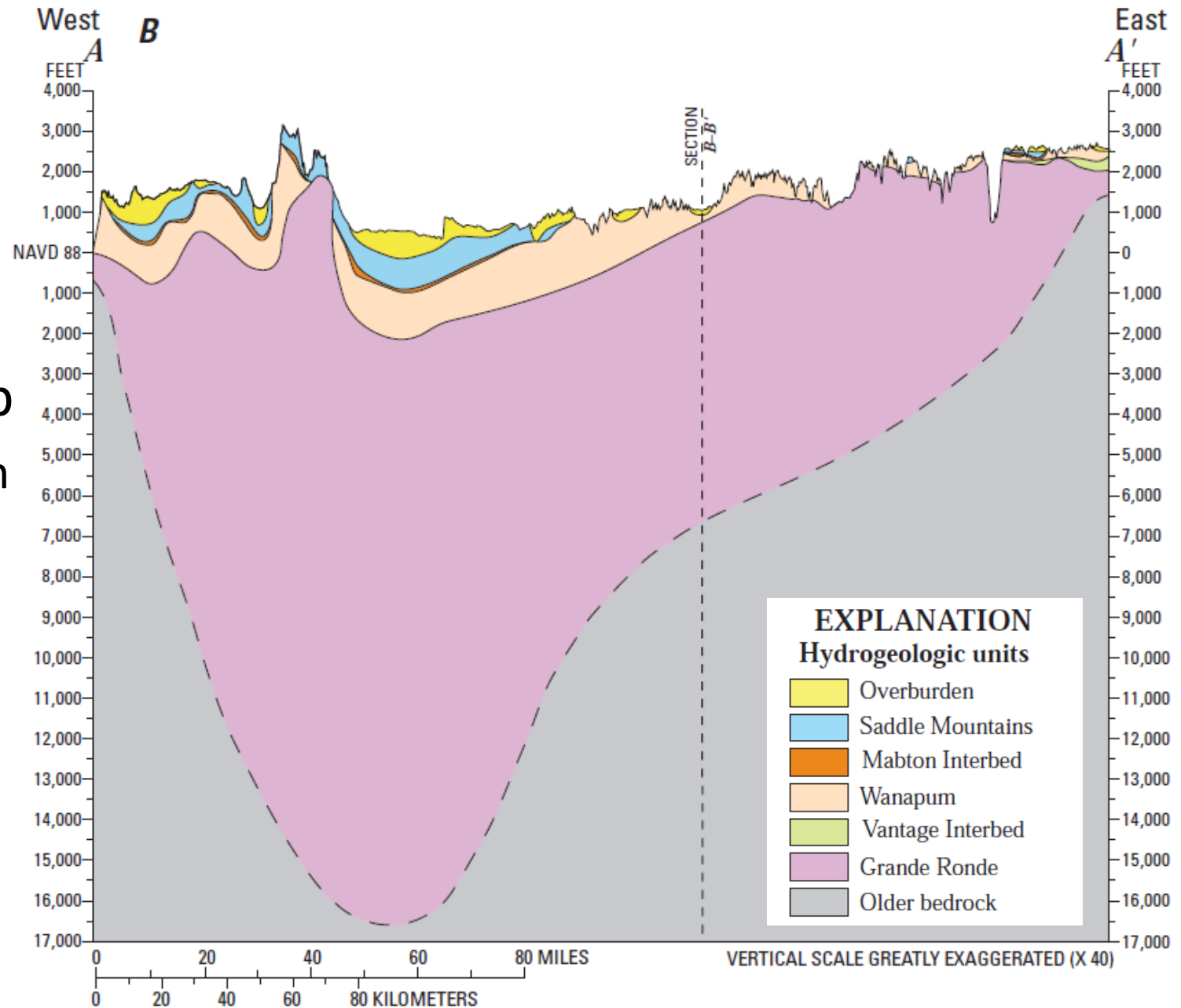


# Hydrogeologic Setting — Select Literature Excerpts

# // Hydrogeologic Setting

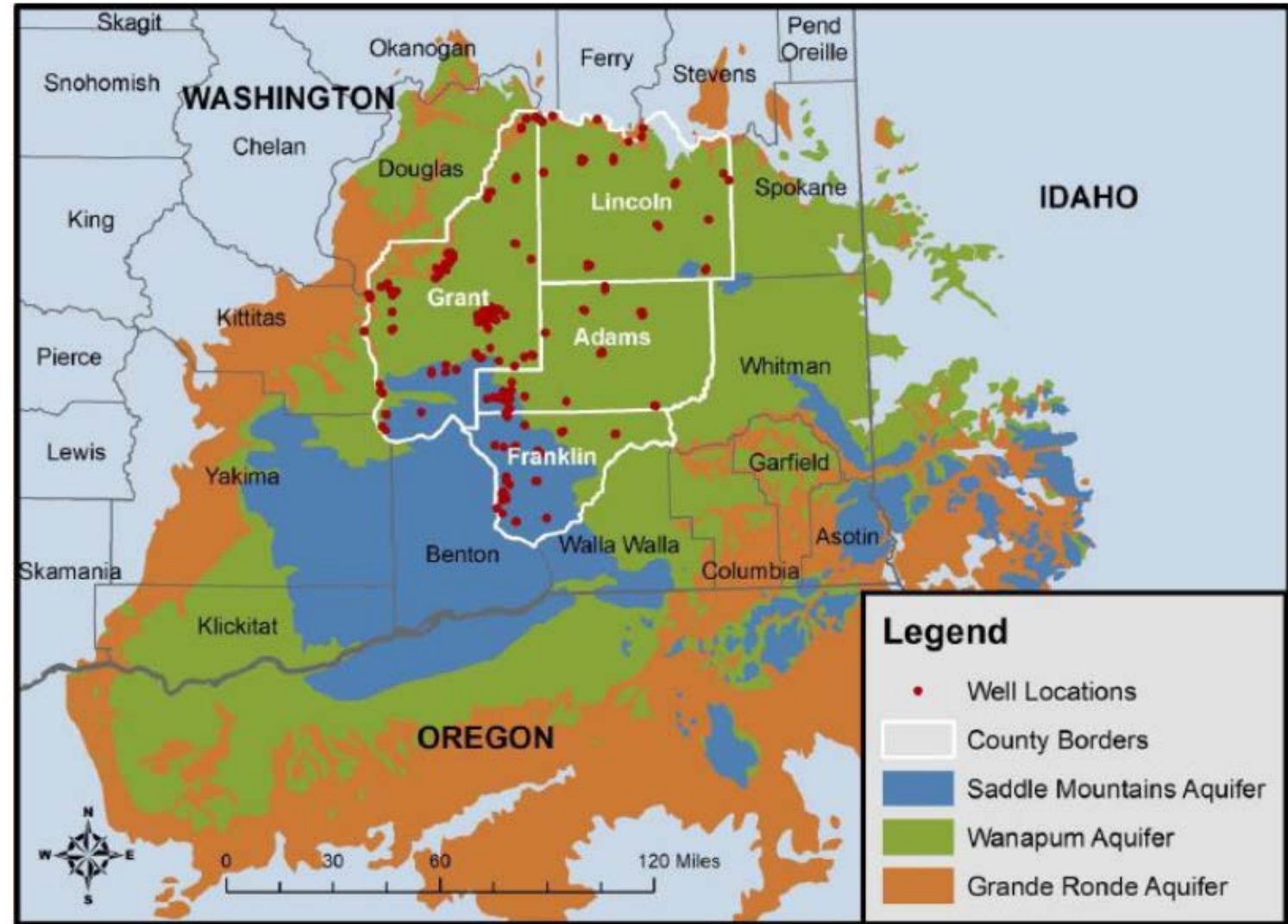
## Primary HG Units:

