Water Resources Department

MEMO SEPT 1, 2005

TO **Application G-** 16489

FROM **GW:** Ivan Ball
(Reviewer's Name)

SUBJECT **Scenic Waterway Interference Evaluation**

☐ Yes
☒ No

The source of appropriation is within or above a Scenic Waterway

☐ Yes
☒ No

Use the Scenic Waterway condition (Condition 7J).

PREPONDERANCE OF EVIDENCE FINDING: (Check box only if statement is true)

☐ At this time the Department is unable to find that there is a preponderance of evidence that the proposed use of ground water will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway in quantities necessary for recreation, fish and wildlife.

FLOW REDUCTION: *(To be filled out only if Preponderance of Evidence box is not checked)*

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

TO: Water Rights Section Date **September 1, 2005**

FROM: Ground Water/Hydrology Section **Ivan Gall**
Reviewer's Name

SUBJECT: Application G- **16489** Supersedes review of **N/A**
Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525.* Department staff review ground water applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. **This review is based upon available information and agency policies in place at the time of evaluation.**

A. GENERAL INFORMATION: Applicant's Name: **City of Gearhart** County: **Clatsop**

A1. Applicant(s) seek(s) **2.18** cfs from **14** well(s) in the **Pacific Ocean (just west of Necanicum R.)** Basin, _____ subbasin Quad Map: **Gearhart**

A2. Proposed use: **Municipal** Seasonality: **Year-round**

A3. Well and aquifer data **(attach and number logs for existing wells; mark proposed wells as such under logid)**:

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
1	**na**	**1**	**Sand**	**0.156**	**06N/10W-04 SESE**	**3658' N, 1135' W fr E ¼ cor S 9**
2	**na**	**14**	**Sand**	**0.156**	**06N/10W-09 NENE**	**2457' N, 1096' W fr E ¼ cor S 9**
3						
4						
5						

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
1	**25**	**na**	**na**	**na**	**120**	**0-75**	**+1-120**	**na**	**88-118**	**na**	**na**	**na**
14	**25**	**na**	**na**	**na**	**120**	**0-75**	**+1-120**	**na**	**88-118**	**na**	**na**	**na**

Use data from application for proposed wells.

A4. **Comments:** Applicant is proposing 14 wells in an approximate north-south line, wells 2-13 located between wells 1 and 14. Aquifer testing has been conducted on one test well with two observation wells. The static water level in the test well was 24.22 feet (Sect. 2 of Kennedy-Jenks report, page 6). Due to the close proximity of the wells to each other, aquifer type, and same well construction, I have only reviewed in detail Well #1 and #14. Results of the analyses will be similar for all the proposed City of Gearhart wells.

A5. ☒ **Provisions of the North Coast** Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☐ **are**, *or* ☒ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: **Division 501 rules**

A6. ☐ **Well(s) #** _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: _____
Comments: _____

B. GROUND WATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

B1. **Based upon available data**, I have determined that ground water* for the proposed use:

a. ☐ **is** over appropriated, ☒ **is not** over appropriated, *or* ☐ **cannot be determined to be** over appropriated during any period of the proposed use. * This finding is limited to the ground water portion of the over-appropriation determination as prescribed in OAR 690-310-130;

b. ☐ **will not** *or* ☐ **will** likely be available in the amounts requested without injury to prior water rights. * This finding is limited to the ground water portion of the injury determination as prescribed in OAR 690-310-130;

c. ☐ **will not** *or* ☐ **will** likely to be available within the capacity of the ground water resource; or

d. ☒ **will, if properly conditioned**, avoid injury to existing ground water rights or to the ground water resource:
   i. ☒ The permit should contain condition #(s) **7B, 7C (April), 7F**;
   ii. ☒ The permit should be conditioned as indicated in item 2 below.
   iii. ☒ The permit should contain special condition(s) as indicated in item 3 below;

B2. a. ☐ **Condition** to allow ground water production from no deeper than _____ ft. below land surface;

b. ☐ **Condition** to allow ground water production from no shallower than _____ ft. below land surface;

c. ☒ **Condition** to allow ground water production only from the **unconsolidated sand** ground water reservoir;

d. ☐ **Well reconstruction** is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Ground Water Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): _____

