well yields are generally less than 50 gpm as static water levels near and below sea level are often the limiting factor. Transmissivity data are limited but values of 30,000 gpd/ft are reported. We estimate that typical values range from several 1,000 to several tens of 1,000 gpd/ft.

Aquifer A is probably not present beneath the southeastern South Whidbey subarea. It was not observed in the USGS test wells drilled south of Langley and was not reported in our data base. Its properties and possible distribution are not known.

B. Water Quality and Saltwater Intrusion

Southeastern South Whidbey Island has two main water quality considerations: saltwater intrusion and iron and/or manganese exceeding the recommended state levels. Saltwater intrusion into freshwater supplies is the most serious problem as excessive chloride levels associated with saltwater intrusion can render a water supply unusable. Excessive iron or manganese is not as serious. State levels for these constituents were established for aesthetic, not health reasons. Exceeding the recommended state levels is not thought to lead to health problems, but may produce a water supply that is unpalatable or stains clothing and fixtures.

Saltwater intrusion is not currently a problem in the Southeastern South Whidbey subarea. No chloride levels exceeding 100 mg/L were reported for any of the wells for which we have information.

There are, however, a few wells in the subarea, not yet experiencing saltwater intrusion but reporting water levels below mean sea level. These wells have the potential for saltwater intrusion in the future, especially as groundwater use increases. These areas all lie near coastal areas. The potential intrusion areas are outlined on Exhibit K-8. All wells in coastal areas have the

potential for saltwater intrusion and should be pumped in a properly engineered manner.

Iron and manganese problems are very common in the subarea with approximately 30 percent of the class I, II, III and IV wells in our database reporting iron and/or manganese exceeding the State Recommended Drinking Water Standard. Excessive iron and manganese do not appear to be associated with any specific location or aquifer as substandard water has been reported in both major aquifers at all parts of the subarea. These constituents are associated with weathering of the glacial and interglacial materials that form the aquifers in the Southeastern South Whidbey subarea.

C. Recharge and Groundwater Available for Additional Development

A groundwater recharge and appropriation analysis was used to quantify additional development in the Southeastern South Whidbey subarea. A mass balance approach was used in the analysis (described in Section K-III) where recharge minus existing appropriation equals the maximum amount available for additional development under optimal conditions. The lower end of the additional development range represents the amount that is likely feasible while the upper end of the range may be possible but only with optimal well placement (including replacement of many coastal wells), verification through monitoring, and more detailed analysis.

(1) Recharge

A mass-balance analysis indicates that approximately 18 to 25+ mgd recharge the groundwater system of the Southeastern South Whidbey subarea. The analysis, shown in Subappendix K-A, is based on rainfall of 30 to 38 inches per year, runoff of approximately 3 to 7 percent of precipitation, and evapotranspiration of 18 to 21 inches per year. The large range of precipitation is based on the uncertainty and contradictory nature of the rainfall data for the area (see Section K-III). Runoff is indicated by the perennial and intermittent streams in the subarea. The recharge area on Southeastern South Whidbey subarea is estimated to range from 34 to 37 square miles.

(2) Existing Appropriation

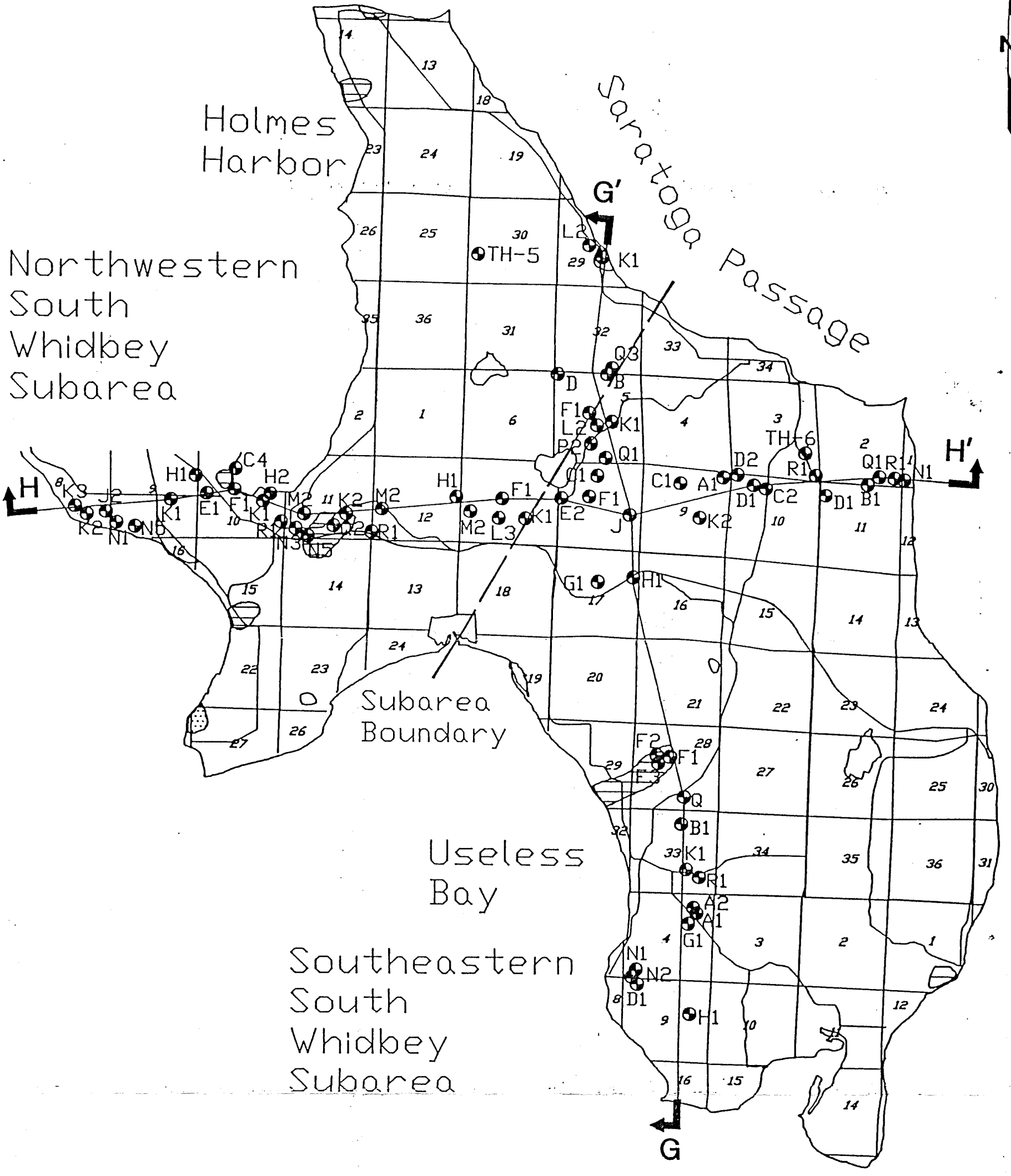
A summation of existing water rights indicates that approximately 2.38 mgd are already appropriated in the subarea. This summation includes water rights for domestic, public supply, and irrigation use. Single family wells were not included in the summation but use at less than appropriation levels by registered wells are likely to offset the non-inclusion of domestic wells as is explained in Section K-III.

(3) Additional Use

The difference between recharge and appropriation indicates that 16 to almost 23 mgd may be available for additional development. Many low yield wells will be needed to develop this additional supply, although local, higher yield wells (250+ gpm) are possible at some locations. Exploration will be needed to define these zones. Aquifer C has the best potential for this development, and will require care to minimize saltwater intrusion, as this aquifer lies below sea level. The preferred location for additional wells is inland, one mile or more from the coast. Aquifer B may also have good potential for additional development if higher transmissivity zones can be identified. Since well yields in these aquifers are typically less than 50 gpm, many tens of wells will be needed. Where higher yield wells of 250+ gpm can be established, fewer wells will be needed. One higher yield area was located near Langley. Others are likely to lie beneath other parts of the subarea. Heavy development in high yield areas near the coast (such as near Langley) may induce saltwater intrusion and is therefore not recommended without an area-specific evaluation.

Development should be accompanied with monitoring of new and existing wells for water levels, pumping quantities, and chloride or electrical conductivity. Wells should be pumped at rates that allow water levels to remain at or above mean sea level in the well.

# *Well/Cross Section Location and Water Quality Map*
## *South Whidbey Island*




P1 ◓ Production Well Location and Number

TH-1 ◓ USGS Test Well Location and Number

G G′ Hydrogeologic Cross Section Location and Designation

Area with One or More Wells with Water Levels Below Mean Sea Level

Area with One or More Wells Indicating Saltwater Intrusion (Cl ≥ 100 ppm)