- ▲ Overburden
- ▲ Columbia River Basalt Group
  - Saddle Mountains Formation
  - Wanapum Formation
  - Grande Ronde Formation



# // Hydrogeologic Setting

## CRBG Extent and Near-Surface CRBG Formations



From: WA Commerce 2019



# // Hydrogeologic Setting

## Conceptual Groundwater Flow within CRBG Formations

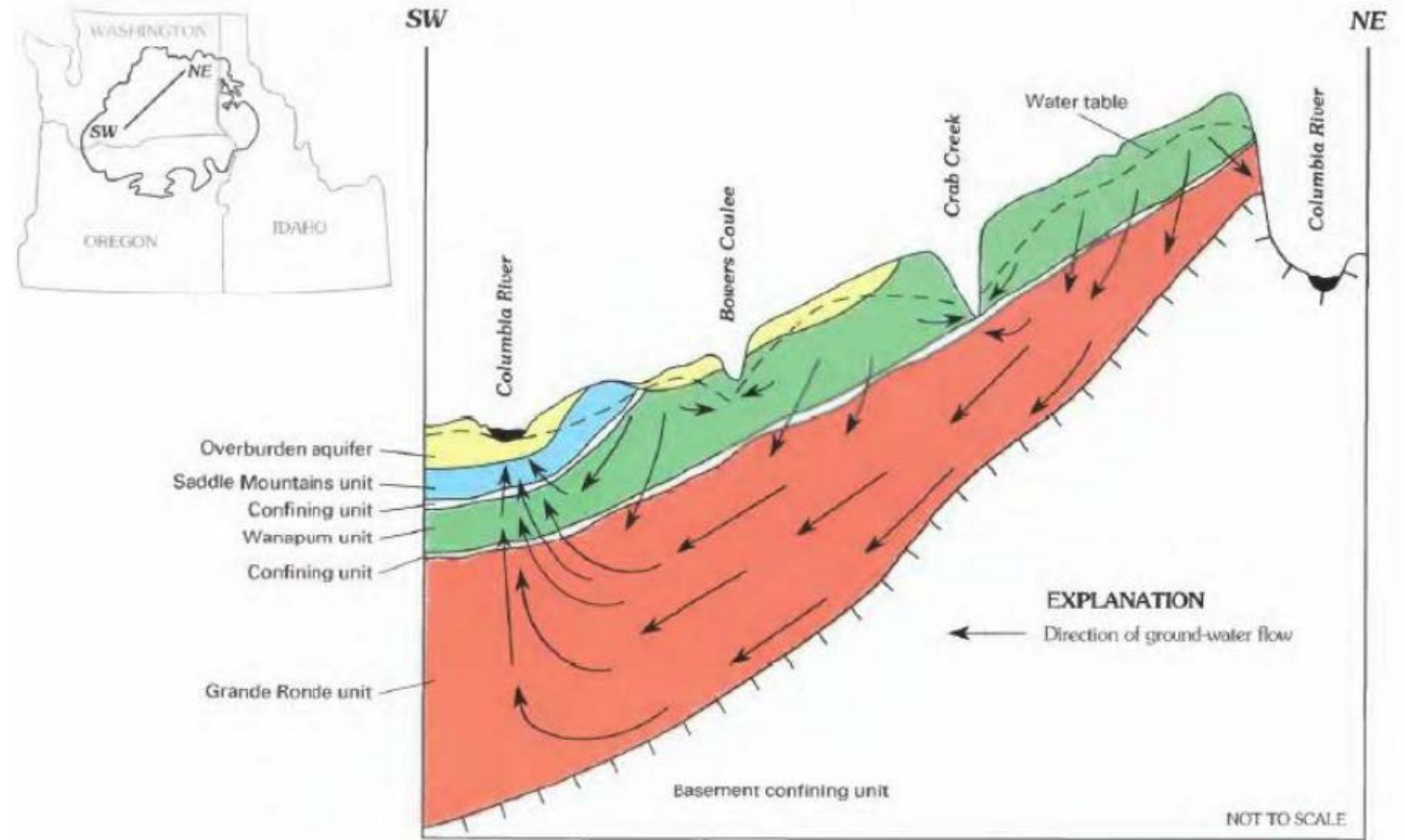


FIGURE 21.—Generalized ground-water-flow pattern in the Columbia Plateau aquifer system.