B3. **Ground water availability remarks:** 1. Require applicant to install and maintain a properly functioning, totalizing flow meter on each well developed under this permit.
2. Require applicant to measure and report to OWRD water levels for each well in January, April, July, and October of each year for the first 7 years of each wells' use.
3. Require applicant to measure, record, and report to OWRD specific conductance values for groundwater samples pumped from each well in January, April, July, and October of each year for the first 7 years of each wells' use.
Local geology is composed of dune and beach sand deposits overlying low permeability bedrock of the Astoria Formation (Frank, 1970). The Astoria Formation consists of 1,400 feet of sandstone and shale, is of low permeability, and produces only limited groundwater, both to wells and stream baseflow. The unconsolidated sand (both dune and beach) deposits make up the aquifer, which extends from the mouth of the Columbia River on the north to Tillamook Head on the south, ranging in width from one-half to about 2 miles. At Gearhart, the aquifer is just over one mile in width. Recent drilling by Kennedy/Jenks for Gearhart indicates that the sand thickness is at least 124 feet at the proposed well field.
Frank (1970) indicates that the water table in the area is in the shape of a low ridge coinciding with the extent of the dune sand. The water table shape is locally affected by the presence of sand ridges and surface water (streams, lakes, and the ocean) with which the groundwater is hydraulically connected. Frank (1970) presents hydrographs for the aquifer (Figs. 5 and 6), which show the response of water levels to precipitation, and also show little to no tidal influence. In October 1966 the water table was about 5 feet lower than in January 1967. CLAT 50230, located in 08n/10W-33CCC, shows seasonal water level fluctuations ranging from approximately 2-5 feet. SEA (1981) reports that in some nested wells, deeper wells had higher or equivalent heads compared with shallow wells. Frank (1970), from 3 aquifer tests of partially penetrating wells, estimated an average aquifer transmissivity value of 27,000 gpd/ft (3,609 ft^2/day) for the sand aquifer. Frank (1970) notes that the specific yield could reasonably range between 0.1 and 0.3. Kennedy/Jenks estimated aquifer transmissivity between 16,000-20,000 gpd/ft. Domenico and Schwartz (1990, pg. 118) provide spec. yield values of 28% for medium sand and 23% for fine sand. Well density is limited in sections 4 and 9; given the aquifer capacity and recharge, well interference is unlikely. Frank (1970, pg. A30) notes some concern with a "strip of dune sand immediately adjacent to the Pacific Ocean and the mouth of the Necanicum River" where "large withdrawals from wells" might lead to seawater intrusion.

C. GROUND WATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Unconsolidated Sand**	☐	☒
14	**Unconsolidated Sand**	☐	☒
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluatio (App G-16489) and thick
confining layers, rapid water level respons nconfined,
unconsolidated sand aquifer.

11-08-05
Per Van Gall –
– require 1/4 water level measurements & 1/4 gw samples to be collected by geologist, etc. like condition 7c

C2. **690-09-040 (2) (3):** Evaluation of distanc ited a
horizontal distance less than ¼ mile from hall be
assumed to be hydraulically connected tc nd one mile
that are evaluated for PSI.

Well	SW #	Surface Water Nai	Potential for ubst. Interfer. Assumed? YES	NO
1	1	**Neacoxie Creek**	☐	☒
14	1	**Neacoxie Creek**	☐	☒
1	2	**Necanicum River**	☐	☒
14	2	**Necanicum River**	☐	☒
1	3	**Neawanna Creek**	☐	☒
14	3	**Neawanna Creek**	☐	☒
			☐	☐

Basis for aquifer hydraulic connection evaluation: Unconfined sand aquifer in contact with surface water. Frank (1970) indicates hydraulically connected nature of aquifer with streams and lakes. Distance to Neacoxie Cr based on USGS topo map. Distance to Necanicum River and Neawanna Cr based on Google Earth aerial photo and WRD aerial photo, with distance taken to northern edge of "channel". *GW elev. Estimated from 25-foot land surface elevation and 24-foot static water level.
Water Availability Basin the well(s) are located within: Pacific Ocean (no WAB); Necanicum R WAB immed. To East

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	**1**	☐	☐	**na**	**na**	☐	**28.9**	☐	**<15%**	☐
14	**1**	☐	☐	**na**	**na**	☐	**28.9**	☐	**15%**	☐
14	**2**	☐	☐	**72996**	**35.3**	☐	**28.9**	☐	**<15%**	☐
1	**3**	☐	☐	**na**	**na**	☐	**28.9**	☐	**<15%**	☐
14	**3**	☐	☐	**na**	**na**	☐	**28.9**	☐	**<15%**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells.** Otherwise same evaluation and limitations apply as in C3a above.

