RECEIVED
By Mollie Hurt at 1:08 pm, Mar 26, 2024

INSIGHT GEOLOGIC, INC.

September 22, 2023

Merrlawski Investments, LLC
209 Crescent Beach Dr.
Packwood, Washington 98361
Attention: Chris Merritt

Report
Hydrogeologic Assessment and Nitrate Loading Study
Proposed Subdivision
Packwood, Washington
Project No. 2193-001-01

INTRODUCTION

This report presents the results of our hydrogeologic assessment and nitrate loading study for your proposed subdivision of the planned subdivision to be located on Parcel 035067002003 near Packwood in Lewis County, Washington. The location of the site is shown on the attached Vicinity Map, Figure 1.

We understand that the project includes developing nine residential lots on the 12.8 acre property. The homes will be served by two, Group B water supply wells. Sanitary waste will be disposed of through individual, on-site septic systems. The Lewis County Public Health and Social Services Department is requiring this hydrogeologic assessment and nitrate loading study as a part of the permitting process because the site is located within a Critical Aquifer Recharge Area (CARA).

SCOPE OF SERVICES

The purpose of our services was to evaluate the hydrogeologic conditions at the site. Specifically, our scope of services for this project included the following:

1. Reviewed available information concerning topography, hydrogeology, soil conditions and other relevant characteristics of the site and surrounding area. This information included water well logs from the Washington State Department of Ecology (Ecology) files, soils maps prepared by the SCS (Soil Conservation Service), wellhead protection plans, and published reports on the geology and hydrogeology of Lewis County, as appropriate.
2. Evaluated groundwater elevations and flow direction based on available published and well log information.
3. Obtained information regarding existing nitrate concentrations in groundwater in the area. We utilized information collected for nearby water systems as presented in the Washington State Department of Health database.
4. Evaluated the potential nitrate contribution to the aquifer from the proposed individual drainfields.

1015 East 4th Avenue, Olympia, Washington 98506
Phone: 360.754.2128 Fax: 360.754.9299

5. Developed our opinion with regard to the potential impact of the proposed development on the aquifer systems in the site area.
6. Prepared a report summarizing our observations and conclusions with regard to nitrate loading and the impact of the proposed development on the groundwater regime.

SITE CONDITIONS

General

The site consists of a single 12.8-acre parcel (Lewis County Tax Parcel No. 035067002003) located northeast of Packwood, Washington, and southeast of Cannon Road in unincorporated Lewis County. The surrounding land use is residential to the north, west, and south, and the Cowlitz River to the east. An existing Group A water supply well (High Valley Country Club) is located north of the property. The site is generally flat with an elevation of 1,100 feet above mean sea level (MSL), based on our review of topographic information. A small drainage crosses the east edge of the site. The site is at an elevation approximately 4 feet above the elevation of the Cowlitz River which is located approximately 350 feet east of the site at its closest point.

Surface Conditions

The subject property is undeveloped and vegetated with a mixture of wooded and overgrown field areas.

The U.S. Department of Agriculture Soil Conservation Service (SCS) map indicates the surface soils on the subject property consist of Siler silt loam and Ledow sand. In general, these soils are characterized as having moderate to rapid permeability. The soils are formed on terraces and flood plains. Lewis County defines these soils as being a Category II Critical Aquifer Recharge Area.

HYDROGEOLOGY

Geologic Conditions

Site geology was evaluated by reviewing available well logs, published information, and our geologic reconnaissance of the site area. We were able to identify the locations of three wells within about 1,500 feet of the site having well logs in Ecology's files. The approximate locations of the identified wells in relation to the subject site are shown on the Radius Well Location Map, Figure 2. Copies of the well logs are contained in Attachment A.

Based on our document review and site observations, the thin surficial geologic deposits within the study area appear to consist of alpine glacial outwash of the Evans Creek Drift consisting of gravel and sand river channel deposits within the Cowlitz River valley which were later downcut, forming river valley terraces.

A fine-grained, dense unit identified on driller's logs as "hardpan" is interpreted to be glacial till underlying the outwash deposits. Glacial till is deposited at the base of a glacier and consists of an unsorted mixture of sand, silt, and gravel with occasional cobbles. The deposit is generally very dense and has a low permeability. The low permeability of the till unit provides a means of increased denitrification of septic wastes due to the development of anaerobic conditions within the aquitard.

The glacial till or “hardpan” in the site area appears to be approximately 10 to 20 feet thick, based on depths identified on the attached well logs.

Aquifer Systems

The nearby wells identified in Attachment A and Figure 2, generally appear to obtain water from the primary water-bearing zone in deeper sand and gravel water-bearing units deposited prior to the layer of glacial till. The wells identified in Attachment A generally appear to obtain water from these deposits at depths of between 58 to 70 feet below the local ground surface. Water levels noted on the well logs are between the depths of 7.1 and 27 feet below ground surface, indicating that the aquifer is at least partially confined.

A seasonally saturated zone is likely present in the thin layer of recessional outwash material that overlies the glacial till in the site vicinity. The zone of water saturation over the till is expected to fluctuate seasonally. This saturated zone does not appear to contribute significant water to wells in the area.

Hydraulic Conductivity

Published estimates of hydraulic conductivity for the sand and gravel deposits within the aquifer average about 1,000 cubic feet per square foot per day.

Groundwater Flow Direction and Gradient

The direction of local horizontal groundwater flow for the aquifer is likely to the southeast or south, subparallel with the Cowlitz River. The hydraulic gradient in this area is estimated to be approximately 0.004 feet per foot based on the valley gradient.

Groundwater Recharge

Groundwater in this area of Lewis County generally originates as precipitation, but also includes underflow within the channel deposits of the Cowlitz River.