From: USGS Professional Paper 1413-B

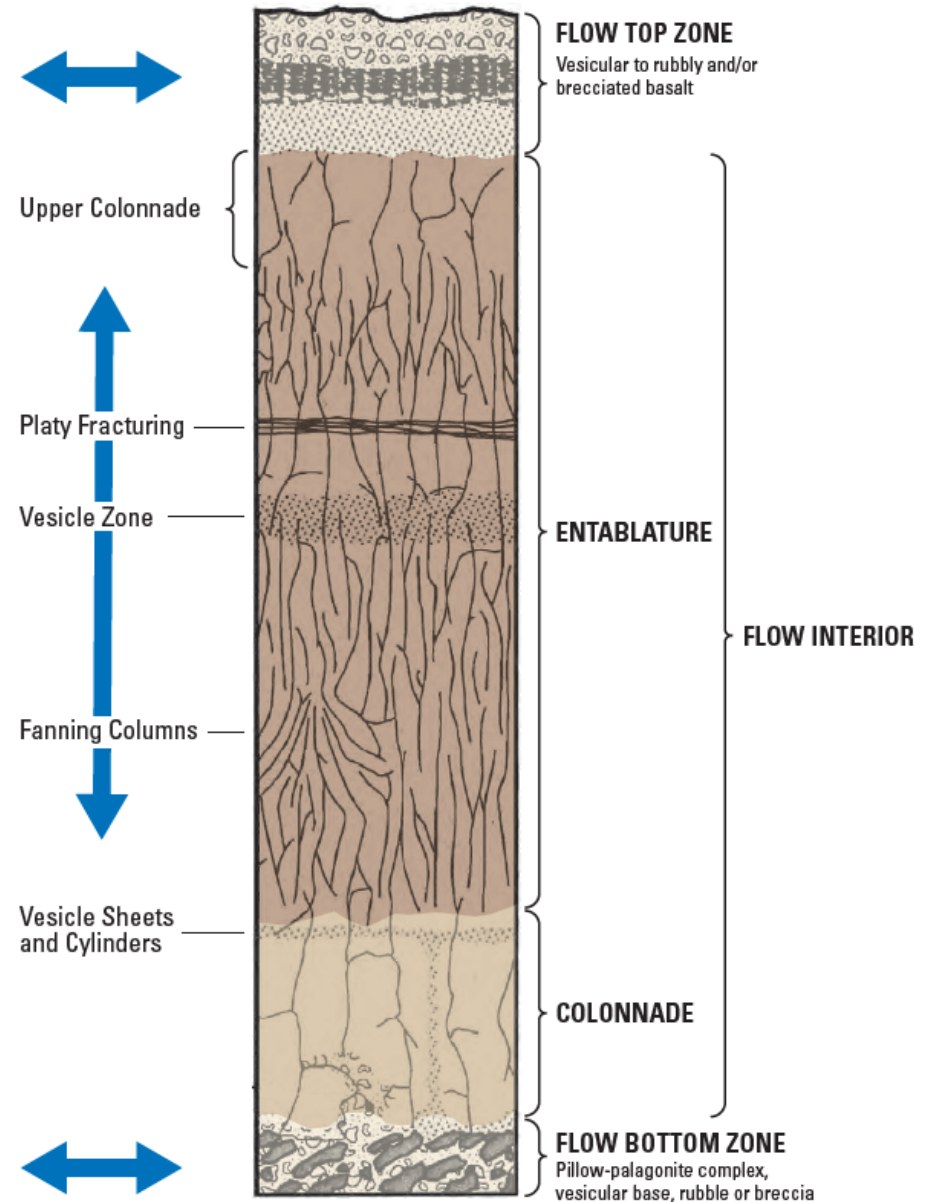




# // Hydrogeologic Setting

Lateral groundwater movement through basalt “Interflow Zones” at top/bottom of individual flow members

Limited groundwater movement through basalt “Flow Interiors”



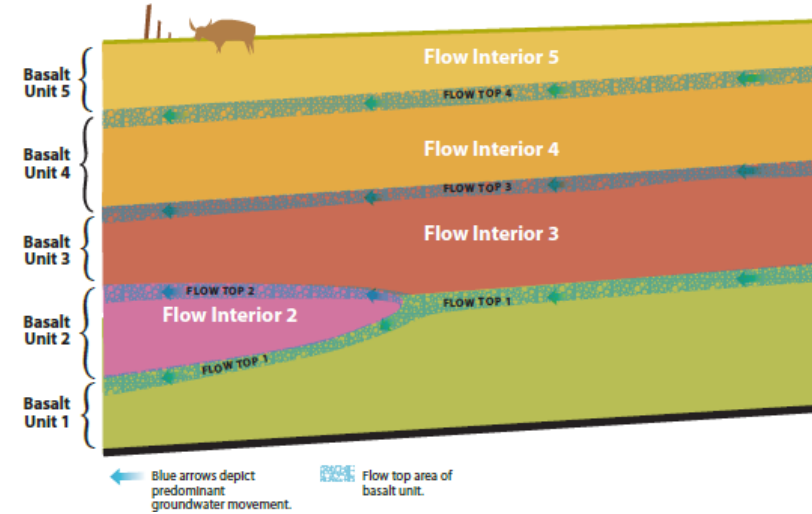
From: USGS SIR 2011-5124



# // Hydrogeologic Setting

## Conceptual groundwater movement through Interflow Zones

### Basalt Flow Pinchouts

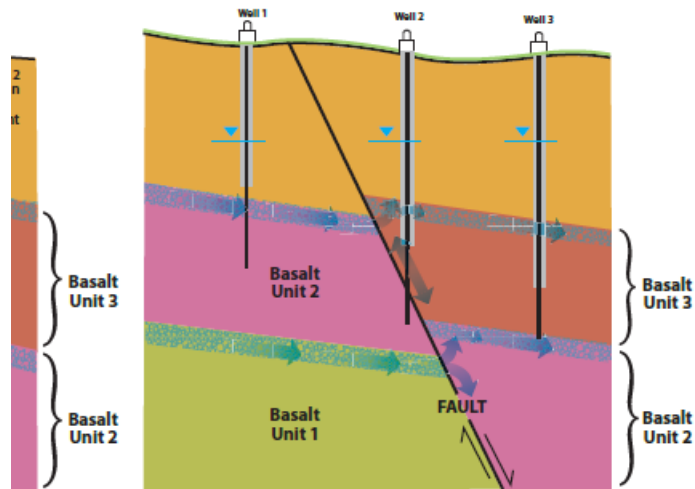


### Faults

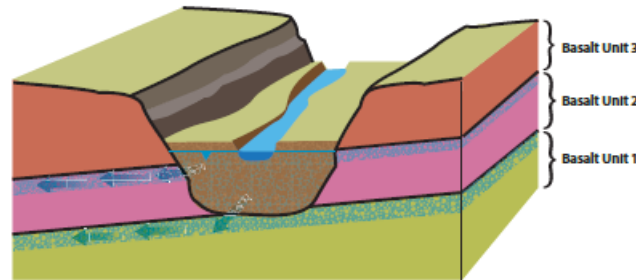
Amount of leakage depends on physical properties of fault.

#### as pathways

All wells act similarly, because they are connected via open fault zone.