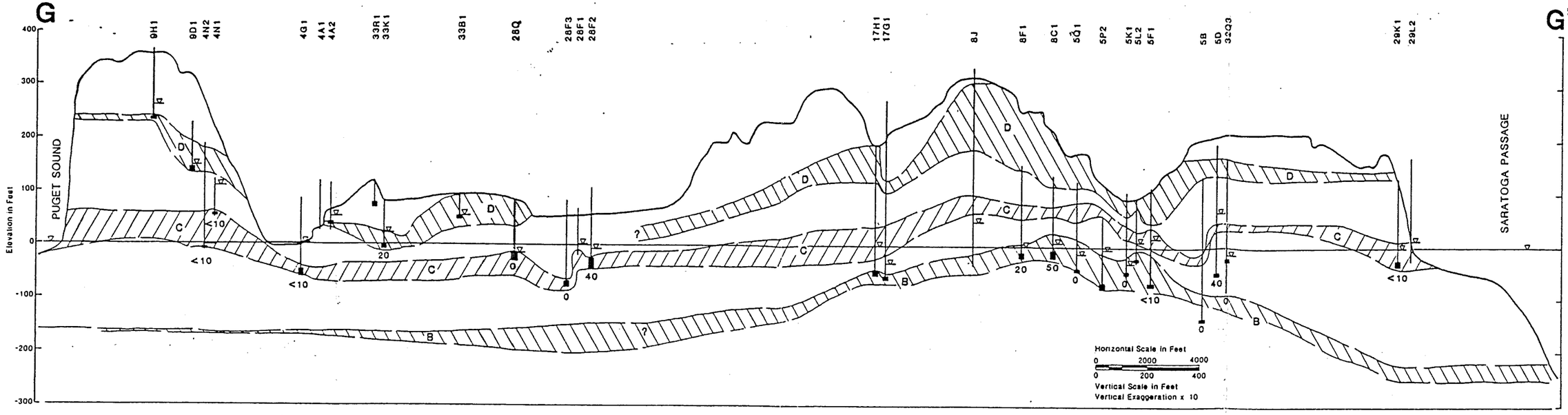
0 1 2
Scale in Miles

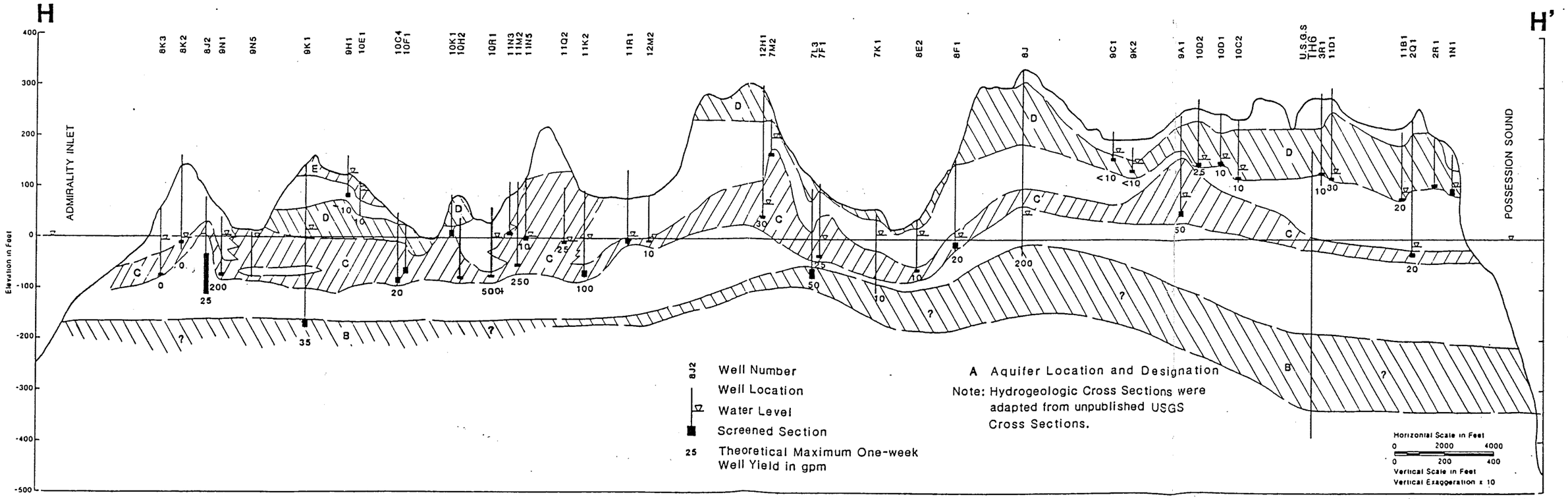
K-VII-9

*Hart Crowser, Inc.*
*J-1939 9/87*
*Exhibit K-8*

# Hydrogeologic Cross Sections G-G' and H-H'

## South Whidbey Island

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J-1939 9/87
Exhibit K-9

Walters, K.L., 1971, Reconnaissance of Sea-water Intrusion along Coastal Washington, 1966-1968: Washington Department of Ecology Water-supply Bulletin, 32, 208p.

Washington State Department of Ecology, 1987, Registered water rights, computer file printout for Island County.

Washington State Department of Ecology, 1987, Water well logs for Island County, on file with the Redmond Office of the Washington State Department of Ecology.

Washington State Department of Ecology, 1979, Coastal Zone Atlas of Washington, Volume Four: Island County. DOE 77-21-4.

Washington State University, 1966. Washington Climate for Clallam, Jefferson, Island, San Juan, Skagit, Snohomish, and Whatcom Counties, Pullman.

Subappendix K-A: Infiltration Potential Analysis for Island County

Recharge to Island County was calculated using the equation:

Re=P-Ro-ET-dS

Where:

Re Represents recharge to the area
P Represents preciptiation based on the 1930-57 isohyetal map, Water Supply Bulletin 25, Island County Extension Service data, and information contained in the files of the USGS.
Ro Represents runoff based on the mechanism of Dunne and Black and interpretation of various maps.
ET Represents evapotranspiration based the Thornthwaite method using climatic data and a soil moisture holding capacity of 6 in. (40 in. soil depth with a field capacity of 0.15).
dS Represents change in storage which is assumed to be 0 over the long term.

The following input values were used, producing the indicated recharge rates:

| SUBAREA | PRECIPITATION in/yr | | RUNOFF in/yr | | EVAPOTRANSPIRATION in/yr | | RECHARGE AREA square miles | | INFIL. POT. MGD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN |
| NORTHERN CAMANO | 29 | 23 | 1.5 | 1.1 | 20 | 18 | 35 | 32 | 12.6 | 6.0 |
| SOUTHERN CAMANO | 32 | 25 | 0.8 | 0.0 | 20 | 18 | 6 | 5 | 3.2 | 1.7 |
| NORTHERN N. WHIDBEY | 22 | 19 | 0.6 | 0.0 | 18.5 | 16.5 | 11 | 9 | 1.5 | 1.1 |
| EASTERN N. WHIDBEY | 24 | 21 | 1.2 | 0.0 | 20 | 18 | 18 | 15 | 2.4 | 2.2 |
| SOUTHWESTERN N. WHIDBEY | 20 | 16 | 1.0 | 0.0 | 18 | 15 | 24 | 21 | 1.2 | 1.1 |
| NORTHERN C. WHIDBEY | 21 | 17 | 0.6 | 0.0 | 19 | 16 | 22 | 19 | 1.5 | 0.9 |
| SOUTHERN C. WHIDBEY | 25 | 20 | 2.0 | 0.6 | 20 | 18 | 23 | 20 | 3.3 | 1.3 |
| NORTHWESTERN S. WHIDBEY | 35 | 25 | 2.8 | 0.6 | 21 | 18 | 24 | 22 | 12.9 | 6.8 |
| SOUTHEASTERN S. WHIDBEY | 38 | 30 | 2.8 | 0.7 | 21 | 18 | 37 | 34 | 25.2 | 18.4 |

# APPENDIX L

## ISLAND COUNTY HEALTH DEPARTMENT
## SALT WATER INTRUSION POLICY FOR PUBLIC WATER SYSTEMS

# STATE OF WASHINGTON DEPARTMENT OF HEALTH
# ISLAND COUNTY HEALTH DEPARTMENT
# SALT WATER INTRUSION POLICY
# FOR PUBLIC WATER SYSTEMS

## I. THE PROBLEM

When groundwater is pumped from aquifers that are in hydraulic connection with the sea, the gradients that are set up may induce a flow of salt water from the sea toward the well. This migration of salt water into freshwater aquifers under the influence of groundwater development is known as sea-water intrusion (Walton, 1970:6). This same process is also known as saline-water intrusion (Dion and Sumioka, 1983:4).

The occurence of salt water intrusion is identified by increasing concentrations of sodium and chloride and by elevated specific conductivity and dissolved solids. Typically, the concentration of chloride ions in water is used to identify salt-water intrusion.

Salt water intrusion is a problem in the Puget Sound area. This is supported by the U.S. Geological Survey in its National Water Summary 1983 - Hydrologic Events and Issues[2] which states:

> "The islands of Island and San Juan Counties are being affected by saline-water intrusion, which is expected to worsen with continued groundwater use. Increased chloride concentrations, some in excess of 500 milligrams per liter, have been detected in water from 10 to 15 percent of the nearly 300 wells sampled by Whiteman and others (1983)[3]. Saline-water intrusion also is occurring at other major islands and along coastal areas, especially along Puget Sound (Dion and Sumioka, 1983)[4]." (U.S. G.S. Water-Supply Paper 2250, 1984, pg 227)

The Rules and Regulations of the State Board of Health Regarding Public Water Systems (WAC 248-54, Maximum Contaminant Levels) lists sodium as a primary chemical contaminant with an unspecified maximum contaminant level. Chloride is listed as a secondary chemical contaminant at levels of 250 mg/l or more.[1] DOH considers the problem of saltwater intrusion worthy of attention through the development of a specific policy.

## II. PURPOSE OF POLICY

The purpose of this policy is to responsibly manage the approval of new public water systems as well as classify and monitor existing public water systems with respect to the problem of salt water intrusion. Through this policy it is hoped that the problems of degradation of drinking water quality or loss of water system source due to salt water contamination will be reduced or eliminated.

## III. POLICY APPLICATION

This policy shall apply to all new, existing non-expanding and expanding public water supply systems in Island County which use or propose to use ground water as a water source.

## IV. DEFINITIONS

AQUIFER: A geological formation, group of formations, or part of a formation capable of yielding a significent amount of ground water to wells or springs.

COMPLETED WATER SYSTEM: A public water system not planning to increase its present number of service connections.

EXISTING EXPANDING WATER SYSTEM: A public water system identified in the Island County Coordinated Water System Plan (CWSP) as having future service areas.

EXISTING NON-EXPANDING WATER SYSTEM: A public water system having no planned future service area and planning to complete service to approved connections.

NEW WATER SYSTEM: A public water system created after October 1, 1988 or not identified in the Island County CWSP. (Water systems developing a new well source are included in this category).

PUBLIC WATER SYSTEM: Any water supply system intended or used for human consumption or other domestic uses, including source, treatment, storage, transmission, and distribution facilities where water is furnished to any community or group of individuals, or is made available to the public for human consumption or domestic use, but excluding all water supply systems serving one single family residence.

SALINE-CONTAMINATION: Occurrence of chloride and or specific conductivity in public water supplies at concentrations which exceed the specified maximum contaminant levels. Maximum contaminant levels are 250 mg/l for chloride and 700 unhos/cm for specific conductivity. Sodium is listed as a primary contaminant with an unspecified maximum concentration level.

SALT WATER INTRUSION: Replacement of pumped fresh water by saline contaminated water in an aquifer; typically evidenced by well water samples showing values of 100 mg/l or greater of chlorides.

## V. POLICY ORGANIZATION/PROCEDURE

Requirements for approval for new or existing expanding water systems are outlined in Rules and Regulations of the State Board of Health Regarding Public Water Systems, Rev. Feb 1988, (WAC 248-54). This policy is not intended to substitute or replace any part of WAC 248-54.

This policy establishes three (3) categories of saline contamination risk for all public water supply systems existing and proposed which use or propose to use ground water as the water source. This policy further establishes standard requirements for water systems within each risk category. The requirements are based on information submitted as required under WAC 248-54.

The following is a general outline of the salt water intrusion evaluation process which DOH and Island County Health Department will follow. Island County Health Department will initially classify water systems into one of three categories based on their proximity to existing systems or on the history of a system's chloride analyses. Island County Health Department and DOH will then develop a pump test protocal for existing expanding and new water systems, including chloride analysis requirements. Using the information obtained from the pump test and evaluating site specific characteristics, DOH will make the final classification which will determine departmental requirements. The categorization criteria, supporting information to be requested and Department's requirements are listed under each water system grouping. We advise water purveyors or potential water purveyors to review the categories to get a general idea of what information will be required for DOH/ICHD review.

## VI. RISK CATEGORIES

### LOW RISK

1. Criteria

   a. History of chloride analyses from water system's existing sources showing concentration less than 100 mg/l (existing systems) or;

   b. Chloride concentrations of new source of less than 100 mg/l based on certified lab test. NOTE: A 24 hour pump test may be required, to further assess the salt water intrusion potential.

   c. Not in proximity (½ mile) to any groundwater source with chloride concentrations equal to or greater than 100 mg/l.

### MEDIUM RISK

1. Criteria

   a. A history of chloride analyses from water system's existing sources showing concentrations over 100 mg/l but under 200 mg/l (existing systems), or;

   b. Located within ½ mile of a groundwater source with chloride concentrations between 100 mg/l and 200 mg/l.

   c. Certified lab tests from proposed source showing chloride concentrations in the 100 to 200 mg/l range.