Potential Groundwater Impacts

We understand that on-site septic tanks and drainfields are proposed to serve the proposed residences. The site soil in the area of the proposed drainfields, consisting of Siler silt loam soils, may be limited in its ability to remove nitrates from septic effluent due to its granular and porous nature. However, a silty/clayey glacial till horizon appears to underlie the site beneath the upper soils, based on our review of local well logs. The presence of these fine-grained materials will reduce the rate of infiltration from the septic systems to the underlying aquifer and will tend to increase the nitrate removal from the septic effluent. In our opinion, based on our nitrate loading calculations presented below, there could be a slight contribution of nitrate to the local groundwater as a result of septic effluent from the proposed development migrating to the groundwater table. However, the nitrate contribution does not appear to be sufficiently elevated to increase overall nitrate concentrations above a regulated level.

Wellhead Protection Areas

The subject site is located overlying two wellhead protection areas for the High Valley Country Club water supply systems as shown on Figure 3. The wellhead protection area is related to Well 03, and Well 08 for the High Valley Country Club which are located hydraulically upgradient of the site. The

majority of the site overlies the 5, and 10-year Calculated Fixed Radius (CFR) time of travel boundaries for the water system. These wells serve the High Valley Country Club water system having 896 connections serving a population of 950. The wells are reported to be 58 and 140 feet deep respectively based on the Washington State Department of Ecology's well files.

It should be noted that wellhead protection areas for Well 03 and 08 are based on the calculated fixed-radius method which uses nominal aquifer parameters and pumping rates. As the name implies, the calculated result provides a fixed radius around the well head and does not take into account other aquifer parameters such as anisotropy. Other wellhead protection areas in the Packwood area that have modeled wellhead protection areas showing strongly anisotropic, asymmetric travel time boundaries characterized by very narrow downgradient capture zones and long, upgradient capture areas. It is likely that Well 03 and 08 would show a similar asymmetry with modeled wellhead protection areas, thereby significantly reducing the apparent capture zones under the downgradient project site.

Nitrate Loading

We utilized available soil and climatic information, in conjunction with information provided by the applicant regarding the septic systems proposed for the development. We estimated a total of 27 bedrooms for the development with an assumed volume of 120 gallons per bedroom, per day based on septic design parameters. Actual household septage flows are more on the order of 45 gallons per day per person. Nominal nitrate loading values and soil denitrification values were obtained from the US Geological Survey Report #207-5237 titled "Evaluation of Approaches for Managing Nitrate Loading from On-Site Wastewater Systems Near La Pine, Oregon" dated 2007. The Hantzsche & Finnemore equation for calculating nitrate contribution to an aquifer is:

$$N_r = \frac{In_w(1-d) + RN_b}{(I+R)}$$

Where:

- N_r = nitrate impact to groundwater in mg/l
- I = volume of wastewater over the gross developed area in in/yr
- n_w = total nitrate/nitrogen concentration of wastewater
- d = fraction of nitrogen loss due to denitrification in the soil profile
- R = average recharge rate of rainfall in in/yr
- N_b = background nitrate concentration in rainfall in mg/l

Using default values, as well as values obtained from information provided for the proposed development, we derived that the resulting nitrate contribution at the aquifer interface is 3.4 mg/l. We used the Darcy equation for flow of Q=KiA to evaluate dilution of the nitrate in the aquifer. We used a nominal hydraulic conductivity (K) for the aquifer of 800 cubic feet per square foot per day, an aquifer cross-sectional area (A) of 7,500 square feet measured perpendicular to groundwater flow, and a hydraulic gradient (i) of 0.004 feet per foot to derive an annual flow (Q) beneath the property of

approximately 6.5 x 10^7 gallons. The ratio of the application rate to the annual aquifer flow is 1.2 x 10^6/6.5 x 10^7 or 0.02. The nitrate loading value (3.4 mg/l) was then multiplied by this factor to obtain the overall contribution, or 0.06 mg/l.

Lewis County does not have a policy regarding nitrate loading. However, Thurston County, in their policy statement dated August 14, 1995, indicates that the nitrate contribution must be compared to a concentration that is 10 percent of the assimilative capacity of the aquifer. The assimilative capacity is defined as the difference between the Maximum Contaminant Limit (MCL) for a contaminant (nitrate) and the existing level of that contaminant in the aquifer. Based on the published information for nitrate in the area, the existing concentration of nitrate in the aquifer is 0.2 mg/L (High Valley Country Club well 03 located approximately 800 feet north and upgradient of the proposed project). The laboratory result was obtained from the Department of Health website (copy attached). The MCL for nitrate is 10.0 mg/L, and the background concentration is 0.2 mg/l, so the assimilative capacity for the aquifer is 9.8 mg/L. Ten percent of that value is 0.98 mg/L.

The estimated nitrate contribution from the proposed septic systems is 0.06 mg/L, which is less than the 10 percent value (0.98) of the available assimilative capacity of the aquifer. Therefore, the development appears to be acceptable based on a low nitrate contribution using Thurston County's criteria. It should be noted that we contacted Lewis County regarding their methodology for evaluating nitrate loading, but we received no response to our request by the time this report was finalized. Our nitrate loading calculations are presented in Table 1, attached.

We contacted Keith Baird with the Washington State Department of Health regarding our nitrate loading calculations to discuss an acceptable method for determining the contribution to the aquifer. Keith agreed, that in lieu of Lewis County having methodology for conducting the loading study, the method used by Thurston County using the "assimilative capacity" would be the next-best method.