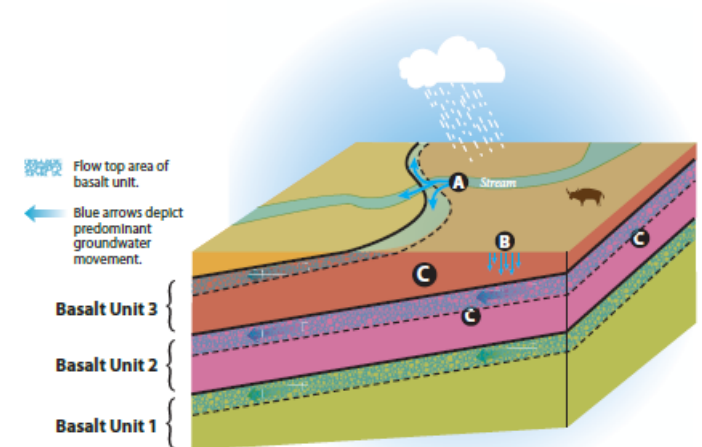


### Potential Recharge Pathways Coulees containing water



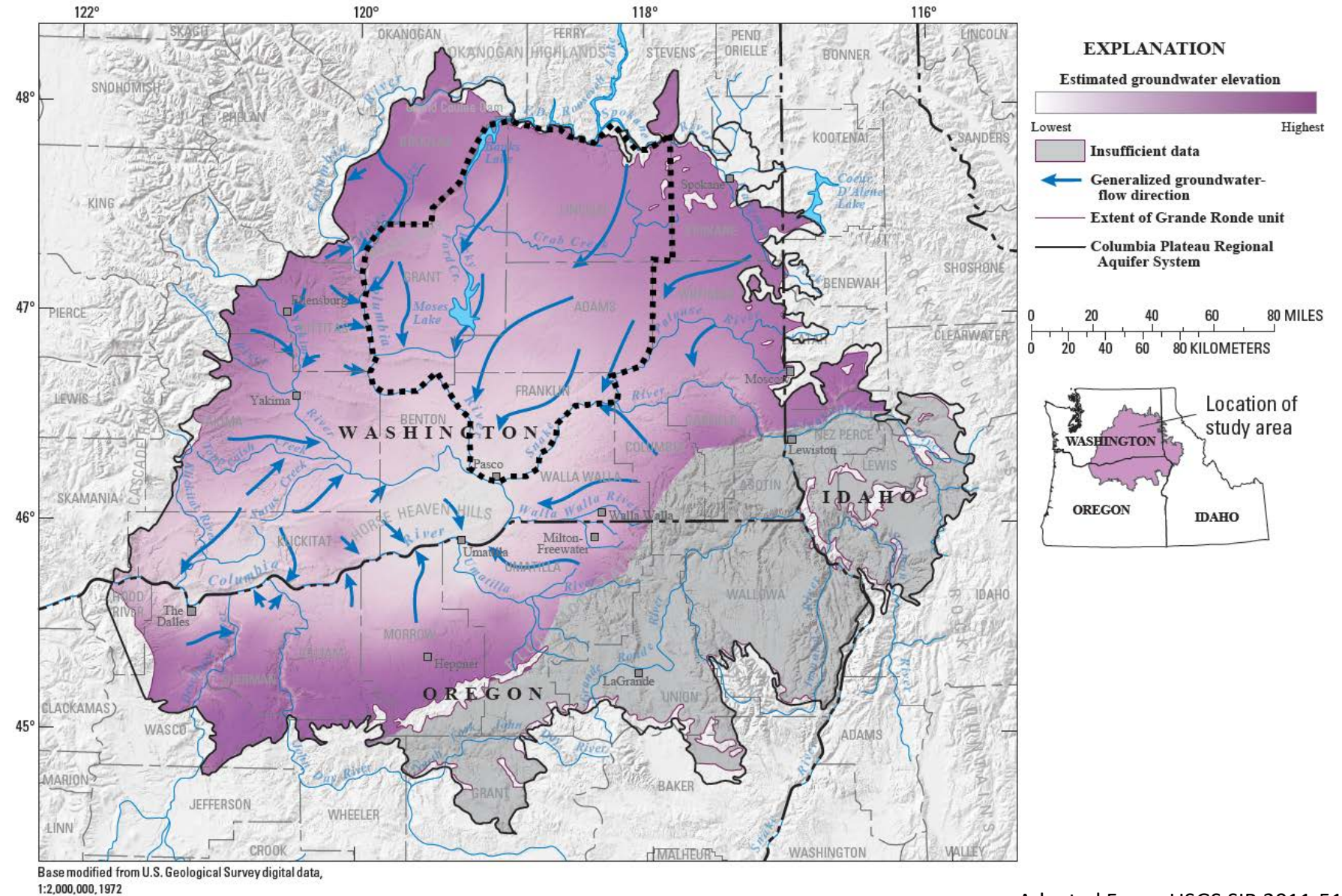
Groundwater in coulee fill gravel recharges interflow zones cross-cut by coulee.

### Potential Recharge Pathways From ground surface where water is present



# // Hydrogeologic Setting

## Regional Groundwater Flow Patterns





# **Columbia Basin Sustainable Water Coalition Monitoring Network Well Logs**

Connell Well #5

STATE OF WASHINGTON.  
DEPARTMENT OF CONSERVATION  
AND DEVELOPMENT

Appli. # 8094  
Permit # 7686  
WELL LOG

No. 14 / 31E 36L

Date August 4, 1967

Record by Driller

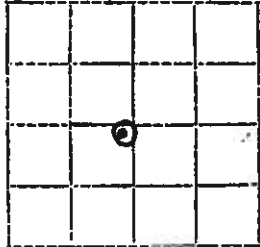
Source Driller's report

Location: State of WASHINGTON  
County Franklin  
Area  
Map  
NE 1/4 SW 1/4 sec. 36 T. 14 N., R. 31 E.

Drilling Co. Charles Jungmann Drilling Co.  
Address 115 Rees Ave. W.W., Wash.  
Method of Drilling Cable Date July 12, 1967

Owner Town of Connell  
Address Connell, Wash.

Land surface datum 340 ft above 10, 12 & 16"  
SWL: 340' 6/28-67 ft below Dims: x 990'



CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Municipal		
	Soil	0	3
	Gravel, brown	3	19
	Gravel, black	19	38
	Boulders	38	50
	Gravel, cemented	50	66
	Gravel, gray	66	95
	Basalt, black, broken	95	105
	Basalt, black	105	133
	Basalt, gray	133	185
	Basalt, black	185	190
	Basalt, brown	190	192
	Basalt, black	192	313
	Basalt, gray	313	325
	Basalt, blacke	325	329
	Basalt, brown	329	368

Turn up Sheet of sheets

The Department of Ecology does NOT Warranty the Data and/or the Information on this We