	SW #		Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
	1		☐	na	na	☐	28.9	☒	15%	☒
	2		☐	72996	35.3	☒	28.9	☒	<15%	☒
	3		☐	na	na	☐	28.9	☒	<15%	☒
			☐			☐		☐		☐

Comments: Total rate of appropriation applied for from 14 wells completed in the sand aquifer is 2.18 cfs. Wells #1, #2, and #3 are located sufficiently north of the Necanicum River such that their combined discharge (210 gpm = 0.467 cfs) was eliminated from this analysis, leaving 1.71 cfs, still exceeding 1% of both the instream and the 80% natural streamflow value.

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													

Distributed Wells Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2***	%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.													
(B) = 80 % Nat. Q													
(C) = 1 % Nat. Q													
(D) = (A) > (C)													
(E) = (A / B) x 100		%	%	%	%	%	%	%	%	%	%	%	%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation:

Note the presence of three hydraulic boundaries: the Pacific Ocean, approx. 1,000 feet to the west; Neacoxie Creek, approx. 2100 feet to the east; and the Necanicum River/Neawanna Creek approx. 4,500-5,700 feet to the south. The simple analytical models of Jenkins and Hunt assume only one boundary. The presence of the closest boundary, the Pacific Ocean, is likely to be fairly efficient, given the beach/dune sand nature of the aquifer material. As the cone of depression encounters this recharge boundary, the spread of the cone will be truncated, likely before the cone reaches Neacoxie Creek, the next nearest boundary.

To be as conservative as possible, the simple analytical model of Jenkins was used to evaluate the impact of the closest proposed well (#14) to the closest fresh water stream (Neacoxie Creek). The Jenkins model assumes no streambed clogging, and a stream that fully penetrates into the aquifer. A low aquifer storage of 0.15, and a high transmissivity of 40,000 gpd/ft, were chosen. After 30 days of pumping the impact was estimated at 15%, less than the 25% Div. 9 criteria. Again, because of the presence of the nearer boundary to the west, the real impact would be less than this 15%. The remaining wells and streams will each have a lower percent impact due to the greater distances involved.

Watermaster G. Beaman reports no regulation on lower Neacoxie Creek or the lower Necanicum River.

Because of the saline nature of the hydraulic boundary to the west, water quality shall be monitored in each permitted well to evaluate saline intrusion or upwelling.

***An analysis for C4A above was not conducted, as the large distance and simple analytical modeling result in no estimated impact.

C4b. **690-09-040 (5) (b) The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.**

C5. ☐ **If properly conditioned,** the surface water source(s) can be adequately protected from interference, and/or ground water use under this permit can be regulated if it is found to substantially interfere with surface water:

i. ☐ The permit should contain condition #(s)_____;

ii. ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions** Neacoxie Creek receives groundwater discharge throughout the year, and flow increases progressively in a downstream direction (Frank, 1970, pg. A22). Plate 1 (Frank, 1970) shows the contoured water level data (both dry and wet seasons) with an influence of groundwater discharge to Neacoxie Creek. The unconfined sand aquifer is in hydraulic connection with the other lakes and streams in the area, and with the Pacific Ocean.

My interpretation of hydraulic connection between the proposed wellfield and Neacoxie Creek, Neawanna Creek, and the Necanicum River reflect the concept that it would be possible to install sufficient wells with sufficient discharge to have an impact on the hydraulic gradient in the aquifer adjacent to these streams. However, the simple analytical modeling with conservative parameters, and not accounting for the closest recharge boundary (Pacific Ocean) suggest that the actual impact to the fresh water streams will be little to none. Additional simulations with a more refined and flexible numerical model, which could account for the presence of all the boundaries may show little impact on the fresh water streams.

Note that the lower reaches of all 3 streams are tidally influenced, making accurate measurement of surface water discharge difficult to impossible.

References Used:

Domenico, P.A., and F.W. Schwartz, 1990. Physical and Chemical Hydrogeology. John Wiley & Sons.
Frank, F.J., 1970. Ground-Water Resources of the Clatsop Plains Sand-Dune Area, Clatsop County, Oregon. USGS Water Supply Paper 1899-A.
Hunt, B., 1999, Unsteady stream depletion from ground water pumping: Ground Water, v. 37, no.1, p. 98-102.
Kennedy/Jenks Consultants, 2005. Draft Section 2 report, Wellfield.
USGS 1:24,000 scale topographic map, Gearhart.
Sweet, Edwards & Associates, Inc., 1981. Clatsop Plains Ground Water Protection Plan Ground Water Evaluation Report.
Jenkins, C.T., 1968b, Computation of Rate and Volume of Stream Depletion by Wells: U.S. Geol. Survey Techniques of Water-Resources Investigations. Book 4, chapter D1, pp. 1-17.