OPINION

Based on our understanding of Lewis County Critical Areas Ordinance for Critical Aquifer Recharge Areas, we believe that the information presented herein adequately characterizes the proposed project site for the purposes of a hydrogeologic assessment and nitrate loading for the proposed development. In our opinion, the proposed project does not appear to present potential adverse effects to the regional groundwater quality or quantity in the area from nitrate contributions.

LIMITATIONS

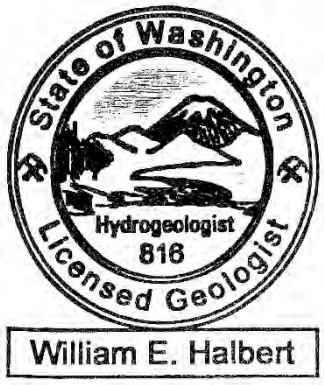
We have prepared this report for use by Merrlawski Investments, LLC and their authorized agents. This report may be made available to regulatory agencies. Our interpretations regarding subsurface conditions are based on widely spaced, and generally poorly-located water wells drilled and logged by others, on published geologic information, and a brief site reconnaissance. Our interpretations contained herein should not be construed as a warranty of subsurface conditions. Actual subsurface conditions with respect to geology and groundwater may vary with location and time and, if required, should be explored using appropriate field techniques. No subsurface explorations have been completed for this project.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No other conditions, express or implied, should be understood.

We appreciate the opportunity to assist you with this project. Please contact us if you have questions regarding the information presented in this report or if we can provide additional services.

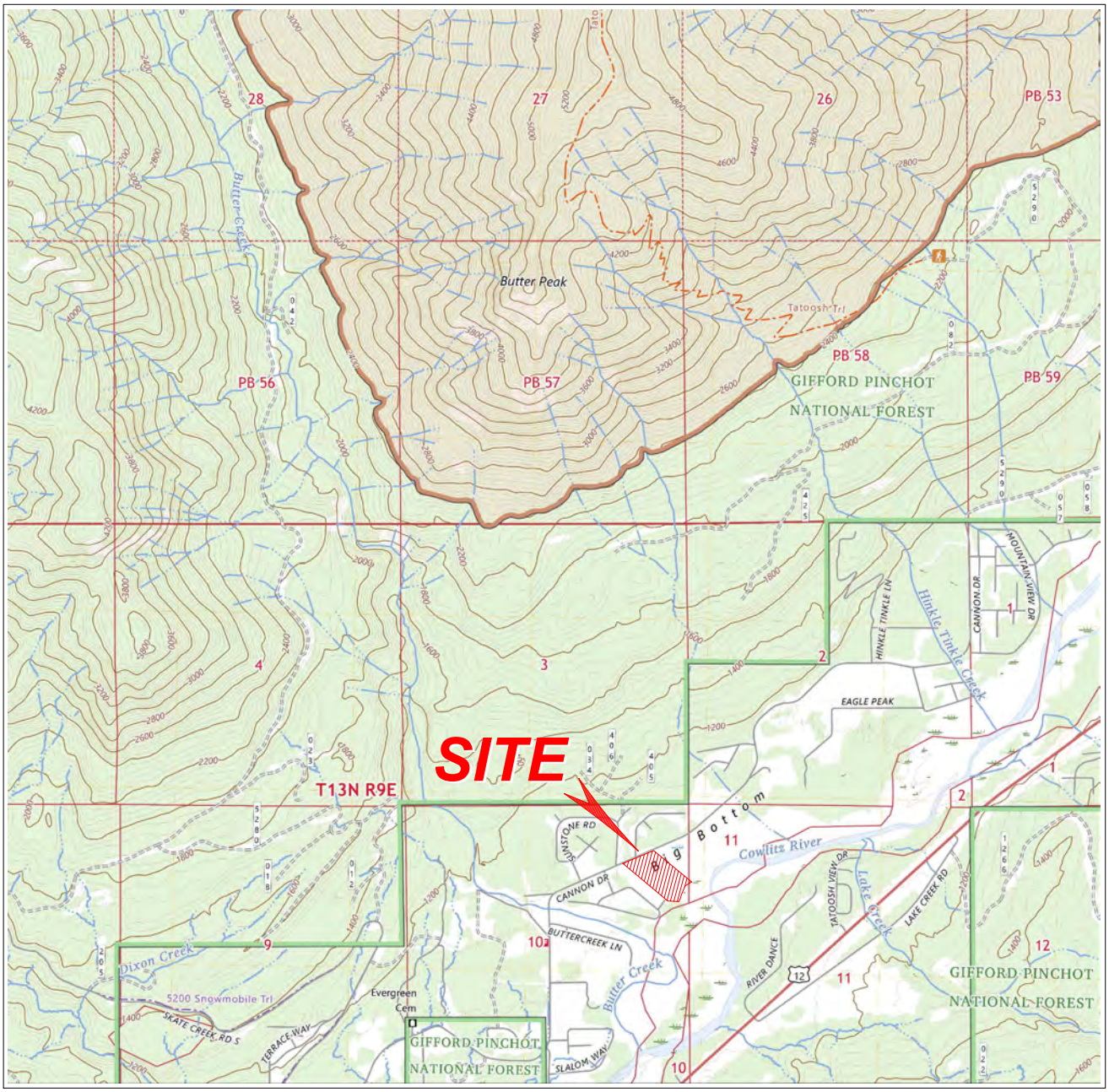
Respectfully Submitted,
INSIGHT GEOLOGIC, INC.