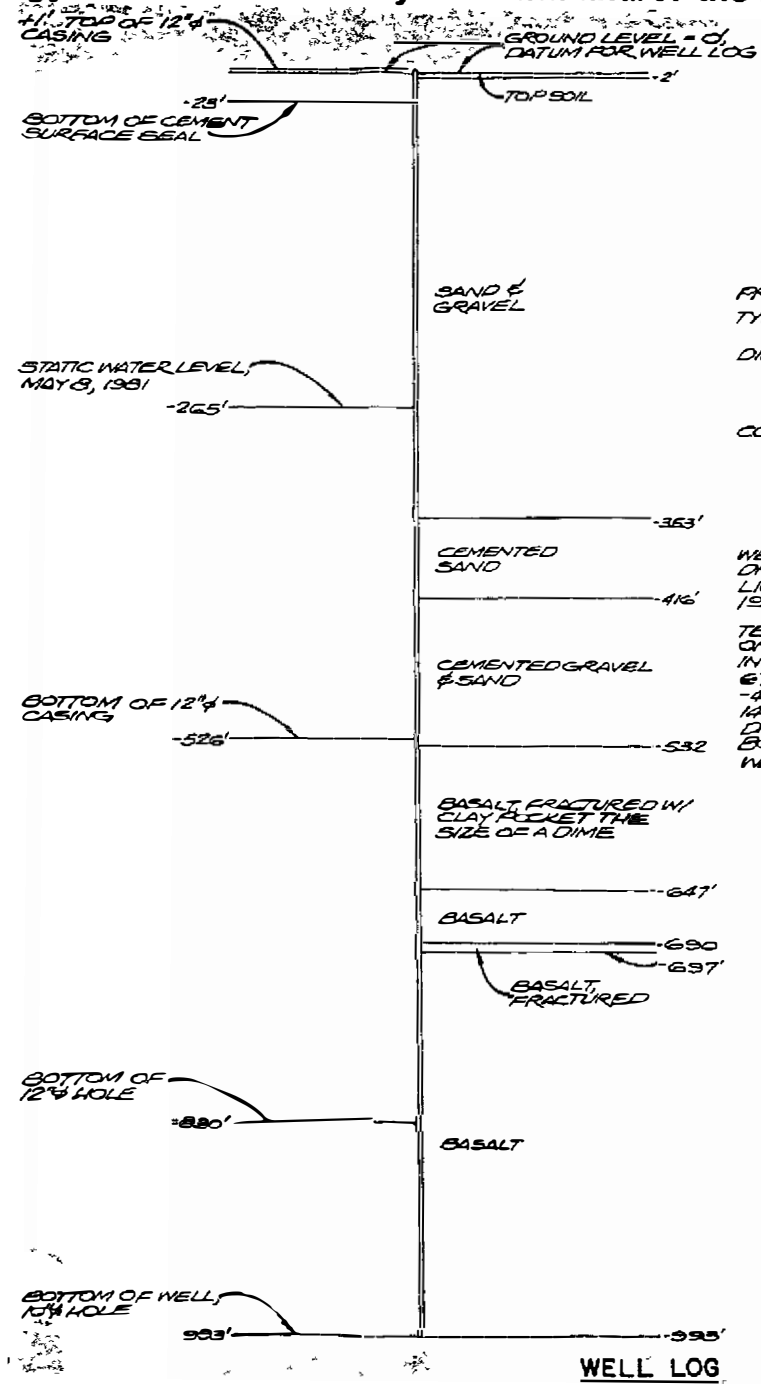






Mattawa Well #2 (cont'd)

502



TOWN OF NEW

**WATER WELL REPORT**

PROPOSED USE MUNICIPAL  
 TYPE OF WORK NEW WELL (NO 2)  
 METHOD ROTARY  
 DIMENSIONS  
 DIAMETER - 12" x 10"  
 DRILLED - 993'  
 DEPTH OF COMPLETED WELL - 993'  
 CONSTRUCTION DETAILS  
 CASING INSTALLED - 12" FROM +1' TO -526'  
 PERFORATIONS - WELDED  
 SCREENS - NONE  
 GRAVEL PACKED - NO  
 SURFACE SEAL - CEMENT TO -23'  
 WELL DRILLED BY BARTHOLOMEW WELL DRILLING, INC, NINE MILE FALLS, WA, 99026 LICENSE NO 0051 WORK STARTED FEB 10, 1981, COMPLETED APR 7, 1981

TEST PUMPED BY LAD IRRIGATION FOR 8 HRS ON MAY 8, 1981 STATIC WATER LEVEL = -265' INITIAL DRAWDOWN AFTER 2 HR @ 570 G PM = 67' (-332' WATER LEVEL) 4 HR @ 1050 G PM = -429' WATER LEVEL (164' DRAWDOWN) 2 HR @ 1403 G PM = -532' WATER LEVEL (267' DRAWDOWN). BOWLS SET @ -745' FOR TEST WATER TEMP = 70°