HIGH RISK

1. Criteria

   a. A history of chloride analyses showing concentrations over 200 mg/l; and/or
   b. Located within ½ mile from a groundwater source with chloride concentrations greater than 200 mg/l.

   c. Results of certified lab test from proposed water source sample showing chloride concentrations in excess of 200 mg/l.

## VII. REQUIREMENTS

### A. COMPLETED WATER SYSTEMS

1. Low Risk Areas - No requirements

2. Medium Risk Areas

   a. Chloride and conductivity sampling and analysis by certified lab required for each source in August each year.

3. High Risk Areas

   a. Chloride and conductivity sampling and analysis by certified lab required for each source in April and August each year.

### B. EXISTING NON-EXPANDING WATER SYSTEMS

1. Low Risk Area - No requirements

2. Medium Risk Area

   a. Annual reporting to DOH of analysis for chlorides and conductivity required. Sampling and analysis by a certified lab to be performed in April and August of each year.

   b. Recommend analysis of problem and investigation of solutions. Department is available for assistance.

3. High Risk Area

   a. Annual reporting to DOH of analysis for chlorides and conductivity required. Sampling and analysis by a certified lab to be performed in April and August of each year.

   b. Annual reporting of monthly source meter readings required.

   c. Require investigation of possible mitigation measures.

   d. Existing non-expanding systems within this category with chloride concentrations greater than 250 mg/l will have moratoriums placed on new hook-ups.

VII. REQUIREMENTS (Continued)

C. EXISTING EXPANDING WATER SYSTEMS

1. Low Risk Area

   a. A chloride test (for each source) may be required once each year during August.

   b. Water conservation practices incorporated into the operation and maintenance agreement are recommended.

   c. Individual meters may be required in addition to source meter requirement.

   d. Recommend phase development, or require it in the case of rising chloride concentrations - or lack of data.

   e. Special design requirements requested, for example on the construction or operation of the well. This requirement may be needed in some cases to protect other public water supplies that may have previously installed deeper wells.

2. Medium Risk Area

   a. Pump test protocal set up by Island County Health Department and DOH based on hydrogeology of area.

   b. Annual reporting to DOH of analysis for chlorides required. Sampling and analysis by a certified lab to be performed in April and August of each year.

   c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.

   d. Source and individual meters for expansion portion required.

   e. Appropriate design modifications are likely to be required (for example raise pump intake or reduce pumping rate and increase storage).

   f. Phase development is likely to be required.

   g. A current engineering report including a hydrogeologic evaluation of the potential for intrusion, may be required.

   h. Future degradation of water quality or rising of chloride concentrations in water source may halt development at current levels, even if system is approved for additional connections.

3. High Risk Area

   a. (a) through (h) as listed for "Medium Risk".

   b. New or expanding systems will be denied or modified unless applicant can develop mitigating measures to reduce intrusion contaminating risk.

VII. REQUIREMENTS (Continued)

D. NEW WATER SYSTEMS (NEW WELL SOURCES)

1. Low Risk Area

   a. Pump test as required by DSHS Policy (Sept 1987). Chloride analysis sample taken at beginning of test. Sample for complete inorganics taken at end of test. Samples must be analyzed at a certified lab.

   b. A chloride test (for each source) may be required once each year during August.

   c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.

   d. Individual meters may be required in addition to source meter requirement.

   e. Recommend phase development, or require it in the case of rising chloride concentrations - or lack of data.

   f. Special design requirements requested, for example on the construction or operation of the well. This requirement may be needed in some cases to protect other public water supplies that may have previously installed deeper wells.

2. Medium Risk Area

   a. Pump test protocal set up by Island County Health Department and DOH based on hydrogeology of area.

   b. Annual reporting to DOH of analysis for chlorides required. Sampling and analysis by a certified lab to be performed in April and August of each year.

   c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.

   d. Source and individual meters required.

   e. Appropriate design modifications are likely to be required (for example raise pump intake or reduce pumping rate and increase storage or multiple wells).

   f. Phase development is likely to be required.

   g. An engineering report including a hydrogeologic evaluation of the potential for intrusion, may be required.

   h. Future degradation of water quality or rising of chloride concentrations in water source may halt development at current levels, even if system is approved for additional connections.

3. High Risk Area

   a. (a) through (h) as listed for "Medium Risk".

   b. New or expanding systems will be denied or modified unless applicant can develop mitigating measures to reduce intrusion contaminating risk.

## VIII. REFERENCES


1. Rules and Regulations of the State Board of Health Regarding Public Water Systems, Revised February 1988.

2. National Water Summary 1983 - Hydrologic Events and Issues, U.S. Geological Survey Water-Supply Paper 2250, 1984.

3. Whiteman, K.J., Molenaar, Dee, Bartleson, G.C. and Jacoby, J.M., 1983. Occurrence, Quality and Use of Ground Water in Orcas, San Juan, Lopez, and Shaw Islands, San Juan County, Washington: U.S. Geological Survey Water Resources Investigations 83-4019, 12 sheets.

4. Dion, N.P., and Sumioka, S.S., 1983, Seawater Intrusion Along Costal Washington, 1978: Washington Department of Ecology Water Supply Bulletin 56. (in press)

5. Davis, S.N. and R.J.M DeWiest, 1966, Hydrogeology, John Wiley and Sons, Inc., pgs 43, 237.

6. Walton, Wm. C., 1970, Groundwater Resource Evaluation, McGraw-Hill, pg 375.


Ethan Moseng DATE: 7/19/89

Ethan Moseng, Section Head
NW Drinking Water Operations
Department of Health

DATE: 7-21-89

Tim McDonald, Health Director
Island County Health Department

# APPENDIX M

## WHIDBEY ISLAND AND CAMANO ISLAND WATER IMPORTATION STUDY

# APPENDIX M

## WHIDBEY ISLAND AND CAMANO ISLAND WATER IMPORTATION STUDY

### 1. WHIDBEY WATER IMPORTATION PLAN

Portions of Central Whidbey Island lack an adequate supply of good quality water. As an example, the Town of Coupeville constructed an electro-dialysis plant in the 1970s to treat its groundwater supply which was high in dissolved solids. Recently, the Town has prospected for additional water associated with its well field on the west side of Whidbey Island. It has obtained enough water by developing several shallow wells for its immediate needs. Other development in the vicinity of Coupeville has experienced considerable difficulty in obtaining sufficient water supply. The groundwater assessment conducted as part of this CWSP indicates there may be extremely limited additional groundwater supply available in Central Whidbey. Therefore, the long-term planning for additional water supply in Central Whidbey will require an alternative for importation of water.

#### A. Future Water Requirements

The City of Oak Harbor has recently completed an update of its Comprehensive Water Plan for its present and future service areas. The City's plan has projections for the years 1995 and 2010, including the U.S. Naval Air Station and Sea Plane Base. It is assumed the City will serve all of the population within its future service area by the year 2010.

The City's Comprehensive Water Plan projects that the population of the City and the population served water in the Navy installations will grow as follows:

1987 - 17,075
1990 - 19,900
1995 - 24,500
2010 - 40,300

The Oak Harbor Comprehensive Water Plan projects the following future water requirements from the Anacortes system.

| | Average Day (MGD) | Maximum Day (MGD) | Peak Hour (MGD) |
|---|---|---|---|
| 1990 | 1.8 | 5.3 | 9.5 |
| 1995 | 2.4 | 7.9 | 12.0 |
| 2010 | 4.4 | 11.3 | 19.2 |

The 10- and 24-inch pipelines from Anacortes have a capacity of approximately 10 MGD. These pipelines must be able to deliver at least the maximum daily demand rate, so the projected Oak Harbor use would approach the pipeline capacity by approximately 2005. At that time, a booster pump could be installed in the vicinity of Deception Pass to boost the capacity to approximately 15 MGD.

It is also helpful to review the water use in the Anacortes system. Table M-1 summarizes the 1987 actual usage and projects future use in the system. The projection is based on incomplete information and it is difficult to forecast the water use of some customers. The following assumptions are implicit in the projections.

- The Shell and Texaco Refineries are using close to their contract amount of 150 million gallons per month. It is assumed that future use will continue at present levels.

- The Anacortes system must be capable of supplying the maximum daily demands of its major industries and purveyor customers. These customers should provide storage to meet their peak hourly rates.

- The water demands from the Oak Harbor Comprehensive Water Plan are used in projecting its future water requirements.

- During the fall of 1987, Skagit County Public Utility District purchased large quantities of water from Anacortes because of the drought conditions. It is assumed this was a temporary situation and that future water use will revert to past levels of water consumption.

- The water use criteria of 100 gpcd average and 250 gpcd maximum daily demands are used in forecasting future demands for Central Whidbey Island. The projected water use is for the service area on Central Whidbey Island, shown shaded on Exhibit M-1. It assumes that all existing sources will be abandoned in favor of the Anacortes supply.

As previously identified, the peak capacity of the Anacortes water treatment facility and transmission pipeline is approximately 30 MGD. Examination of Table M-1 indicates the Anacortes water supply should be adequate to serve its present customers, plus Central Whidbey Island in the year 2000. The demands will increase to the capacity of the Anacortes system between 2010 and 2015. At that time, Anacortes would be faced with major treatment/transmission expansion as discussed elsewhere in this report.

B. Future Service Area

Based on the investigations in other tasks of the CWSP, it is estimated that it may be feasible to extend a pipeline from Oak Harbor as far south as Coupeville by the year 2000. This judgment is based on existing water supply problems, the level of existing and projected future population, and shortages of groundwater within the area.

The feasible water supply service area for the pipeline is identified on Exhibit M-1. It includes the Penn Cove, Rolling Hills/Glenncairn, Coupeville, Sierra Country Club, Crockett Lake Estates, and Admiral's Cove areas. The unincorporated areas in the vicinity of Oak Harbor are not included because they are mostly covered by the future water use projected by Oak Harbor. The projected water service areas are shown for estimated year 2000 and 2015 planning horizons. The estimated future population and water requirements for the Central Whidbey area are summarized in Table M-2.

The Town of Coupeville has pipelines that extend for considerable distance outside of the corporate limits to the west and south. It is assumed that when it becomes economically feasible, the Town will be willing to extend its water system to serve additional areas.

C. Conceptual Water System

Exhibit M-1 shows a feasible water supply pipeline to Coupeville and the improvements that would be required to the Oak Harbor water system in order to be able to supply the additional demands projected for Central Whidbey Island.

The extension of a water pipeline south from Oak Harbor to serve areas in Central Whidbey Island will require improvements to the City's water distribution system. It will also hasten the day when future improvements will be required to the City's water supply from the Anacortes system.

The City of Oak Harbor has just completed an update to its Comprehensive Water Plan, as referred to earlier. The proposed improvements shown on Exhibit M-1 within the Oak Harbor system coincide with new pipelines shown in the Oak Harbor Comprehensive Water Plan. Oversizing the proposed Oak Harbor pipelines would permit delivery of the estimated 2 MGD maximum daily demand projected for the year 2015 within the proposed Central Whidbey water service area. Where two diameters are shown on a pipeline (e.g., 16/12) on Exhibit M-1, the 12-inch diameter pipeline is proposed in the Oak Harbor Comprehensive Plan and the 16-inch pipeline would be necessary to give extra capacity to serve Central Whidbey as well.