William E. Halbert, L.E.G., L.HG.
Principal Hydrogeologist



Attachments

FIGURES



Source: USGS (c) 2023

TATOOSH LAKES QUADRANGLE
WASHINGTON - LEWIS COUNTY
7.5-MINUTE SERIES
Year 2020

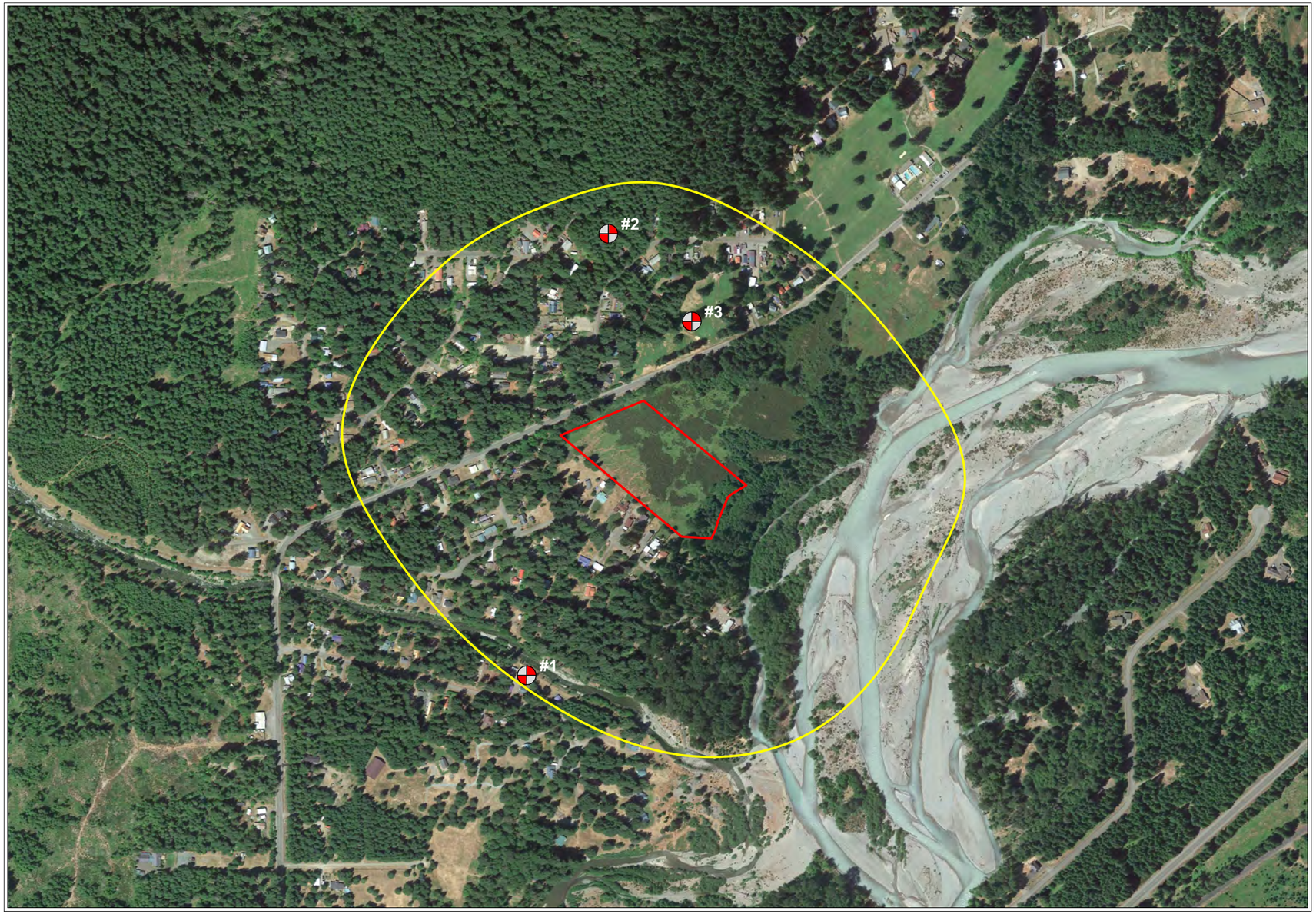
SCALE: 1" = 3000'

PROPOSED SUBDIVISION

PACKWOOD, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 1
Vicinity Map



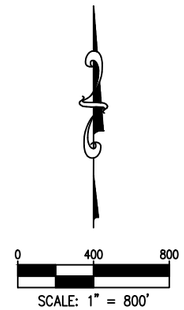
Source: Google Earth (C) 2021

LEGEND:

- APPROXIMATE WELL LOCATION
- APPROXIMATE 1,500 FT WELL RADIUS
- APPROXIMATE PROJECT BOUNDARY

WELL DATA TABLE

MAP ID	OWNER	WELL IDENTIFICATION	WELL DEPTH	DEPTH TO WATER
1	DIANE CAREY	AKP557	58'	27'
2	HIGH VALLEY PARK, Inc.	N/A	114'	43'
3	HIGH VALLEY COUNTRY CLUB	ABR658	58'	7.1'