M  
C  
A  
C  
W

ELLENSBURG

YAKIMAW

TOWN

NEW DRAINAGE SUB  
 NEW PUMP  
 STATION

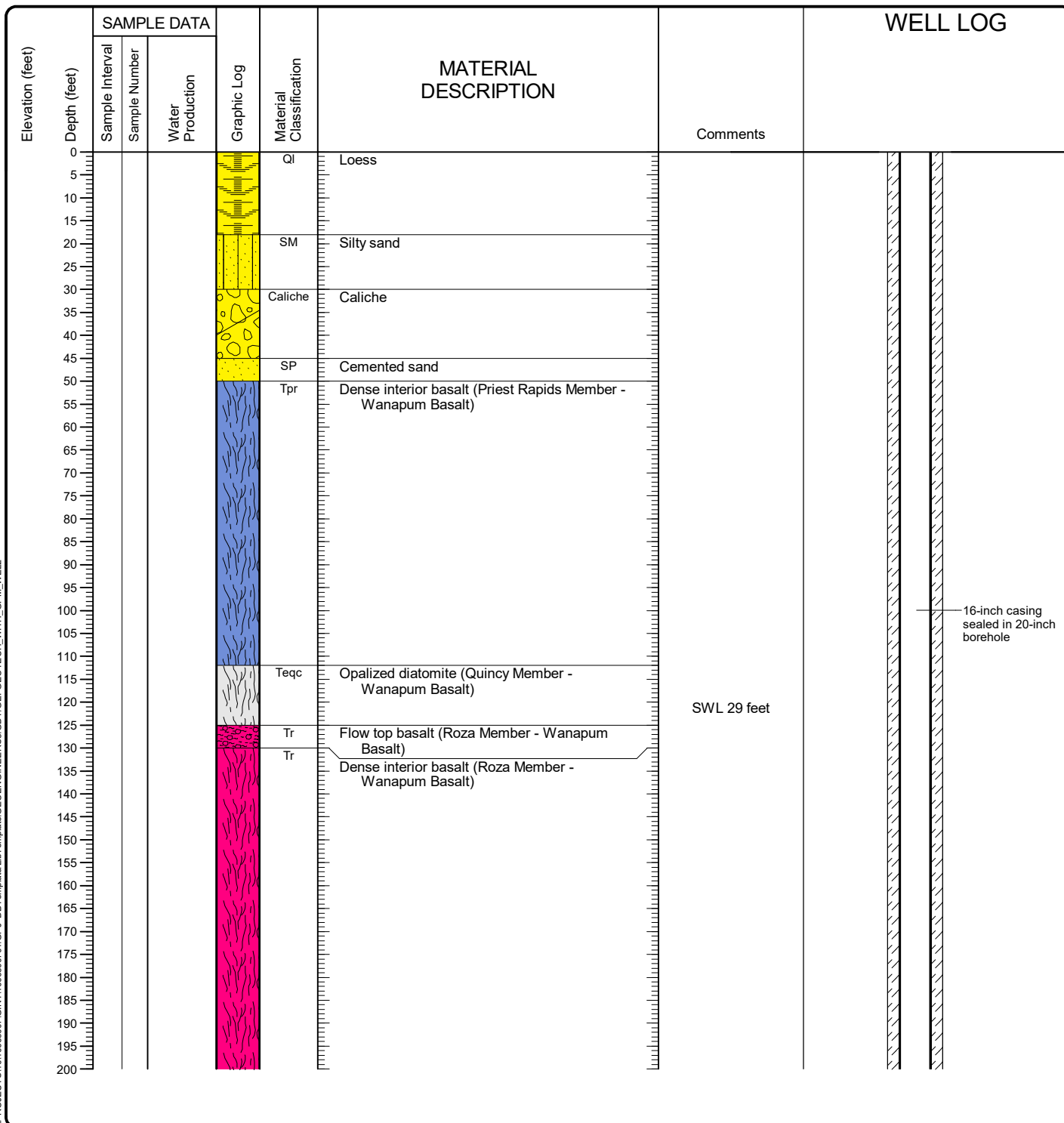
WELL LOG





# Quincy ASR Well

Start Drilled	1/30/2019	End	4/8/2019	Total Depth (ft)	786	Logged By	JST	Checked By	KAL	Driller	Holt Services	Drilling Method	Conventional and RC	
Sampling Method:						Drilling Equipment						Foremost DR-24		
Surface Elevation (ft)						Top of Casing Elevation (ft)						Groundwater		
Vertical Datum						Undetermined						Date Measured		
Easting (X)						Horizontal Datum						4/15/2019		
Northing (Y)												Depth to Water (ft)		
												512.53		
Elevation (ft)												Elevation (ft)		
Notes:														



Kenwick: Date: 8/27/19 Path: \\P:\PROJECTS\101\10665007\GINT\1066500701\GP\_J\DBT\template\Lbt\template\GEOENGINEERS\GDT\GELGEO TECH\_WITH\_GPM\_WELL

<b>Log of Monitoring Well B-1</b>		
	Project: Quincy Aquifer Characterization Well Project Location: Quincy, Washington Project Number: 10665-007-01	Figure 4.1 Sheet 1 of 4

# Quincy ASR Well (cont'd)

Elevation (feet)	Depth (feet)	SAMPLE DATA			Graphic Log	Material Classification	MATERIAL DESCRIPTION	Comments	WELL LOG	
		Sample Interval	Sample Number	Water Production						
200										
205										
210										
215										
220										
225										
230										
235										
240										
245										
250										
255										
260										
265										
270										
275					Tfsh	Flow top, Basalt of Sand Hollow (Frenchman Springs Member - Wanapum Basalt)				
280					Tfsh	Dense interior, Basalt of Sand Hollow (Frenchman Springs Member - Wanapum Basalt)				
285										
290										
295										
300										
305										
310										
315										
320										
325										
330										
335										
340										
345					Tfsh	Pillow lava complex, Basalt of Sand Hollow (Frenchman Springs Member - Wanapum Basalt)				
350					Tfsh	Dense interior, Basalt of Sand Hollow (Frenchman Springs Member - Wanapum Basalt)				
355										
360										
365										
370										
375										
380					Tfg	Flow top, Basalt of Ginkgo (Frenchman Springs Member - Wanapum Basalt)				
385					Tfg	Dense interior, Basalt of Ginkgo (Frenchman Springs Member - Wanapum Basalt)				
390										
395										
400										
405										
410										
415										
420										
425										
430										
435										
440										
445										

SWL 29 feet

## Log of Monitoring Well B-1 (continued)

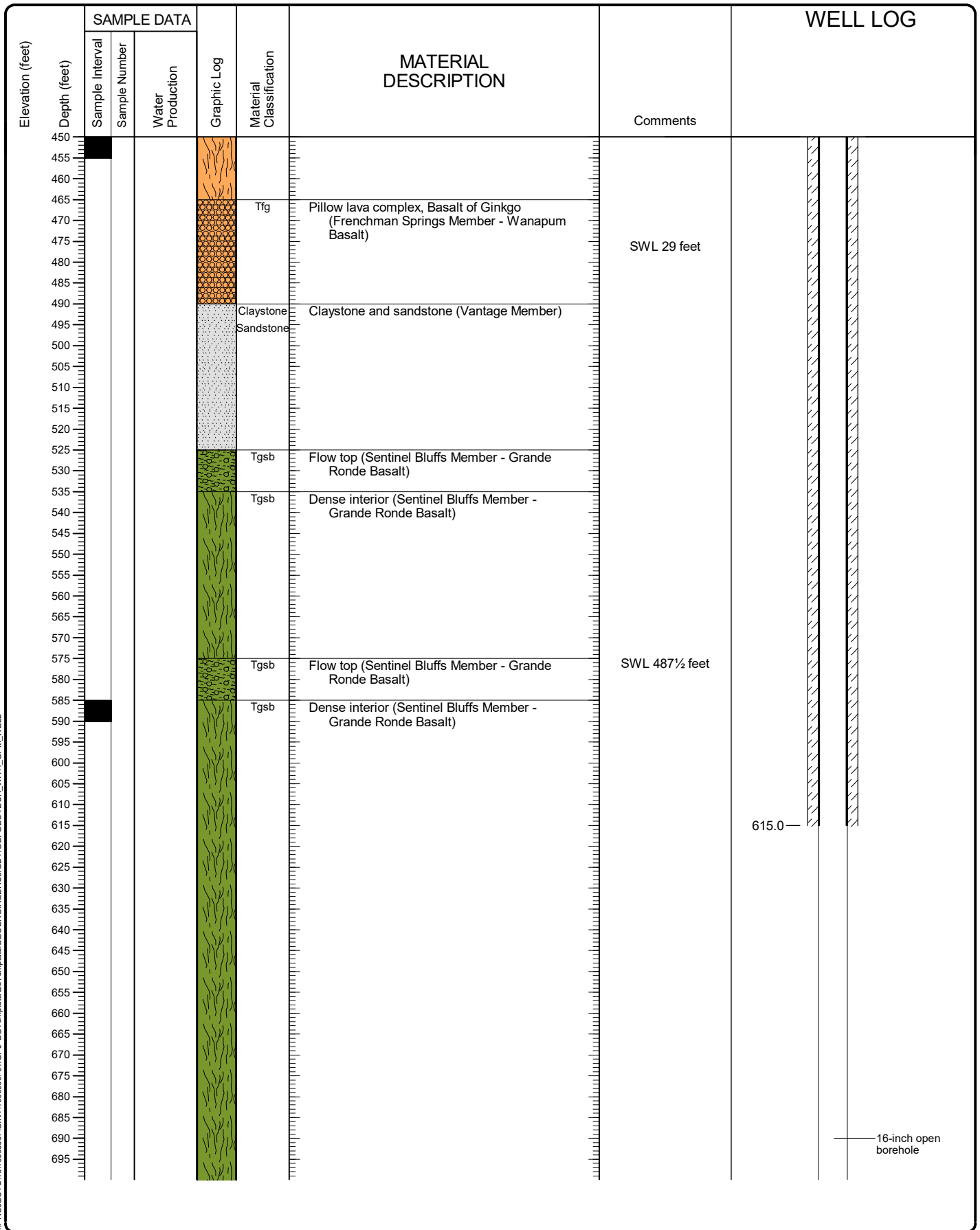


Project: Quincy Aquifer Characterization Well  
 Project Location: Quincy, Washington  
 Project Number: 10665-007-01