The proposed capital improvements identified in the Oak Harbor Comprehensive Water Plan are divided into several categories. The pipelines which are shown on Exhibit M-1 are identified as pipelines that would be required to serve the City's future water service area. For this reason, they are not scheduled to be constructed during the next 10 years as part of the City's capital improvement program. Their construction would likely depend upon requests for water service from the area to the west of the City's present service area. These pipelines would, however, benefit the City's present system. This system has difficulty both delivering water to the City's main 2-MG water reservoir, as well as providing fire flows to the high value areas within the City.

In order to extend the water supply system south as far as Coupeville, a 12-inch water supply pipeline is proposed, generally following SR-20 to Libby Road and then following Madrona Drive along Penn Cove to connect with the Coupeville system. This pipeline would be able to deliver approximately 1 MGD by gravity from the City of Oak Harbor's present reservoir. The delivery rate is determined by the reservoir overflow elevation in the Coupeville system, which is only approximately 20 feet lower than the water surface elevation in the Oak Harbor system. Most areas could be served directly by the new pipeline although customers at the lower elevations (from sea level to approximately 60 feet) would experience excessive pressure, and pressure reducing valves would be required as protection. This protection could be achieved either with individual PRVs on each customer service or through a larger PRV where the supply system connects into existing water distribution systems.

When the water demands on the supply system exceed the ability of the pipeline to deliver by gravity, the next increment would be for the Town of Coupeville to install a booster pump to fill its reservoir by pumping water from the supply system into the distribution system. Finally, as the maximum daily demands reach approximately 2 MGD (i.e., 2015 maximum daily demand), it would be necessary to install an additional booster pump approximately midway along the transmission pipeline to deliver larger quantities at adequate pressures. It is estimated that with the second booster pump the system could deliver approximately 3 MGD.

The Coupeville Comprehensive Water Plan includes a proposed new reservoir on Sherman Road at the same elevation as the Town's existing water reservoir. This could be used as a terminal reservoir for the water supply system. The connection could be valved and metered to allow water to flow from the reservoir back into the supply system during extreme peak or emergency conditions.

A cursory review of the system hydraulics for the Oak Harbor water supply pipeline from the Anacortes system was conducted as part of this study. The estimated 9.4 MGD capacity of the pipeline and the increase in capacity to 15 MGD presented in the Oak Harbor Comprehensive Water Plan appear reasonable. The new booster pump station and expansion of the existing Ault Field Road booster pump station would not be required immediately. In accordance with the Oak Harbor Comprehensive Water Plan, the Ault Field booster pump station would need to be expanded by about the year 2000. Furthermore, based on projected water demands for the Oak Harbor service area, a new booster station would be required by approximately the year 2005. The effect of adding water service to Central Whidbey Island, as outlined in this report, would be to require these improvements approximately 2 to 3 years earlier.

D. Estimated Construction Costs

Table M-3 summarizes the estimated cost for the construction of the proposed Central Whidbey pipeline project. The estimated total cost of $3,210,400 includes the incremental costs for oversizing pipelines within the City of Oak Harbor. It is assumed the City will pay the cost of the pipelines sized in accordance with its Comprehensive Water Plan. The total construction cost for the pipelines within the City of Oak Harbor is also shown as an indication of the cost of these pipelines. Indirect costs including sales tax, construction contingencies, engineering, legal, and administrative costs are included in this construction cost. The estimate is based on January 1988 price levels and can be correlated with an Engineering News Record (ENR) construction index of 4685.

In addition to the costs shown on Table M-3, the water systems served by the Central Whidbey pipeline project will need to pay the cost of constructing pipelines connecting to the project. These costs are not shown and it is assumed that they will be paid by the system distributing the water.

E. Estimated Annual Costs

The customers of the proposed water supply system to Central Whidbey Island will need to pay charges and/or rates to amortize the capital cost of the facility and to pay for its operation and maintenance. In addition, they will need to pay the City of Oak Harbor for its cost of delivering water to the proposed system.

In order to get an approximate estimate of the cost of water supplied to the new system, we have used the current City of Oak Harbor rates. The City of Oak Harbor has several rate schedules which might apply: (1) a

master meter rate for customers outside the service area, and (2) an industrial rate within the City. A new rate especially for the Central Whidbey water supply system appears reasonable because the system will not use most of the distribution system and should pay a proportionate share of the cost for the water transmission/distribution pipeline improvements in the Oak Harbor system required to "wheel" the water to the new system.

The operating and maintenance costs for the new system should be minimal because there are no pump stations or reservoirs in the first phase. We have assumed 1/2 of 1 percent of the project cost as an allowance for operation and maintenance.

Table M-4 shows annual costs for several financing plans and different levels of water use. There is a corresponding estimate of monthly water charges for a typical residential customer. The least expensive monthly charge occurs if the rates are used only to pay the operating costs and the capital costs are paid by property assessments. On this basis, the monthly charges for a typical residential customer range from $5.00 to $9.00. The one-time property assessment for this customer could be on the order of $1,000 or could be $2,000 to $3,000 depending on the number of customers (or property owners) contributing and whether or not grant/loan assistance is received for the project. Other financing options presented include: (1) the entire capital costs financed by revenue bonds; (2) a 50 percent grant for capital costs; and, (3) a public works trust fund loan.

F. Organization

There are several ways in which the Central Whidbey water supply system can be organized:

(1) County Services Act - Island County can designate a water service area, proceed with the preparation of a general plan, and subsequently sponsor the development of the water system;

(2) Water and/or Sewer District - A new unit of government, a district, could be formed for the purposes of financing and developing the proposed Central Whidbey water supply system;

(3) Interlocal Agreement - As municipal corporations, the Cities of Oak Harbor and Coupeville, Island County, and/or the Penn Cove Sewer District have the authority under Washington law to enter into an Interlocal Agreement for the development of public facilities. One of these parties could take the lead in developing and operating the system.

## G. Financing

A water system project such as the proposed water pipeline to Central Whidbey Island involves a large capital construction expenditure. Typically, this investment cannot be paid directly from system operating revenues but must be financed and paid for over time. Several methods are commonly used by municipalities to fund major public works projects. Revenue Bonds repaid by the water system revenues are a popular method for financing public works projects in the State of Washington. Bonds are issued to pay for the capital construction cost and are retired over 20 to 30 years from the water rates. Special assessment revenue bonds are bonds that are either backed by property assessments or can be retired from system revenues. General Obligation Bonds are another way to finance public works projects. They are retired by a property tax levee. The general obligation bonds would be issued by a district, city, or county and paid back by the property owners within the particular municipal corporation, whereas utility improvements may only benefit property owners within a small portion of this area.

Revenue Bonds are generally preferred for utility systems (in Washington State) because municipalities have a limited property tax bonding capacity. Revenue Bonds allow the utilities to charge customers in accordance with the use that they make of the system, and there is more flexibility in using Revenue Bonds because they generally do not require a vote each time they are issued.

There are several grant and loan programs to assist public agencies such as cities, counties, and special service districts with the financing of water and wastewater projects. At the federal level, the Farmer's Home Administration (FmHA) is probably the best source for financial assistance. This program is directed toward helping systems that either cannot obtain financing because they have not established their credit rating or to assist economically depressed areas and areas where the cost of water and/or sewer service is excessive. Some of the incentive to use this program has been eliminated in recent years because the interest rate on loans is no longer subsidized but has been "pegged" to current market levels. The amounts of grants and loans under this program are generally small in relationship to the cost for the proposed water supply project. Most loans and grants issued by the FmHA are for a few hundred thousands of dollars and almost all are less than $1 million.

The State of Washington has been progressive in implementing programs to assist municipalities in the State with the construction of water and wastewater facilities. The Department of Health (DOH) has had a grant program under Referendum 38 which has funded water supply projects. This program has generally provided approximately 40 percent grants to

assist with the construction of successful projects. Unfortunately, the current funding authorization is exhausted. It must either be reauthorized or a new program implemented in order for funds to be available to Island County. Some funds already committed to projects could become available if they are not required for projects currently under construction, so it may be worthwhile to apply.

For the past several years, the State of Washington has been issuing low-interest loans under its Public Works Trust Fund Program. The maximum amount for these loans is $1.5 million, with interest rates ranging from 1 to 3 percent depending on the percentage of local funding. This funding is available to cities, counties, water districts, sewer districts, public utility districts, and other local governmental units. It is not available to private water companies or water associations. The program allows a municipality to receive up to three public work trust fund loans.

The proposed Central Whidbey Island water system is a project that should be able to attract grant and/or loan assistance because it represents a cooperative effort by local citizens and government to resolve a regional water supply shortage.

Connection charges and/or Assessments are another way to finance all or part of the proposed water system. Each new customer could be required to pay a connection charge to help pay for the construction cost of the system. The proposed Central Whidbey water system will have capability to serve future customers within the service area. There are a large number of platted but undeveloped lots within subdivisions. Assessing these lots at the present time since the system is designed to serve their future demands would help to pay the construction costs for the system and make its construction today more feasible.

Table M-4 summarizes capital and operating costs for several possible financing options. It includes an estimate of monthly water rates to a typical residential customer for these alternatives. It defines a range of alternatives but is not intended to present all possible financing schemes.

## H. Implementation

The following issues need to be addressed in order for a water supply pipeline to Central Whidbey Island to proceed:

(1) Consideration of Comprehensive Plan, Preservation District, and SEPA requirements.

(2) The City of Anacortes needs to agree to make a quantity of water available for this additional service area.

(3) The City of Oak Harbor must agree to use a portion of the capacity of its existing water supply system to serve Central Whidbey Island, agree to proceed with upgrades to its distribution system earlier than otherwise would be necessary, agree to an allocation of attributable capital costs for existing and future improvements, and negotiate water rates for the Central Whidbey system.

(4) A municipal corporation such as Island County, the Town of Coupeville, the City of Oak Harbor, or possibly a water or sewer district, or RWA, needs to take the lead role in the project and be willing to encumber debt.

(5) There need to be commitments and contractual relationships between the various water purveyors on Central Whidbey Island to pay for and to purchase water from the system. In turn, the lead agency will need to enter into a long-term agreement with the City of Oak Harbor for the purchase of water.

(6) A financial plan needs to be developed which takes advantage of any available financial assistance programs and has a plan for financing the local share of the cost of the project.

(7) Engineering and construction of the project needs to proceed.

## 2. CAMANO WATER IMPORTATION PLAN

The groundwater investigations conducted as part of the Island County CWSP and GWMP have identified that water resources on Camano Island are limited. This is particularly true for the south end of Camano Island and for the northeast sector of the Island. Water systems in these areas have experienced either water shortages or deteriorating water quality due to high chlorides. The chloride levels are indicative of sea water intrusion along the coastal areas.

In particular, the Juniper Beach Water Association (Northeast Camano) has identified increasing chlorides as a serious problem to its system and is actively pursuing a connection to the Stanwood Water System. The Camano Vista Water District in south Camano Island has completed a well development program along the spine of the Island in order to try to extract enough groundwater to meet its needs.