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** _____ **Logid:** _____

D2. **THE WELL does not meet current well construction standards based upon:**
- a. ☐ review of the well log;
- b. ☐ field inspection by _____;
- c. ☐ report of CWRE _____;
- d. ☐ other: (specify) _____

D3. **THE WELL construction deficiency**:
- a. ☐ constitutes a health threat under Division 200 rules;
- b. ☐ commingles water from more than one ground water reservoir;
- c. ☐ permits the loss of artesian head;
- d. ☐ permits the de-watering of one or more ground water reservoirs;
- e. ☐ other: (specify) _____

D4. **THE WELL construction deficiency is described as follows:** _____

D5. **THE WELL**
- a. ☐ **was**, *or* ☐ **was not** constructed according to the standards in effect at the time of original construction or most recent modification.
- b. ☐ I don't know if it met standards at the time of construction.

D6. ☐ **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section.

THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

D7. ☐ Well construction deficiency has been corrected by the following actions: _____

_____ _____, 200____.
(Enforcement Section Signature)

D8. ☐ **Route to Water Rights Section (attach well reconstruction logs to this page).**

Water Availability as of 8/24/2005 for
NECANICUM R > PACIFIC OCEAN - AT MOUTH
Watershed ID #: **70955** Basin: NORTH COAST Exceedance Level: 80
Time: 14:12 Date: 08/24/2005
Select an Item Number for More Details

Item #	Watershed ID #	Jan	Feb	Mar	Apr	May	Jun	*Jul*	*Aug*	*Sep*	*Oct*	Nov	Dec	Sto
1	70955	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	YES	YES	YES

STREAM NAMES
Water Availability as of 8/24/2005 for
NECANICUM R > PACIFIC OCEAN - AT MOUTH
Watershed ID #: 70955 Basin: NORTH COAST Exceedance Level: 80
Time: 14:12 Date: 08/24/2005

Item	Watershed ID	Stream Name
1	70955	NECANICUM R > PACIFIC OCEAN - AT MOUTH

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION
Water Availability as of 8/24/2005 for
NECANICUM R > PACIFIC OCEAN - AT MOUTH
Watershed ID #: 70955 Basin: NORTH COAST Exceedance Level: 80
Time: 14:12 Date: 08/24/2005