Kenwick: Date 8/2/19 Path: \\PROJECTS\1\1011066507\GINT\1066500701\GP\_J\_DBT\template\Lbt\template\GEOENGINEERS\GDT\GELGEO TECH\_WITH\_GPM\_WELL



# Quincy ASR Well (cont'd)



Kenwick: Date 8/2/19 PathV:\PROJECTS\10110665007\GINT\1066500701\GP\_J\_DBT\template\Lbt\template\GEOENGINEERS.GDT\GELGEO TECH\_WITH\_GPM\_WELL

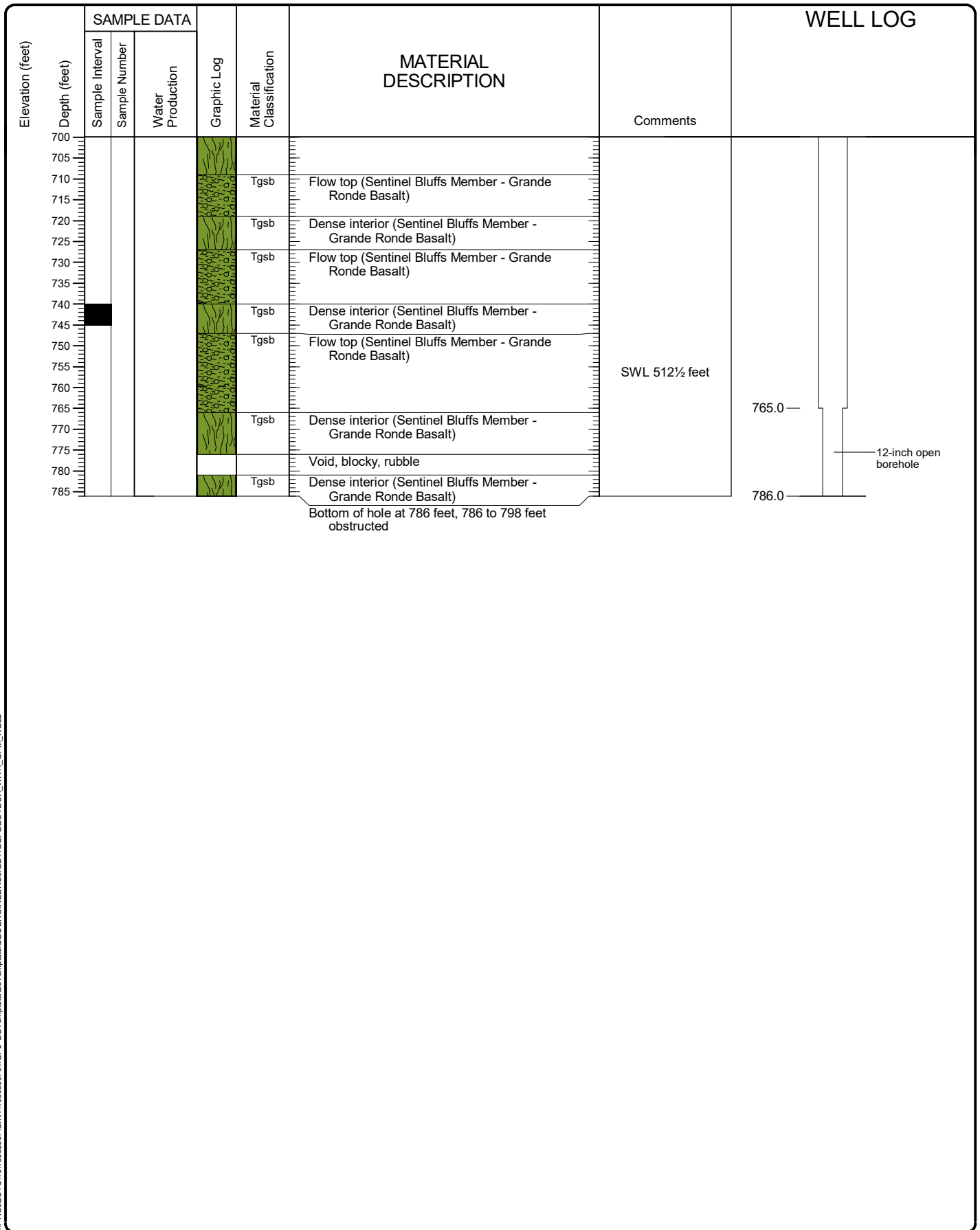
## Log of Monitoring Well B-1 (continued)



Project: Quincy Aquifer Characterization Well  
 Project Location: Quincy, Washington  
 Project Number: 10665-007-01

Figure 4.1  
Sheet 3 of 4

# Quincy ASR Well (cont'd)



Kenwick - Date 8/2/19 Path: \\PROJECT\81\01\10665007\GINT\1066500701\GP\_J\_DBT\template\Lbt\template\GEOENGINEERS\GDT\GELGEO TECH\_WITH\_GPM\_WELL

## Log of Monitoring Well B-1 (continued)



Project: Quincy Aquifer Characterization Well  
 Project Location: Quincy, Washington  
 Project Number: 10665-007-01

Figure 4.1  
Sheet 4 of 4





WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W07498

UNIQUE WELL I.D. # AAS228

Water Right Permit No. Declaration of GW Claim #150

124458

(1) OWNER: Name City of Othello Address 500 East Main, Othello, WA 99344

(2) LOCATION OF WELL: County Adams SW 1/4 SW 1/4 Sec 26 T 16 N.R. 29E WM

(2a) STREET ADDRESS OF WELL: (or nearest address) None Assigned ENE of intersection of Lee w/ Reynolds

TAX PARCEL NO.:

(3) PROPOSED USE: Domestic, Industrial, Municipal, Irrigation, Test Well, Other, DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) 8, New Well, Method: Dug, Bored, Reconditioned, Cable, Driven, Decommission, Rotary, Jetted

(5) DIMENSIONS: Diameter of well 24x20 inches, Drilled 951 feet, Depth of completed well 853 ft.