The planning horizon for the CWSP is to the year 2015. Within this period, it appears feasible to import water from Stanwood to the northern part of Camano Island. The strategy for central and south Camano would be to interconnect systems and to share wells developed in good recharge areas of the Island. This report discusses the imported water supply.

A. Future Water Requirements

Using the inventory of water systems and the population forecasts developed as part of the CWSP, we identified likely future water service areas on North Camano Island for the year 2000 and the year 2015. These are shown on Exhibits M-2 and M-3.

The future population and estimated water use in what is identified as the Juniper Beach water service area is summarized in Table M-5. This area includes the Juniper Beach subdivision, a number of other plats, and some commercial development along State Route 532. The water use estimates are based on average and peak values of 100 and 250 gallons per capita per day. In the case of Juniper Beach and the other areas on Northeast Camano Island, the average daily water use has been reduced to one-half of the value in Table M-5 for purposes of estimating the annual quantities used (i.e., 50 gpcd) because of the high seasonal occupancy in these areas. The water supply facilities must be capable of meeting the maximum daily requirements, which are the criteria used in this report.

B. Proposed Water Supply System

There is a 12-inch pipeline through the Stanwood water system from the Bryant Wells, which are located east of the main water service area, to Twin City Foods, which is in the western area of the Town. This pipeline will soon be intertied to an 8-inch pipeline in East Stanwood. The 8-inch pipeline extends further west and could be connected to a new pipeline serving Camano Island in the vicinity of 104th Street. The connection point is shown on Exhibit M-4.

It appears feasible to extend a pipeline from the Stanwood system to North Camano Island. The initial phase would likely serve Northeast Camano Island and future phases might extend the pipeline to Utsalady and other areas of Camano Island. Exhibit M-4 shows the projected sizes for proposed Phase 1 system facilities and Table M-6 is a cost estimate.

Phase 1 is proposed as a 10-inch pipeline connecting to the Stanwood system, crossing the bridge over the slough to Camano Island, and following the highway (SR 532) to approximately Good Road where a reservoir would be constructed. The 10-inch pipeline is not required for the Northeast Camano service area, but will be required to extend service to Utsalady or other areas on North Camano. The reservoir is designed to provide equalizing, fire, and standby storage. Assuming a fire flow of 1,500 gpm for the commercial development at a minimum pressure of 20

psi and allowing for normal water service fluctuation plus some system losses requires a standpipe 70-80 feet high with a total capacity of approximately 500,000 gallons. If desired, the reservoir could be plumbed so as to be able to return some water to Stanwood during an emergency.

A booster pump will be required near the connection point with the Stanwood system to deliver the water with adequate pressure for the developments located on higher ground. The initial service area potentially includes Juniper Beach, Livingston Bay, Sundin Beach, Lands Hill, and the commercial development along State Highway 532. The estimated construction cost at January 1988 price levels (ENR CCI = 4,685) is $1,045,000 with another $276,400 required to connect the existing developments to the proposed system.

Either now, or in the future, the pipeline might likely be extended to Utsalady Bay. This area is presently served by several small water systems and there are water shortage and quality problems in the area. The water elevation in the reservoir constructed as part of Phase 1 should have adequate pressure to serve the Utsalady area.

Ultimately, Camano Island utilities will need to share their limited groundwater resources and to supplement them with outside sources, which could eventually justify the interconnection of large areas of the Island.

The Juniper Beach Water Association has conducted a preliminary investigation of a water supply pipeline connecting to the Stanwood system. Costs and facilities for this "minimum sized" facility to serve Juniper Beach are given in Table M-7. It is recommended that if the Juniper Beach community ends up developing the "minimum sized" system, the pipeline segment along SR 532 should be constructed of 10-inch diameter pipeline to permit future expansion. The pressure would be inadequate to serve elevations more than 35-40 feet above sea level unless a booster pump were added.

C. Organization

There are several possibilities for organizing the development of a water system for Northern Camano Island:

(1) Island County could implement the County Services Act by designating a water service area, preparing a general plan, and sponsoring the development of the water system;

(2) Snohomish Public Utility District (PUD) could develop and operate the system;

(3) Stanwood could extend its water system;

(4) A new water and/or sewer district could be formed; or,

(5) One of the existing water systems such as Juniper Beach could take the lead role in developing the system.

The Snohomish PUD has the capability to serve all of Camano Island and can approach the water supply in a comprehensive and coordinated manner. Island County is sponsoring the preparation of this CWSP as its expression of interest in improving water supply. The PUD has had some discussions about serving water to areas on Camano Island. The PUD already provides electric power and has a water utility organization which would be beneficial to supplying water to Camano Island. The PUD is a governmental body with established credit ratings, qualifies for grant assistance programs, and has the capability to serve as a water utility.

If the PUD does not take a lead role for developing water supply on Camano Island, a system like Juniper Beach has the ability to improve its water supply. A new water and/or sewer district could be formed although this would be a proliferation of governmental units, which is not considered desirable since there already are local governmental units capable of providing the service. Stanwood also has the ability to extend its pipeline into Camano Island. This is not considered likely since it is outside the Town's service area. Also, Stanwood probably would not have an interest in building a booster pump, reservoir, and pipelines required to deliver water to the several developments in Northeast Camano Island.

D. Financing

The first issue to be resolved in financing the regional water supply to Northern Camano Island is the definition of the water supply system. In the case of the "minimum sized" system to serve Juniper Beach, it is clear that the Juniper Beach water system would need to finance all of the costs shown in Table M-7. Using the 135 lots in Juniper Beach, and the capital cost of $378,000 shown in Table M-7, the cost per customer would be approximately $2,800.

If the system is built to serve Northeastern Camano Island as described in Table M-7 and shown on Exhibit M-4, there are several options for defining the project and financing the improvements. The system consists of the 10-inch water supply pipeline along SR 532, the booster pump, reservoir, and the water connections to the various platted developments and individual properties that will be served. The supply system could be defined as all of the above facilities or it could be limited to the supply pipeline, booster pump, and reservoir, i.e., those facilities that benefit all

or most of the customers. The customer connections to the individual properties or to the water distribution systems serving the several subdivisions benefit only those systems and their costs will vary depending on the distance from the supply facilities to the customer. For purposes of this financing analysis, the water supply system is therefore considered to be the major pipeline, booster pump, and reservoir facilities that are of common benefit to most of the customers in the system. The cost of the customer connections to individual customers or existing distribution systems is presumed to be their responsibility.

Table M-7 shows that the estimated cost for the water supply system, as defined above, is $1,045,000. Counting the platted lots in Juniper Beach, Sundin Beach, Livingston Bay, and Lands Hill with some allowance for individual or commercial customers gives approximately 270 customers. This is a cost of $3,870 per customer or platted lot. In addition, each distribution system would have to pay for the cost to connect to the water supply system, which in the case of Juniper Beach is $92,400 or $685 per customer for a total of $4,555. The cost of this system is, therefore, significantly more than for the "minimum build" system but is designed to provide fire protection as well as water supply and has the ability for future system extension.

In Washington State, there are several alternatives for financing water system improvements. Considering the large capital cost of the water system facilities, most of this cost is usually financed over time rather than directly from water rates or as a lump sum assessment amount. Revenue bonds repaid from water system revenues are a popular method for financing public works projects in Washington State. Bonds are issued to pay for the capital construction cost and are retired over 20 to 30 years from the water rates. Special assessment revenue bonds are secured by property assessments against benefitted properties and can be paid back from revenues or by the property assessments. General Obligation Bonds are also used by cities, counties, and special service districts to finance public works improvements with property assessments. They are probably not particularly applicable to Northeastern Camano Island unless a water or sewer district is created because they must be applied to all of the property within a municipality. The issuance of General Obligation Bonds usually requires an election and it is difficult to win public support unless the proposed improvements will benefit all or most of the property within the jurisdiction.

Grant or loan assistance could be available for the Northeast Camano water system. At the Federal level, the FmHA has a grant and loan program to assist public agencies such as cities, counties, and special service districts with the financing of water and wastewater projects. This program is directed toward helping systems that either cannot obtain

financing because they have not established a credit rating or to assist areas where the cost of water and/or sewer service is excessive. The loans carry an interest rate comparable to current market levels and grants are offered if the cost of the water and/or sewer service would otherwise be excessive under FmHA criteria.

There are also assistance options available from state government for projects like the Northeast Camano water supply system. DOH has administered a grant program (Referendum 38) which has provided 40-percent grants for eligible water supply projects. The current funding is exhausted and the program must either be reauthorized or a new program implemented. It is conceivable that some committed funds could become available if they are not required for projects currently under construction.

For the past several years, the State of Washington has been issuing low-interest loans under its Public Works Trust Fund Program. The loans are available to cities, counties, public utility districts, water or sewer districts, and other local governmental units. Water associations, homeowners associations, or private water companies are not eligible. For example, the Juniper Beach Water Association would be ineligible. The maximum amount of these loans is $1.5 million with interest rates ranging from 1 to 3 percent depending on the percentage of local funding.

Connection charges are another way to finance all or part of the proposed water system. A new customer is always required to pay for the cost of the customer service connection. In addition, connection charges can be used to charge future customers for system facilities that have been built to provide them service. This is particularly pertinent to the Northeast Camano Island system, which will have the capability to serve considerable future customers. The water supply system that is being constructed will have the capacity to serve approximately 1,000 customers in the future. Since the cost of the Northeast Camano system is estimated to be approximately $1,045,000, it is suggested that each customer be charged approximately $1,000 when they connect to the system.

Table M-8 outlines water system costs under several possible alternative financing arrangements:

(1) 50 percent public works trust fund loan and 50 percent grant.

(2) 50 percent construction grant with the balance financed through revenue bonds.

(3) 100 percent public works trust fund loan.

(4) All costs locally financed with revenue bonds.

The Town of Stanwood has no wholesale water rates. Also, the Town charges a 7-percent surcharge on the rates for customers outside the City. The Town does have a special contract with Twin City Foods and has a volume charge for the cannery.

It is suggested that water supply to Camano Island would be by an agreement to be negotiated with the Town of Stanwood. The rates would be a new wholesale rate equal to the cost of providing service. For purposes of this analysis, we have assumed a wholesale rate similar to the Twin City Foods rate.

Table M-8 summarizes the capital, operating and maintenance, and the annual debt service or loan repayment schedule for the different financing scenarios. It gives an estimate of the average rate to a typical residential customer. In addition, the systems would need to pay for the cost of extensions to deliver the water to their systems. The water rates charged by these purveyor systems would also include the costs for operating and maintaining the distribution system.

The use of connection charges offers the opportunity to significantly reduce monthly rates. The assumption used in Table M-8 for purposes of analysis is $1,000 per customer as a connection fee.

If the proposed Northeast Camano Island water system is extended to Utsalady (or other areas of Camano Island) in the future, these customers would be expected to pay the $1,000 connection charge. In addition, a financing plan would need to be developed to pay for the costs of any future extension to the system. Once connected to the system, these future customers would pay water rates for operation and maintenance as well as the portion of the capital costs recovered through rates.

E. Implementation

The following steps will be necessary in order for water supply from the Town of Stanwood to areas on Camano Island to become a reality:

(1) Consideration of Comprehensive Plan, Preservation District, and SEPA process requirements.