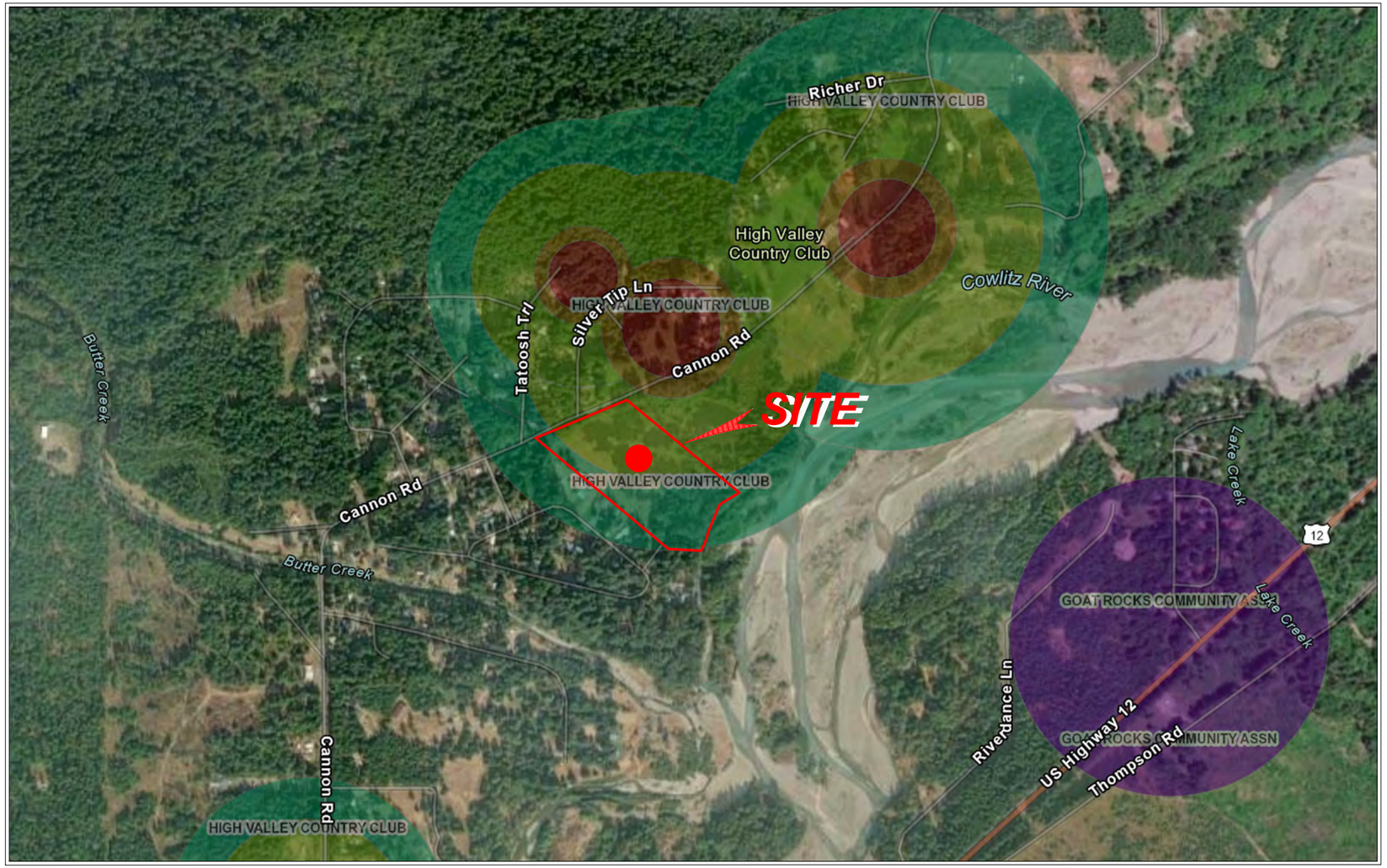


PROPOSED SUBDIVISON

PACKWOOD, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 2
Radius Well Location Map



Source: Source Water Assessment Program (SWAP): Washington State Department of Health (C) 2023

LEGEND:

- APPROXIMATE PROJECT LOCATION
- 10 YEAR TIME OF TRAVEL
- 5 YEAR TIME OF TRAVEL
- 1 YEAR TIME OF TRAVEL
- 6 MONTH TIME OF TRAVEL
- ASSIGNED TIME OF TRAVEL

0 400 800

SCALE: 1" = 800'

PROPOSED SUBDIVISION

PACKWOOD, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 3
Wellhead Protection Area Map

TABLE

TABLE 1
NITRATE LOADING OF AQUIFER
Proposed Subdivision

DATA	QUANTITY	SOURCE
Total Developable Area (acres) =	12.8	Lewis County GIS Web Map
Proposed number of bedrooms @ 3 per lot	27	
V(w) = volume of waste water (gallons per year)	1,182,600	@ 120 gallons per day per bedroom
I = volume of waste water over gross developable area (inches/year) =	3.4	
N(w) = total nitrogen concentration in wastewater (mg/l) =	60	Hantzsche & Finnemore, 1992; Metcalf & Eddy, 1972
d = fraction of nitrogen loss due to soil denitrification =	0.4	Hantzsche & Finnemore, 1992
R = average recharge rate (inches per year) based on average annual precipitation - evapotranspiration =	42.1	
Average annual precepitation (inches) =	62.0	Washington Climate - 1968
Average annual actual evapotranspiration (inches) =	19.9	Washington Climate - 1968
N(b) = background concentration of nitrogen in rainfall (mg/l) =	0.75	Hantzsche & Finnemore, 1992
N(r) = estimated concentration of nitrate in effluent prior to dilution in aquifer (mg/l) =	3.4	
N(ba) = Background concentration of nitrate in aquifer (mg/l)=	0.20	High Valley Country Club Group A Water System 327004 (9/29/2022)
K = hydraulic conductivity (ft/day)	800	USGS Professional Paper 1424-D
i = groundwater gradient	0.004	Based on valley gradient
A = Aquifer cross-sectional area (feet squared)	7,500	750 feet wide by 10 feet thick
Q = Ground water flow (gallons per year)=	65,524,800	Calculated (Q=KiA)
Ratio of effluent flow to ground water flow	0.02	
N(g)=Nitrate concentration after dilution in aquifer (mg/l)=	0.06	
10% of aquifer assimilative capacity (MCL - background concentration)	0.98	
Is nitrate contribution less than 10 percent of aquifer assimilative capacity?	**YES**	
Is nitrate concentration at the aquifer interface less than the MCL of 10 mg/l?	**YES**	

ATTACHMENT A
WELL LOGS

File original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 226366
Permit No. ....