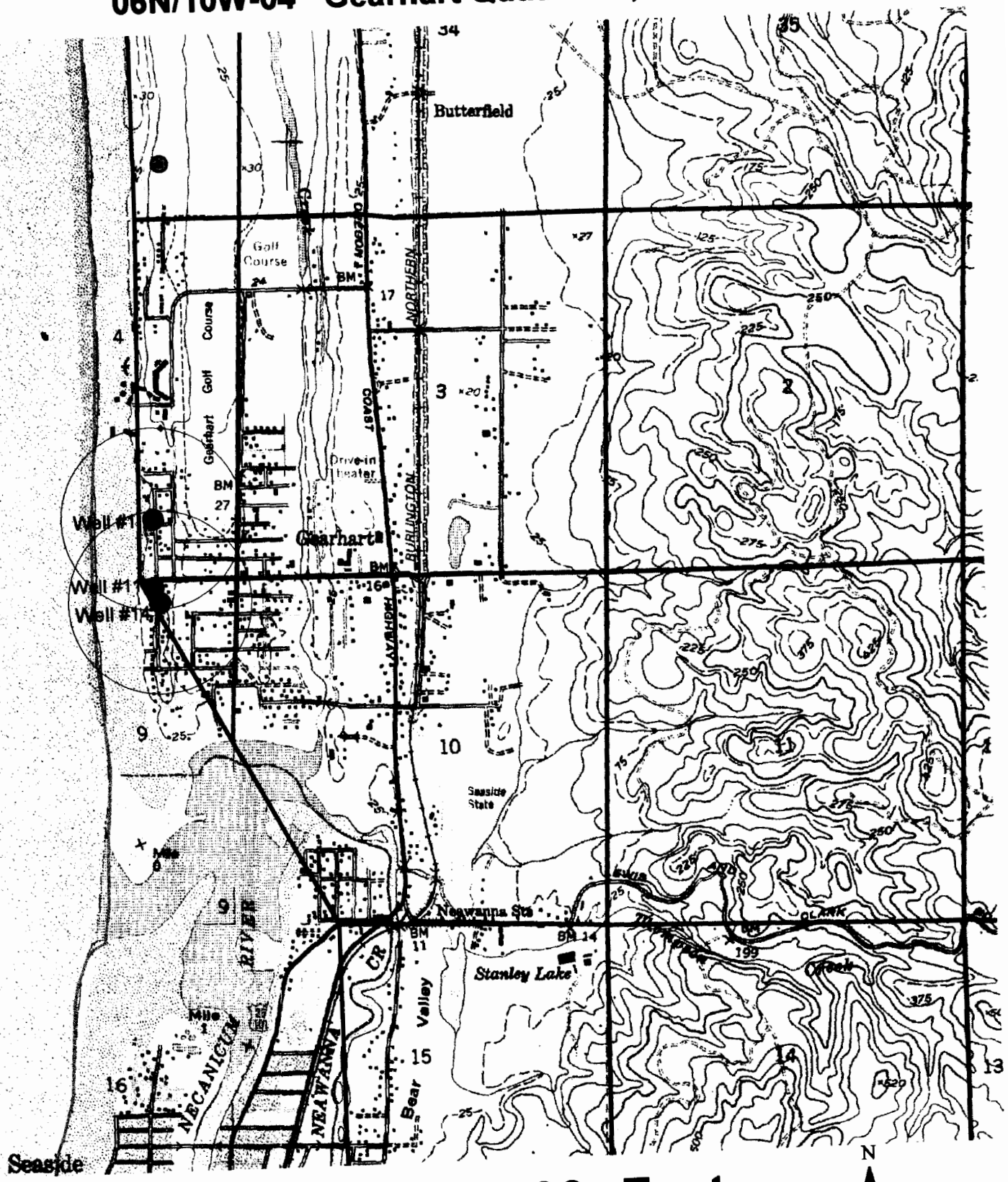
Month	**Natural Stream Flow**	CU + Stor Prior to 1/1/93	CU + Stor After 1/1/93	Expected Stream Flow	Reserved Stream Flow	Instream Water Rights	Net Water Available
1	300.00	15.80	0.53	284.00	0.00	140.00	144.00
2	359.00	15.90	0.62	343.00	0.00	140.00	203.00
3	266.00	15.70	0.41	250.00	0.00	140.00	110.00
4	181.00	15.70	0.14	165.00	0.00	140.00	25.20
5	114.00	15.80	0.01	98.20	0.00	75.00	23.20
6	73.70	16.20	0.01	57.50	0.00	50.00	7.48
7	44.30	17.10	0.01	27.20	0.00	50.00	-22.80
8	**28.90**	16.80	0.01	12.10	0.00	35.30	-23.20
9	41.00	15.80	0.01	25.20	0.00	41.50	-16.30
10	48.50	15.70	0.01	32.80	0.00	91.40	-58.60
11	195.00	15.80	0.04	179.00	0.00	140.00	39.20
12	374.00	15.90	0.74	357.00	0.00	140.00	217.00
Stor	206000	11600	152	194000	0	71300	126000

DETAILED REPORT OF **INSTREAM** REQUIREMENTS
Water Availability as of 8/24/2005 for
NECANICUM R > PACIFIC OCEAN - AT MOUTH
Watershed ID #: 70955 Basin: NORTH COAST Exceedance Level: 80
Time: 14:12 Date: 08/24/2005

		ISWRs						
APP #	33A	70955A	0	0	0	0	0	MAXIMUM
Status	Cert.	Cert.						
1	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00
2	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00
3	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00
4	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00
5	50.00	75.00	0.00	0.00	0.00	0.00	0.00	75.00