(2) The Town of Stanwood must agree to sell a portion of its supply on Camano Island.

(a) Stanwood should be approached to include Northeast Camano Island within its future water service area as part of the current update of its Comprehensive Water Plan.

(b) If necessary, the residents of Camano Island may need to assist Stanwood with the cost of developing new water sources.

(3) A sponsoring agency should take the responsibility for developing the water system to Camano Island. Ideally, this could be an RWA or a municipality such as Island County, Snohomish County Public Utility District, or the Town of Stanwood.

(4) Preference should be given to developing a system that will serve Northeast Camano Island. However, Juniper Beach has an immediate need, whereas the interest among the other residents of Northeast Camano Island is less clear. Also, Juniper Beach can solve its water supply needs at less cost (but not with an equivalent system) with the "minimum sized" system. Realistically then, the "minimum sized" system may be the first phase of the project. The Camano Regional Water Association should be organized to develop a plan for larger scale regional service, and to assist Juniper Beach with development of initial phases.

(5) There needs to be support from the residents of Camano Island to pay for the system facilities either through grants and/or loans, connection charges, or by issuing bonds that will be paid back from system revenues or property assessment.

(6) Contractual agreements need to be developed by the agency sponsoring the water system for purchase of water from Stanwood and for the sale of water to the various water systems on Camano Island.

(7) A financial plan needs to be developed for underwriting the capital cost of the water system project. This plan should seek to take advantage of available grant and/or loan programs.

(8) Engineering and construction of the water system should proceed.

TABLE M-1

ANACORTES WATER SUPPLY SYSTEM
PROJECTED WATER USE

| | ACTUAL 1987 | | | PROJECTED 2000 | | PROJECTED 2015 | |
|---|---|---|---|---|---|---|---|
| | Avg. Day | Max. Day | Peak Hour | Avg. Day | Max. Day | Avg. Day | Max. Day |
| Anacortes | 1.47 | 4.27 | 5.18 | 1.90 | 5.50 | 2.35 | 6.85 |
| Wholesale Customers | | | | | | | |
| Oak Harbor/NAS Whidbey (2) | 2.14 | 5.02 | 6.35 | 3.00 | 9.10 | 5.00 | 12.50 |
| LaConner | 0.27 | 0.70 | 0.88 | 0.45 | 1.15 | 0.50 | 1.30 |
| Swinomish Tribal Community | 0.01 | 0.03 | 0.04 | 0.05 | 0.15 | 0.07 | 0.20 |
| Skagit County PUD No. 1 (1) | 0.77 | 2.60 | 2.60 | 0.20 | 0.50 | 0.25 | 0.65 |
| Subtotal | 3.19 | 8.35 | 9.87 | 3.70 | 10.90 | 5.82 | 14.65 |
| Industrial Customers | | | | | | | |
| Shell | 4.66 | 5.76 | 6.19 | 4.70 | 5.80 | 4.70 | 5.80 |
| Texaco | 4.31 | 4.61 | 5.04 | 4.60 | 5.10 | 4.60 | 5.10 |
| Other | 0.14 | 0.21 | 0.29 | 1.00 | 1.00 | 1.00 | 1.00 |
| Subtotal | 9.11 | 10.58 | 11.52 | 10.30 | 11.90 | 10.30 | 11.90 |
| System Losses | 0.34 | 0.34 | 0.34 | 0.60 | 0.60 | 0.65 | 0.65 |
| Theoretical Demand | 14.08 | 23.54 | 26.91 | 16.50 | 28.90 | 20.12 | 34.05 |
| Actual Demand/Filter Plant Production | 14.08 | 18.47 | 21.00 | 16.50 | 24.60 | 20.12 | 29.00 |
| Potential Future Service to Whidbey Island | | | | | | | |
| Whidbey Island (3) | | | | 0.55 | 1.40 | 0.85 | 2.05 |
| Total Likely Demand, Filter Plant Production | | | | 17.05 | 26.00 | 20.97 | 31.05 |

Footnotes:

(1) Actual Demand = 0.77 in 1987 due to drought connection. W/O Drought = 0.15.
(2) Oak Harbor/NAS Whidbey future water demands derived from the Oak Harbor Comprehensive Water Plan.
(3) Whidbey Island future water demands taken from Island County Coordinated Water System Plan.

# TABLE M-2

## CENTRAL WHIDBEY ISLAND
## POPULATION AND WATER SUPPLY PROJECTIONS

### POPULATION

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Penn Cove | 506 | 818 | 1,133 |
| Rolling Hills Glenncairn | 450 | 697 | 944 |
| Coupeville | 2,020 | 3,128 | |
| Crockett Lake Estates | 278 | 431 | 6,190 |
| Admiral's Cove | 362 | 561 | |
| TOTAL | 3,616 | 5,635 | 8,267 |

### AVERAGE WATER USE (GPD)

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Penn Cove | 50,600 | 82,000 | 113,000 |
| Rolling Hills Glenncairn | 45,000 | 70,000 | 94,000 |
| Coupeville | 202,000 | 313,000 | |
| Crockett Lake Estates | 27,800 | 43,000 | 619,000 |
| Admiral's Cove | 36,200 | 56,000 | |
| TOTAL | 361,600 | 564,000 | 826,000 gal. |

### MAXIMUM DAY (GPD)

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Penn Cove | 126,500 | 205,000 | 283,000 |
| Rolling Hills Glenncairn | 112,500 | 174,000 | 236,000 |
| Coupeville | 505,000 | 782,000 | |
| Crockett Lake Estates | 69,500 | 108,000 | 1,548,000 |
| Admiral's Cove | 90,500 | 140,000 | |
| TOTAL | 904,000 | 1,400,000 | 2,067,000 |

TABLE M-3

CENTRAL WHIDBEY WATER SUPPLY PROJECT
CAPITAL COSTS
(Reference to Engineering News Record
Seattle Construction Cost Index = 4,685)

| Pipeline Segments | Length (feet) | Diameter (1) (inches) | Unit Costs: Larger Diameter | Unit Costs: Smaller Diameter | Construction Costs: Larger Diameter | Construction Costs: Smaller Diameter | | Construction Costs (2) |
|---|---|---|---|---|---|---|---|---|
| Oak Harbor Improvements | | | | | | | | |
| Between | | | | | | | | |
| Goldie Road and Harbor Road | 2,000 | 16/12 | $52 | $40 | $ 104,000 | $ 80,000 | | $ 24,000 |
| Harbor Road | 2,350 | 16/12 | 52 | 40 | 122,200 | 94,000 | | 28,200 |
| Between Harbor Road and | 2,700 | 20/16 | 62 | 52 | 167,400 | 140,400 | | 27,000 |
| Heller Road | 1,900 | 16/12 | 52 | 40 | 98,800 | 76,000 | | 22,800 |
| Heller Road | 7,300 | 16/12 | 52 | 40 | 379,600 | 292,000 | | 87,600 |
| Heller Road and Swantown Road | 2,400 | 16/10 | 52 | 34 | 124,800 | 81,600 | | 43,200 |
| SR 20 to Waterloo Road | 4,500 | 16/10 | 52 | 34 | 234,000 | 153,000 | | 81,000 |
| | | | | | 1,230,800 | 917,000 | Subtotal | 313,200 |
| Central Whidbey Water Supply | | | | | | | | |
| SR 20 - Waterloo Road to | | | | | | | | |
| Libby Road | 32,500 | 12 | 40 | | | | | 1,300,000 |
| Madrona Drive to Coupeville | 17,000 | 12 | 40 | | | | | 680,000 |
| | | | | | | | Subtotal | 1,980,000 |
| | | | | | | | Total Construction Cost | $2,293,200 |
| | | | | | | | Indirect Costs @ 40% (3) | 917,200 |
| | | | | | | | Project Capital Costs | $3,210,400 |

(1) Where two diameters are shown, the first is the size that will be required to serve both Oak Harbor and Central Whidbey Island. The second diameter is that shown in the Oak Harbor Comprehensive Water Plan.

(2) The construction cost for improvements within the Oak Harbor water service area is the incremental cost between the cost of a pipeline to serve both Central Whidbey and Oak Harbor and a pipeline that would be required to serve Oak Harbor alone.

(3) Indirect costs include sales tax, construction contingencies, engineering, legal and administrative costs.

TABLE M-4

ESTIMATED COST OF WATER
CENTRAL WHIDBEY WATER SUPPLY SYSTEM

OPERATION AND MAINTENANCE COSTS (1)

| AVERAGE DAILY USE (MGD) | OPERATION (2) AND MAINTENANCE | DEBT (3) SERVICE | TOTAL COST | ESTIMATED (3) MONTHLY RATE |
|---|---|---|---|---|
| 0.1 | $ 35,000 | | | $ 9.00 |
| 0.2 | $ 52,000 | | | $ 6.50 |
| 0.5 | $103,000 | | | $ 5.25 |
| 0.8 | $154,000 | | | $ 5.00 |

50 PERCENT CONSTRUCTION GRANT/OAK HARBOR INDUSTRIAL RATE

| AVERAGE DAILY USE (MGD) | OPERATION (2) AND MAINTENANCE | DEBT (3) SERVICE | TOTAL COST | ESTIMATED (4) MONTHLY RATE/ RESIDENTIAL CUSTOMER |
|---|---|---|---|---|
| 0.1 | $ 35,000 | $216,000 | $251,000 | $ 63 |
| 0.2 | $ 52,000 | $216,000 | $268,000 | $ 34 |
| 0.5 | $103,000 | $216,000 | $319,000 | $ 16 |
| 0.8 | $154,000 | $216,000 | $370,000 | $ 12 |

3 PERCENT PUBLIC WORKS LOAN/OAK HARBOR INDUSTRIAL RATE

| AVERAGE DAILY USE (MGD) | OPERATION (2) AND MAINTENANCE | DEBT (3) SERVICE | TOTAL COST | ESTIMATED (4) MONTHLY RATE/ RESIDENTIAL CUSTOMER |
|---|---|---|---|---|
| 0.1 | $ 35,000 | $283,000 | $318,000 | $ 80 |
| 0.2 | $ 52,000 | $283,000 | $335,000 | $ 43 |
| 0.5 | $103,000 | $283,000 | $386,000 | $ 19 |
| 0.8 | $154,000 | $283,000 | $437,000 | $ 14 |

NO GRANT/OAK HARBOR MASTER METER RATE

| AVERAGE DAILY USE (MGD) | OPERATION (2) AND MAINTENANCE | DEBT (3) SERVICE | TOTAL COST | ESTIMATED (4) MONTHLY RATE/ RESIDENTIAL CUSTOMER |
|---|---|---|---|---|
| 0.1 | $ 64,000 | $432,000 | $496,000 | $122 |
| 0.2 | $111,000 | $432,000 | $541,000 | $ 66 |
| 0.5 | $248,000 | $432,000 | $680,000 | $ 34 |
| 0.8 | $386,000 | $432,000 | $818,000 | $ 25 |

(1) Under this financing plan, the capital costs would be paid by property assessment. Depending on the grant/loan assistance received the amount of the on-time assessment could range from $1,000 to $3,000.
(2) Includes Oak Harbor water charges for master meter connection outside water service area @ $0.95 per 100 cf plus meter charges.
(3) Assume 8% interest, 20 year bonds with 1.2 coverage factor. Project costs escalated 10% to assumed 1990 construction date.
(4) Estimated monthly water supply charge for residential customer, assumes three persons per household and 100 gpcd average usage.