(1) **OWNER:** Name Hi Valley Country Club. Address Packwood, Wa.

(2) **LOCATION OF WELL:** County Lewis — NE ¼ NE ¼ Sec. 10 T. 13 N., R. 9E W.M.

Bearing and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 8 inches.
Drilled 58 ft. Depth of completed well 58 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 8 " Diam. from 0 ft. to 53 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☐ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Steel Model No. .....
Diam. 8 Slot size 50 from 53 ft. to 58 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) **PUMP:** Manufacturer's Name .....
Type: ..... H.P. .....

(8) **WATER LEVELS:** Land-surface elevation above mean sea level .... ft.
Static level 7.1 ft. below top of well Date 5-9-83
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Tacoma Pump.
Yield: 350 gal./min. with 46 ft. drawdown after 4 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☒ No ☐

(10) **WELL LOG:**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy Topsoil	0	1
Sand, Small Gravel & Clay	1	20
Sand, large Gravel, Water	20	28
Sand, Gravel & Clay (Red)	28	30
Sand, large Gravel & Water.	30	58

RECEIVED
JUN 15 1983
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 5-2 19 83 Completed 5-2 19 83

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Tacoma Pump & Drilling Co. Inc.
(Person, firm, or corporation) (Type or print)

Address 30316 mt. Hwy. Graham, Wa.

[Signed] [illegible]
(Well Driller)

License No. 0710 Date 5-10 19 83

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Tacoma Pump & Drilling Company Inc.

30316 MOUNTAIN HIGHWAY · GRAHAM, WASHINGTON 98338 · PHONE 847-6087

TEST PUMP INFORMATION

G 226366

me: High Valley Park
ldress: Packwood, Wn

ason for pumping: Community supply

me Test Started: 11:15 AM
me Test Stopped: 3:19 PM

Well Depth: 58 feet
Static Level: 7 ft. 1 in. G.L.*
G.P.M.'S 350
Pumping Level: 21 ft. 7 in. G.L.*
Time Pumped: 4 hrs.
Well Diameter: 8 in.
Screening: 5 ft. Of .50 slot
Perforations: none

Date: May 9, 1983
Samples Taken: yes

me:		GPM		P.L.		C.L.	Time:		GPM		P.L.	
	11:15		100		11' 03"			2:08		350		23' 10"
	11:26		200		14' 9"			2:26		"		23' 10"
	11:28		200		14' 9"			2:45		"		23' 10"
	11:32		275		18' 0"			3:00		"		23' 10"
	11:35		275		18" 3"			3:15		"		23' 10"
	11:40		"		18' 5"							
	11:47		355		22' 10"							
	11:58		"		22' 11⅛"							
	12:09		"		23' 5"							
	12:15		350		23' 5½"							
	12:27		"		23' 6"							
	12:41		"		23' 6"							
	12:53		"		23' 6"							
	1:07		"		23' 7⅛"							
	1:24		"		23' 9⅛"							
	1:45		"		23' 9⅛"							
	2:00		"		23' 10"							

RECEIVED
JUN 15 1983
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

ecovery Information

ime:		Level:	C.L	Time:		Level
	3:19:15	9' 6"				
	3:19:45	9" 5½"				
	3:20:30	9' 4½"				
	3:21:00	9' 4"	full static			

omments: G.L. is ground level
C.L. is casing level
Casing stick up from ground level is approx. 2 ft. 3 in.
9 ft. 4 in. C.L. is 7 ft 1 in. G.L.
23 ft 10 in C.L. is 21 ft. 7 in. G.L.

Total drawdown after 4 hours was 14 ft. 6 in.
24.7 gpm. per ft of drawdown

***Work Done By: Jon M Jones (0193)

WASHINGTON STATE DEPARTMENT OF ECOLOGY

UNIQUE WELL I.D. NUMBER A BR 658
X Y Z 1 2 3

WELL TAGGING FORM

Date of Field Visit 8/5/94 By Bedell-Beers

ADDITIONAL WELL IDENTIFIERS

Department of Health System ID Number 327004 Source Number SO 8

USGS Site Identification _____

RECORD VERIFICATION

☒ Well Report available *(please attach)*
☐ Well Report not available
☐ Verification inconclusive

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

Name _____

Street address _____

City _____ State _____

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address _____

City _____ County _____

T. _____ N. R. _____ ___ W M. Sec. _____ ¼ of the _____ ¼

Latitude 46° 38' 06 N" ☐ GPS (raw data) ☐ GPS (corrected) ☒ Topographic Map ☐ Survey ☐ Computer generated ☐ Other _____

Longitude 121° 39' 17 W"

Elevation at land surface 1090 (feet)/meters *(circle one)* ☐ Digital Altimeter ☒ Topographic Map ☐ Other _____

Additional information, if available:

☒ Location marked on topographic map *(please attach)*

☐ Location marked on air photo *(please attach)*

Water Right # _____ Priority Date _____

Circle one: Application Permit Certificate Claim Exempt

WELL CHARACTERISTICS

Physical Description of Well (size of casing, type of well, housing, etc.): 8" casing

58' deep hydrotary dug Located in concrete pit w/manhole cover

Location of Well Identification Tag: near top of casing

Was Supplemental Tag needed for ease of identifying well?

☒ NO ☐ YES

If yes, where was tag placed? _____

Scale 1:24,000 (1"=2,000')

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Indicate the location of the well within the Section by drawing a dot at that point.