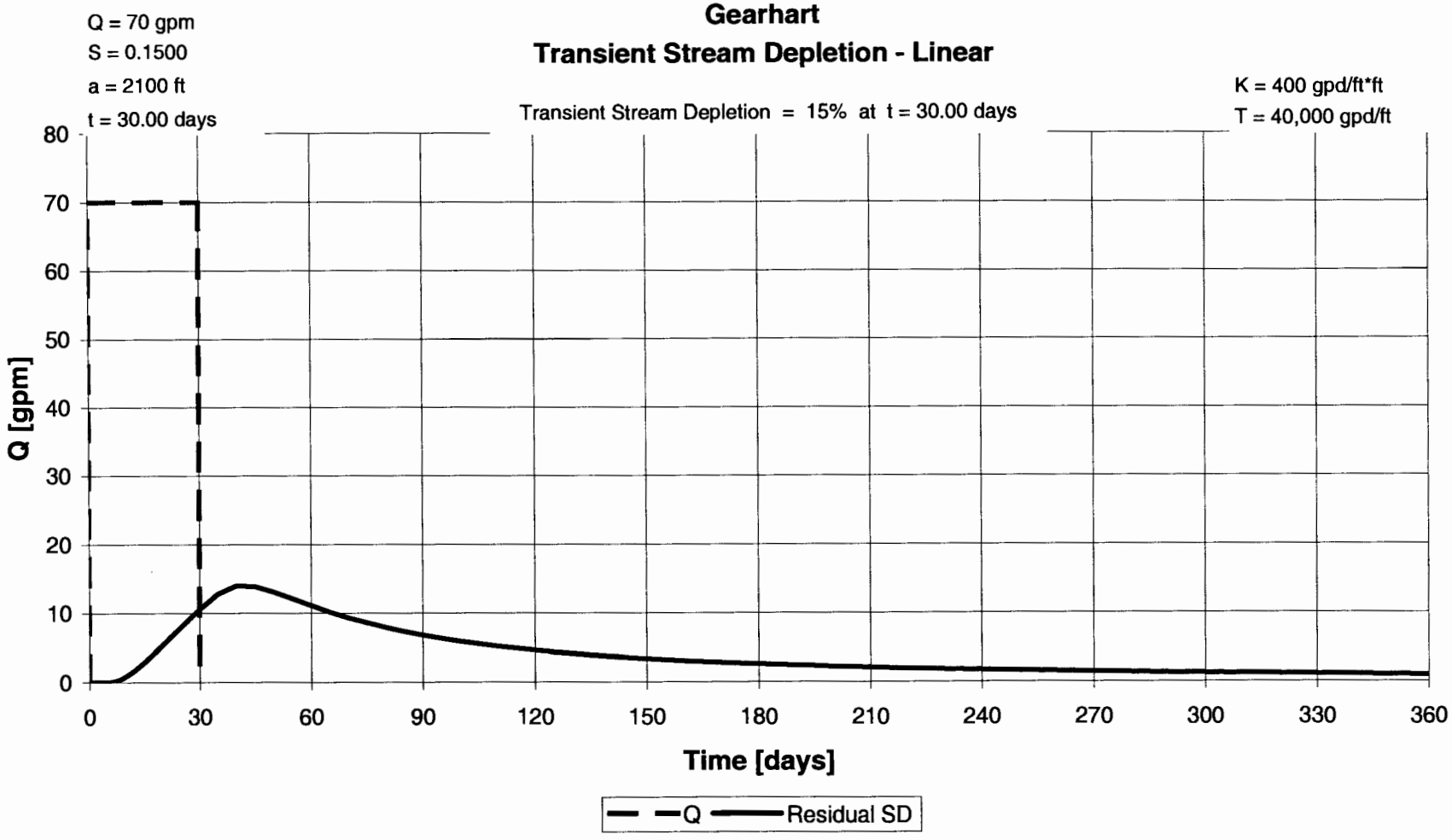
6	30.00	50.00	0.00	0.00	0.00	0.00	0.00	50.00
7	20.00	50.00	0.00	0.00	0.00	0.00	0.00	50.00
8	10.00	**35.30**	0.00	0.00	0.00	0.00	0.00	35.30
9	10.00	41.50	0.00	0.00	0.00	0.00	0.00	41.50
10	80.00	91.40	0.00	0.00	0.00	0.00	0.00	91.40
11	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00
12	80.00	140.00	0.00	0.00	0.00	0.00	0.00	140.00

G-16489 City of Gearhart
06N/10W-04 Gearhart Quad 1:24,000



0 2000 4000 6000 8000 Feet

N
W E
S


Gearhart
Transient Stream Depletion - Linear
Q = 70 gpm
S = 0.1500
a = 2100 ft
t = 30.00 days
Transient Stream Depletion = 15% at t = 30.00 days
K = 400 gpd/ft*ft
T = 40,000 gpd/ft
Q [gpm]
0
10
20
30
40
50
60
70
80
0
30
60
90
120
150
180
210
240
270
300
330
360
Time [days]
Q
Residual SD