# TABLE M-5

## NORTHEAST CAMANO ISLAND
## POPULATION (1) AND WATER SUPPLY PROJECTIONS (2)

### Population

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Juniper Beach ..... | 351 | 405 | 405 |
| Sundin Beach ..... | 78 | 78 | 78 |
| Livingston Bay ..... | 78 | 180 | 180 |
| Lands Hill ..... | 75 | 90 | 90 |
| Other ..... | ___ | 127 | 417 |
| Total ..... | 582 | 880 | 1,170 |
| Utsalady (future) .... | | 2,300 | 2,950 |
| Grand Total ..... | | 3,180 | 4,120 |

### Average Water Use (gpd)

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Juniper Beach ..... | 17,500 | 20,300 | 20,300 |
| Other ..... | 11,500 | 23,700 | 76,500 |
| | 29,000 | 44,000 | 96,800 |
| Utsalady (future) .... | | 230,000 | 295,000 |
| | | 274,000 | 391,000 |

### Maximum Day (gpd)

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| Juniper Beach ..... | 87,800 | 101,500 | 101,500 |
| Other ..... | 57,500 | 118,500 | 191,200 |
| Utsalady (future) .... | | 575,000 | 737,300 |
| | | 795,000 | 1,030,000 |

(1) Assumes 3 persons/dwelling unit.
(2) Assumes 100 gpcd average use and 250 gpcd maximum use, except that average daily use on Northeast Camano Island is estimated at 50 gpcd because of high percentage of seasonal customers.

## TABLE M-6

## CONSTRUCTION COSTS
## WATER SYSTEM TO SERVE NORTHEAST CAMANO ISLAND
(Reference to Engineering News Record
Seattle Construction Cost Index = 4,685)

| Construction Description | Quantity | Unit Cost | Cost |
|---|---|---|---|
| Stanwood connection including meter, vault, and backflow protection | Lump sum (ls) | $ 8,000 | $ 8,000 |
| Pump station | ls | 100,000 | 100,000 |
| 10-inch pipeline from Stanwood connection along SR 532 to reservoir site near Good Road | 10,800 linear feet (lf) | 25 | 270,000 |
| Additional cost for bridge crossing and insulation | ls | 28,000 | 28,000 |
| Reservoir | 1 @ 500,000 gallons | 220,000 | 220,000 |
| 10-inch pipeline from reservoir west along SR 532 to Livingston Bay connection | 4,800 lf | 25 | 120,000 |
| | | Total Construction Cost, Supply System | 746,000 |
| | | Indirect Costs @ 40% | 299,000 |
| | | Supply System Capital Costs | $1,045,000 |

Other Costs

| Construction Description | Quantity | Unit Cost | Cost |
|---|---|---|---|
| 8-inch Juniper Beach connection | 4,400 lf | $ 21 | $ 92,400 |
| 8-inch Sundin Beach connection | 4,400 lf | 21 | 92,400 |
| 8-inch Livingston Beach connection | 600 lf | 21 | 12,600 |
| | | Total Construction Cost | 197,400 |
| | | Indirect Costs @ 40% | 79,000 |
| | | Total, Distribution Connections | $ 276,400 |

TABLE M-7

CONSTRUCTION COSTS
MINIMUM SIZED WATER SYSTEM
TO SERVE JUNIPER BEACH

| Construction Description | Quantity | Unit Cost | Cost |
|---|---|---|---|
| Stanwood connection including meter, vault, and backflow protection ..... | Lump sum (ls) | $ 8,000 | $ 8,000 |
| 10-inch pipeline(1) from Stanwood connection along SR 532 to base of bluff ..... | 7,000 linear feet (lf) | 25 | 175,000 |
| Additional cost for bridge crossing and insulation ..... | ls | 28,000 | 28,000 |
| 6-inch pipeline from SR 532 to Juniper Beach along the base of the bluff ..... | 3,500 lf | 15 | 53,000 |
| Altitude valve for existing Juniper Beach Reservoir ..... | ls | 6,000 | 6,000 |
| | | Total Construction Cost ..... | 270,000 |
| | | Indirect Costs @ 40% ..... | 108,000 |
| | | Project Capital Costs ..... | $ 378,000 |

(1) 6-inch pipeline adequate for Juniper Beach, but 10-inch pipeline recom-mended to allow future expansion.

TABLE M-8

# ESTIMATED COST OF REGIONAL WATER SUPPLY FOR JUNIPER BEACH "MINIMUM SIZED" & NORTHEAST CAMANO ISLAND SYSTEMS

## 50 PERCENT CONSTRUCTION GRANT AND 1 PERCENT PUBLIC WORKS LOAN

| Customer | Operation and Maintenance | Debt Service | Total Cost | No. of Customers | Estimated Monthly Rate, Typical |
|---|---|---|---|---|---|
| Juniper Beach | Not applicable, does not qualify for Public Works Loan | | | | |
| N.E. Camano Island | $26,000 | $36,100 | $ 62,300 | 220 | $24 |

## 50 PERCENT CONSTRUCTION GRANT

| | | | | | |
|---|---|---|---|---|---|
| Juniper Beach | $ 8,600 | $14,800 | $23,400 | 117 | $17 |
| N.E. Camano Island | $26,000 | $47,250 | $73,250 | 220 | $28 |

## 1 PERCENT PUBLIC WORKS LOAN

| | | | | | |
|---|---|---|---|---|---|
| Juniper Beach | $ 8,600 | $22,600 | $37,200 | 117 | $22 |
| N.E. Camano Island | $26,000 | $72,200 | $78,200 | 220 | $37 |

## NO GRANT

| | | | | | |
|---|---|---|---|---|---|
| Juniper Beach | $ 8,000 | $29,600 | $ 38,200 | 117 | $27 |
| N.E. Camano Island | $26,000 | $94,500 | $120,500 | 220 | $46 |

NOTES:

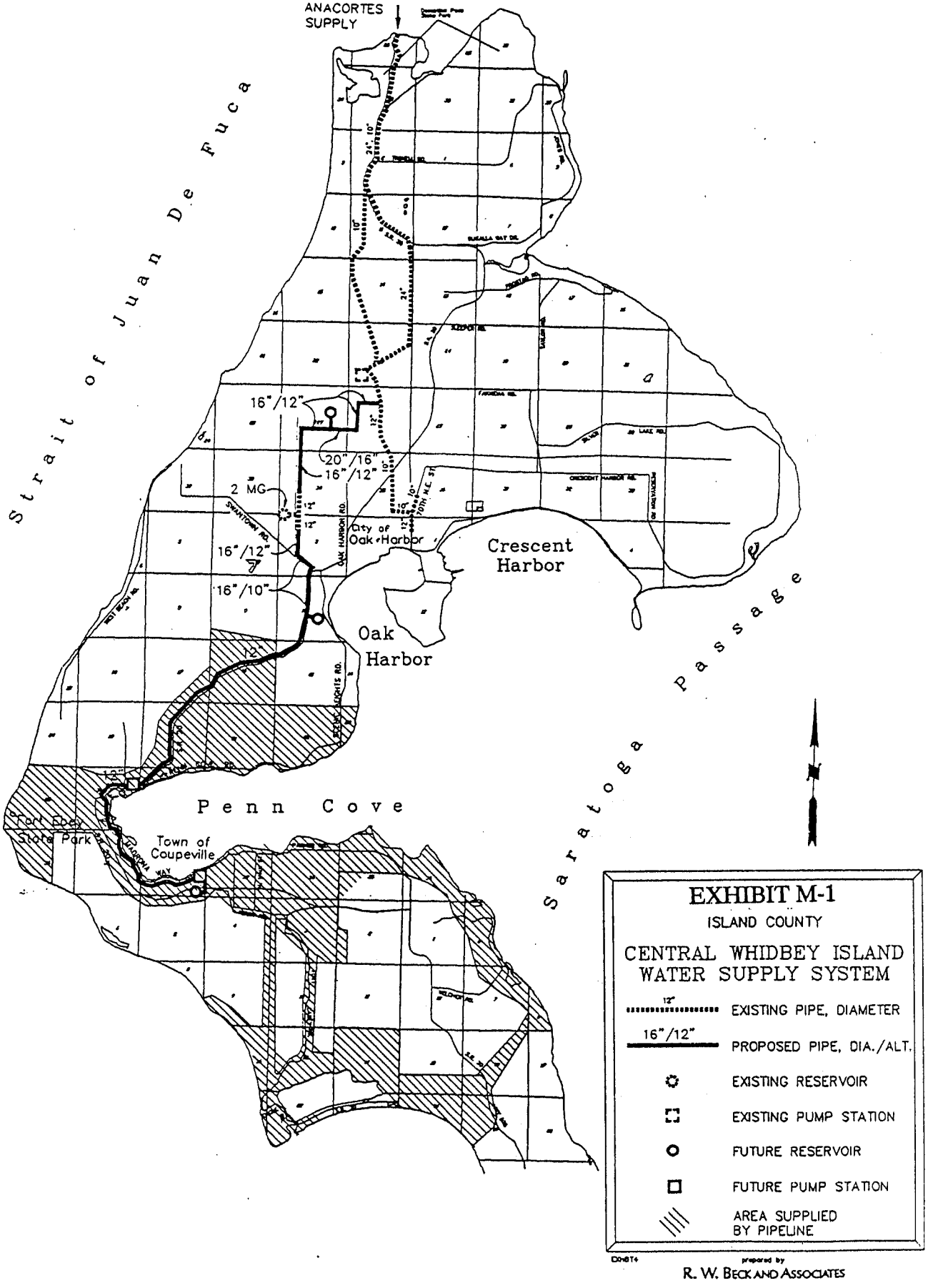
| Construction Cost | Total Cost | Less $1,000 Connection Cost /Lot | Balance to be Financed |
|---|---|---|---|
| Juniper Beach (minimum sized) | $ 378,000 | $135,000 | $243,000 |
| N.E. Camano Island | $1,045,000 | $270,000 | $775,000 |

- Assumes each lot will pay $1,000 connection charge.
- Debt service based on 8% interest, 20-year bonds with 1.2 coverage factor.
- Construction costs based on 1988 price levels. (ENR = 4,685)

| Customer Information | No. Customers | Total Lots |
|---|---|---|
| Juniper Beach | 117 | 135 |
| N.E. Camano Island | 220 | 270 |

| Water Use at 100 gpcd | Annual Use (MG) |
|---|---|
| Juniper Beach | 12.8 |
| N.E. Camano Island | 24.1 |

- Operation and Maintenance Costs assumed to be negligible for "Minimum Sized" system and $10,000/yr for N.E. Camano Island system. This cost includes the cost of purchased water from Stanwood at an assumed wholesale rate of $0.50/100 cf.