SECTION 10

COMMENTS:

Please attach this form to the Well Report and submit it to the Department of Ecology Water Resources Program Headquarters, Well Identification Program, P.O. Box 47600, Olympia, WA 98504-7600

508

Original and First Copy with Department of Ecology
2nd Copy — Owner's Copy
3rd Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No

(1) OWNER: Name Hi Valley Country Club, Address Packwood, Wa.

(2) LOCATION OF WELL: County Lewis — NE ¼ NE ¼ Sec 10 T 13 N. R 9E WM

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches
Drilled 58 ft Depth of completed well 58 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam from 0 ft to 53 ft
Threaded ☐ Diam from ft to ft
Welded ☐ " Diam from ft to ft

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft
perforations from ft to ft
perforations from ft to ft

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Steel Model No
Diam 8 Slot size 50 from 53 ft to 58 ft
Diam Slot size from ft to ft

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft to ft

Surface seal: Yes ☒ No ☐ To what depth? 18 ft
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P

(8) WATER LEVELS: Land-surface elevation above mean sea level
ft level 7.1 ft below top of well Date 5-9-83
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes by whom? Tacoma Pump.
350 gal/min with 14.6 ft drawdown after 4 hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal/min with ft drawdown after hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy Topsoil	0	1
Sand, Small Gravel & Clay	1	20
Sand, large Gravel, Water	20	28
Sand, Gravel & Clay (Red)	28	30
Sand, large Gravel & Water	30	58

3 well

Work started 5-2 1983 Completed 5-2 1983

(11) WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Tacoma Pump & Drilling Co, Inc.
(Person, firm or corporation) (Type or print)

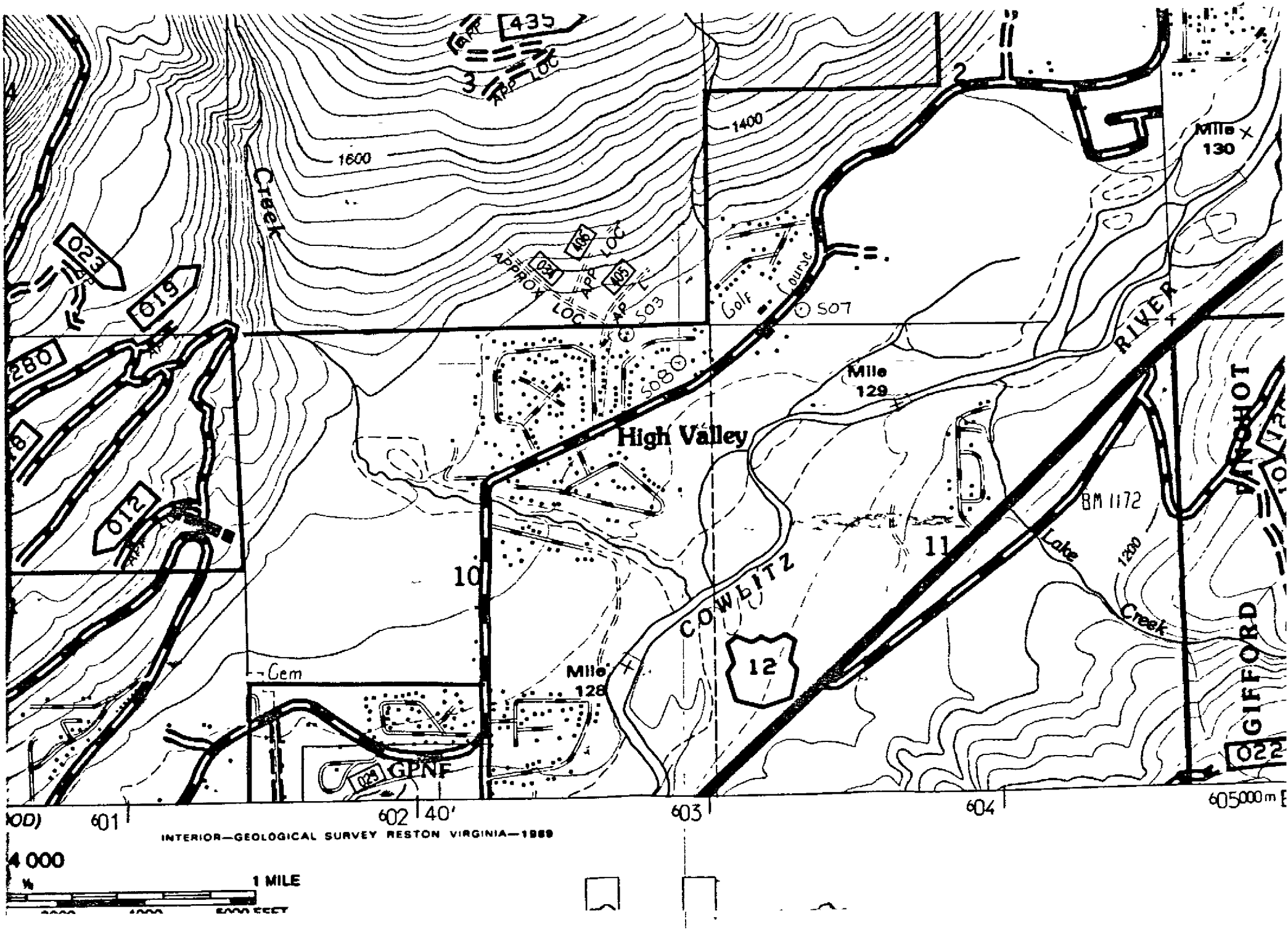
Address 30316 mt. Hwy. Graham, Wa.