ANACORTES SUPPLY
Strait of Juan De Fuca
16"/12"
20"/16"
16"/12"
2 MG
16"/12"
16"/10"
City of Oak Harbor
Crescent Harbor
Oak Harbor
Penn Cove
Saratoga Passage
Fort Ebey State Park
Town of Coupeville
EXHIBIT M-1
ISLAND COUNTY
CENTRAL WHIDBEY ISLAND WATER SUPPLY SYSTEM
12" EXISTING PIPE, DIAMETER
16"/12" PROPOSED PIPE, DIA./ALT.
EXISTING RESERVOIR
EXISTING PUMP STATION
FUTURE RESERVOIR
FUTURE PUMP STATION
AREA SUPPLIED BY PIPELINE
prepared by
R. W. BECK AND ASSOCIATES

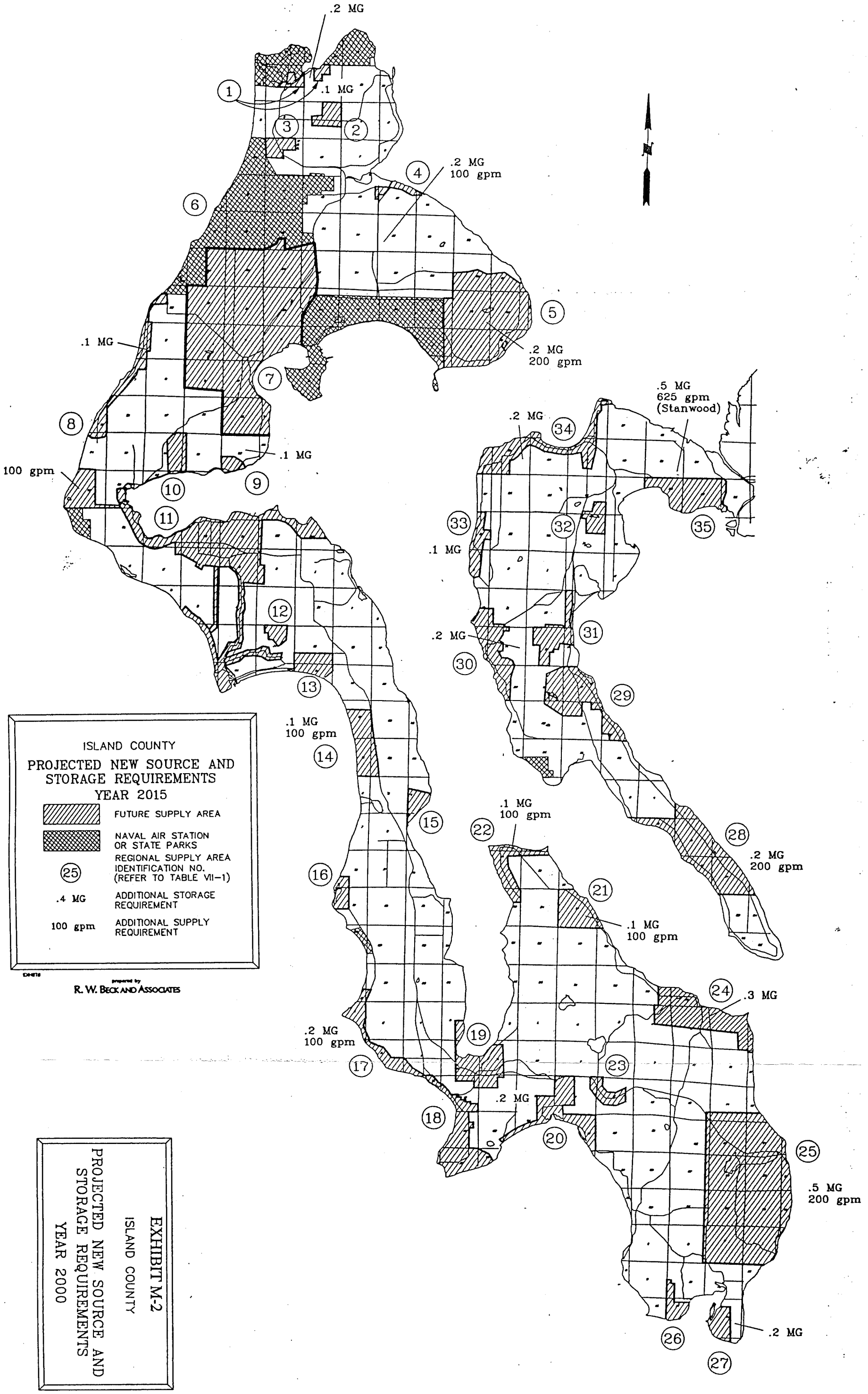



EXHIBIT M-2

ISLAND COUNTY

PROJECTED NEW SOURCE AND STORAGE REQUIREMENTS

YEAR 2000

North Whidbey
.8 MG

Hope Harbor

A
1.5 Mi.
8 in.

B
4 Mi., 8 in.

Dugualla
.2 MG

Central East
North Whidbey
.6 MG
200 gpm

C
5 Mi., 8 in.

Silverlake
.5 MG
300 gpm

Naval
Air Base

D
4 Mi., 10 in.

Oak
Harbor

Rolling Hills
Glenncairn
.1 MG

Coupeville

E
1 Mi., 8 in.

F
8.5 Mi., 10 in.

Ledgewood
.2 MG
250 gpm

G
3 Mi., 8 in.

Lagoon
Point
.3 MG

H
3.5 Mi.
10 in.

I
3 Mi.
8 in.

Bush Point
.5 MG
200 gpm

J
4 Mi., 8 in.

Freeland
.3 MG
200 gpm

K
5.5 Mi., 8 in.

Clinton
1.0 MG
500 gpm

L 3.5 Mi., 6 in.

.2 MG

M 2 Mi., 8 in.

Langley
.9 MG

N 6 Mi., 8 in.

Saratoga
Water System
.7 MG
300 gpm

O 5 Mi., 6 in.

South Camano
.5 MG
400 gpm

P 4 Mi., 6 in.

Central Camano
.3 MG

Q 3 Mi., 8 in.

R
8 Mi., 10 in.

North Camano
1.3 MG

.5 MG
800 gpm
(Stanwood)

ISLAND COUNTY
PROJECTED NEW SOURCE AND STORAGE REQUIREMENTS
YEAR 2015

FUTURE SUPPLY AREA

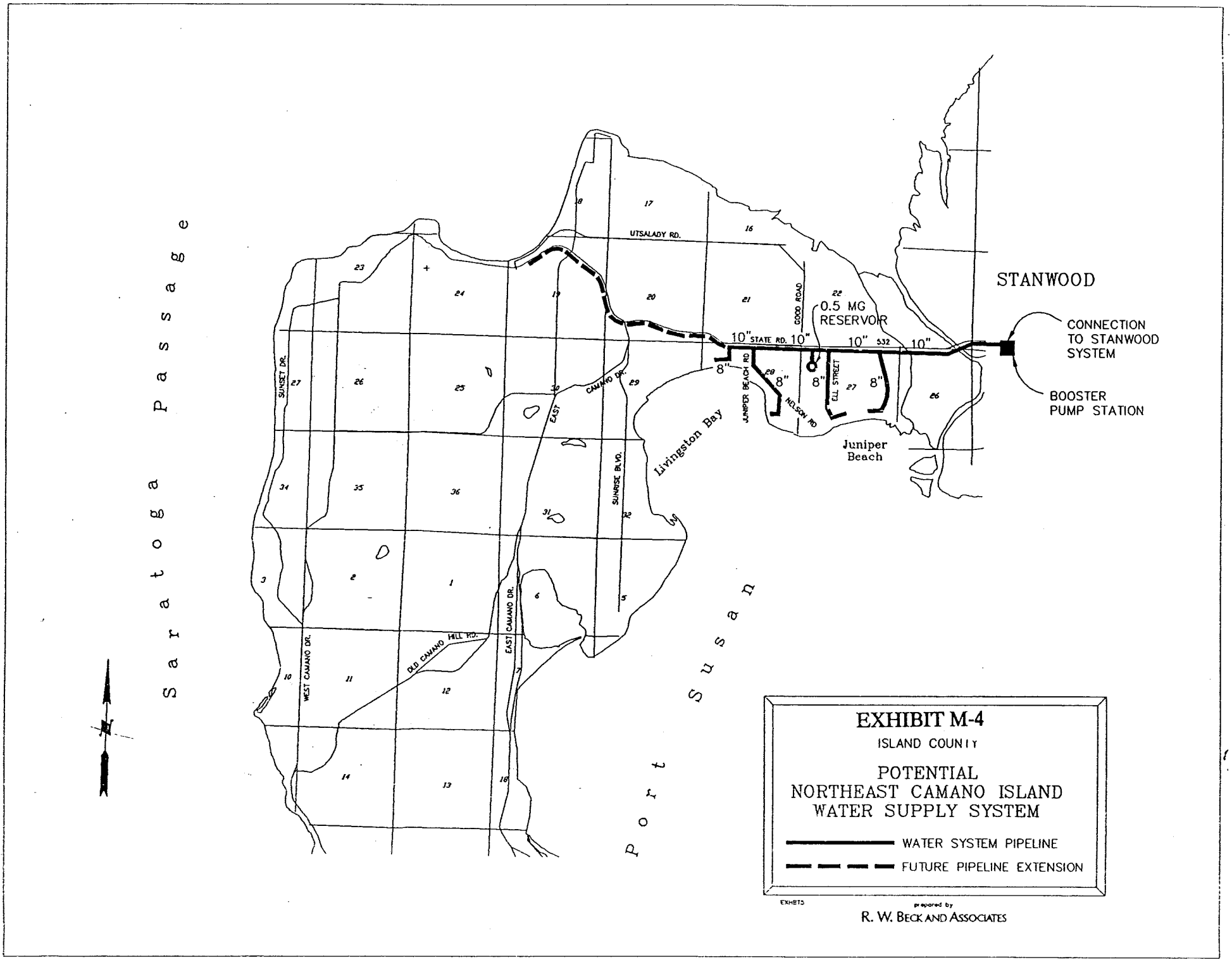
NAVAL AIR STATION OR STATE PARKS

J 3.5 Mi. 10 in. INTERTIE PIPING, LENGTH, DIA. (REFER TO TABLE VII–7)

INTERTIES

prepared by
R. W. BECK AND ASSOCIATES

EXHIBIT M-3
ISLAND COUNTY
PROJECTED NEW SOURCE AND STORAGE REQUIREMENTS
YEAR 2015


Saratoga Passage
Port Susan
Livingston Bay
UTSALADY RD.
STANWOOD
0.5 MG
RESERVOIR
CONNECTION
TO STANWOOD
SYSTEM
BOOSTER
PUMP STATION
10" STATE RD.
10"
10"
532
10"
8"
8"
8"
8"
GOOD ROAD
JUNIPER BEACH RD
NELSON RD
ELL STREET
SUNSET DR.
EAST CAMANO DR.
SUNRISE BLVD.
WEST CAMANO DR.
OLD CAMANO HILL RD.
Juniper
Beach
EXHIBIT M-4
ISLAND COUNTY
POTENTIAL
NORTHEAST CAMANO ISLAND
WATER SUPPLY SYSTEM
WATER SYSTEM PIPELINE
FUTURE PIPELINE EXTENSION
EXHIBITS
prepared by
R. W. BECK AND ASSOCIATES