[Signed] [illegible] (Well Driller)

License No 0710 Date 5-10 1983

(USE ADDITIONAL SHEETS IF NECESSARY)

50-1 20



STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

Appli. #6659
No. Permit #6293

WELL LOG

Date May 23, 1963, 19
Record by Driller
Source Driller's Record

Location: State of WASHINGTON
County Lewis
Area 800' W & 100' S from NE
Map corner Sec.10
NE ¼ NE ¼ sec. 10 T. 13 N., R. 9 E., E. W.

Diagram of Section

13/2E-10K1
File number

Drilling Co. Riebe Well Drilling
Address Yakima, Washington
Method of Drilling Cable Date May, 19 63
Owner High Valley Park, Inc.
Address c/o Mrs.R.W.Anderson,122-17th St.E.Seattle
Land surface, datum ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Domestic well	0	38
	Sand,gravel & bldrs.(water)	38	52
	Hardpan & lg.basalt bldrs.	52	63
	Brown clay & lg.basalt bldrs.	63	70
	Black silt & lg.basalt bldrs.	70	76
	Sand,gravel,bldrs, s/silt	76	88
	Sand,gravel,bldrs.(all.)(water)	88	98
	Alluvial sand & gravel,bldrs.	98	101
	Red burned rock	101	103
	Bl.basalt,rock & crevice	103	107
	Grey basalt,very hard	107	114
	Black basalt & crevices		
	Casing: 8 5/8" from +14 to 104'		
	Perforated from 70 to 105'		
	SWL: 21' on May 23, 1963		
	Yields 300 gpm with 43' DD after 8½ hours		

Sheet ... of ... sheets

Turn up

WELL LOG.—Continued No...../.....-.....

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Depth forward	———	
	Yields 150 gpm with 21' DD after 2 hours		
	275 gpm with 27' DD after 3½ hours		
	immediate recovery		
	may 16, 1963		
	Bailed 40 gpm with 14' DD after 1 hour		
	Temp: 43°		
	Pump: 7½ HP lineshaft turbine		

S. F. No. 7449—OS—6-61—2M.

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- [x] Construction
- [ ] Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* 139860

CURRENT Notice of Intent No W172676

Unique Ecology Well ID Tag No [redacted] AKP 557

Water Right Permit No

Property Owner Name Diane Carey

Well Street Address 145 Butter Creek Lane

City Packwood County Lewis

Location SE 1/4 1/4 NE 1/4 Sec 10 Twn 13N R 9 (EWM) circle or one WWM

Lat/Long (s t r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No 010125-027-000

PROPOSED USE [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK Owner s number of well (if more than one)
[x] New Well [ ] Reconditioned *Method* [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS Diameter of well 6 inches drilled 58 ft
Depth of completed well 58 ft

CONSTRUCTION DETAILS
Casing Installed [x] Welded 6 Diam from +2 ft to 58 ft
[ ] Liner installed ____ Diam from ____ ft to ____ ft
[ ] Threaded ____ Diam from ____ ft to ____ ft

Perforations [ ] Yes [x] No
Type of perforator used
SIZE of perfs ____ in by ____ in and no of perfs ____ from ____ ft to ____ ft

Screens [ ] Yes [x] No [ ] K Pac Location
Manufacturer s Name
Type Model No
Diam ____ Slot Size ____ from ____ ft to ____ ft
Diam ____ Slot Size ____ from ____ ft to ____ ft

Gravel/Filter packed [ ] Yes [x] No [ ] Size of gravel/sand
Materials placed from ____ ft to ____ ft

Surface Seal [x] Yes [ ] No To what depth? 18 ft
Materials used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [x] No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer s Name
Type H P

WATER LEVELS Land surface elevation above mean sea level ____ ft
Static level 27 ft below top of well Date 9-3-03
Artesian pressure ____ lbs per square inch Date
Artesian water is controlled by
(cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [x] No If yes by whom?
Yield ____ gal /min with ____ ft drawdown after ____ hrs
Yield ____ gal /min with ____ ft drawdown after ____ hrs
Yield ____ gal /min with ____ ft drawdown after ____ hrs
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ____ gal /min with ____ ft drawdown after ____ hrs
Airtest 25+ gal /min with stem set at 58 ft for 2 hrs
Artesian flow ____ g p m Date
Temperature of water ____ Was a chemical analysis made? [ ] Yes [x] No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
Top Soil	0	1
gravel / Boulders	1	8
Hardpan	8	17
Boulders / Hardpan	17	36
gravel / water	36	58

RECEIVED
SEP 19 2003
Washington State Department of Ecology

Start Date 9-3-03 Completed Date 9-3-03

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Chris Town

Driller/Engineer/Trainee Signature Chris Town

Driller or Trainee License No 2558

Drilling Company Chehalis Well Drilling

Address 1905 Harrison Ave.

City State Zip Centralia, WA 98531

Contractor s Registration No CHEHALD123LA Date 9-3-03

If trainee licensed driller s Signature and License no

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

ATTACHMENT B
GROUNDWATER NITRATE VALUES

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 327004 - HIGH VALLEY COUNTRY CLUB

Collect Date	9/29/2022
Lab Number	089
Lab Name	Water Management Laboratory Inc
Sample Number	07749
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	NIT-NITRATE SUITE
Sample Location	well 5 wh tap
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0020	NITRATE-N	LT	0.2000	10.0000	0.5000	mg/L

Records 1 - 1 of 1

Department of Health, Office of Drinking Water

Street Address:
243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

Mail:
PO BOX 47822
Olympia, WA 98504-7822

Comments or questions regarding this Web site? Send email to Environmental Health Application Testing and Support