(6) CONSTRUCTION DETAILS: Casing installed: Welded 20", Diam. from +3 ft. to 398 ft., Liner installed 24", Diam. from 2 ft. to 203.5 ft., Threaded

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

Screens: Yes No K-Pac Location, Manufacturer's Name, Type, Model No., Diam. Slot Size from ft. to ft.

Gravel/Filter packed: Yes No Size of gravel/sand, Material placed from ft. to ft.

Surface seal: Yes No To what depth? 398 ft., Material used in seal cement grout, Did any strata contain unusable water? Yes No, Type of water? high fluoride & odor, Depth of strata 913-932±, Method of sealing strata off cement grout (see item #10)

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ~ 1120 ft., Static level 380.5 ft. below top of well Date 11/18/02, Artesian pressure lbs. per square inch, Date, Artesian water is controlled by (Cap, valve, etc.)

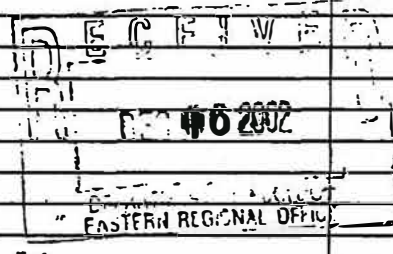
(9) WELL TESTS: Drawdown is amount water level is lowered below static level, Was a pump test made? Yes No If yes, by whom? SEI, Yield: See attached graph ft. drawdown after hrs., Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Table with 6 columns: Time, Water Level, Time, Water Level, Time, Water Level. Row 1: See attached graph

Date of test 11/18-20/02, Bailer test gal./min. with ft. drawdown after hrs., Airtest gal./min. with ft. drawdown after hrs., Artesian flow g.p.m. Date, Temperature of water 75° F Was a chemical analysis made? Yes No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION: 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.

Table with 3 columns: MATERIAL, FROM, TO. Row 1: see attached log. Row 2: slough & large gravel 853 870. Row 3: cement grout 870 890. Row 4: nea gravel w/ sand 890 933. Row 5: cement grout 933 951



Steel plate welded between casings at top of 24" casing. Lower hole abandonment as approved by DOE variance: slough & large gravel 853 870, cement grout 870 890, nea gravel w/ sand 890 933, cement grout 933 951

Work Started 7/17/02 Completed 11/26/02

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.

Type or Print Name Steve Schneider License No. 0643 (Licensed Driller/Engineer) et al

Trainee Name License No. Drilling Company Schneider Equipment, Inc.

(Signed) Stephen J. Schneider License No. 643 (Licensed Driller/Engineer)

Address 21881 River Rd NE, St. Paul, OR 97137

Contractor's Registration No. SCHNEI\*226LG Date 12/6/02

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

## City of Othello Well No 8

124458

by Schneider Drilling Co

Start Card #W07498 Label #AAS228

FM TO DESCRIPTION

0	4	Sandy loam
4	7	Sandy loam & gravel w/ cobbles
7	12	Cobbles, gravel, & claystone, pink (caliche)
12	28	Claystone, pink, soft & gravel, brown w/ cobbles
28	68	Claystone, pink & gravel, cobbles & occasional boulder
68	108	Claystone, grey & pink, soft
108	120	Clay, tan - brown, sticky, medium
120	140	Sandstone, brown, medium, weathered & clay, tan
140	160	Sandstone, brown, medium, weathered
160	165	Sandstone, brown & clay, grey, sticky
165	200	Clay, grey, soft-medium
200	213	Clay, tan - grey, sticky, medium
213	216	Basalt, black, medium, fractured
216	243	Basalt, grey, hard, fractured
243	244	Basalt, brown, medium, fractured
244	248	Basalt, brown, medium, broken
248	252	Basalt, brown, soft, vesicular, broken w/ claystone, yellow
252	258	Basalt, brown & grey, medium, well fractured
258	281	Basalt, brown, soft, vesicular, broken w/ claystone, yellow
281	437	Basalt, grey, hard, some fractures
437	444	Basalt, black, hard, fractured, w/ trace of clay, green
444	517	Basalt, black turning to grey w/ depth, very hard, fractured
517	528	Basalt, black, hard, fractured
528	529	Clay & sandstone, brown & tan & basalt, black, medium-soft
529	569	Basalt, black, soft, broken, vesicular (blue-green in vesicles)
569	592	Basalt, black, hard, some fractures
592	593	Basalt, black, soft, fractured
593	602	Basalt, black, soft, broken, fractured, vesicular
602	612	Basalt, dark grey, medium, fractured

## Othello Well #8 (cont'd)

612 619 Basalt, black, medium-soft, fractured, vesicular w/ some claystone, green  
619 640 Basalt, grey, medium-hard, fractured  
640 670 Basalt, black, medium-soft, broken w/ some claystone, green  
670 674 Basalt, dark grey, hard fractured  
674 683 Basalt, black w/some brown, medium, fractured, vesicular w/some claystone, green  
683 687 Basalt, dark grey w/pink & green tints, soft, cindery, vesicular  
687 695 Basalt, dark grey, medium, some fractures  
695 697 Basalt, dark grey, medium, fractured  
697 700 Basalt, dark grey, medium, fractured, w/ claystone, green  
700 708 Basalt, dark grey, medium, fractured, w/ claystone, blue-green  
708 723 Basalt, dark grey, medium-hard, fractured  
723 739 Basalt, dark grey, medium, fractured w/vesicles  
739 743 Basalt, dark grey, hard-medium, fractured  
743 761 Basalt, dark grey, medium, fractured, w/ vesicles  
761 763 Basalt, dark grey, medium-hard, fractured  
763 780 Basalt, dark grey, hard, some fractures  
780 798 Basalt, black, medium, fractured, vesicular  
798 833 Basalt, dark grey, hard, some fractures  
833 838 Basalt, dark grey, medium, some fractures w/occasional vesicles  
838 839 Basalt, dark grey, hard, fractured w/occasional vesicles  
839 840 Basalt, dark grey, medium, some fractures w/occasional vesicles & claystone, green  
840 844 Basalt, dark grey, medium, some fractures w/occasional vesicles  
844 858 Basalt, dark grey, medium, some fractures  
858 905 Basalt, dark grey, hard, very few fractures  
905 910 Basalt, black, medium, fractured  
910 914 Basalt, black, soft, fractured, vesicular w/claystone, green & grey  
914 915 Clay, green w/some basalt, dark grey  
915 932 Basalt, dark grey, soft, fractured w/claystone, green  
932 937 Basalt, grey, medium, fractured w/claystone, green  
937 948 Basalt, dark grey, medium, fractured w/claystone, green  
948 951 Basalt, grey, hard, some fractures



Lind Well #8

FROM :

FAX NO. :

Jul. 13 2001 03:12PM PZ

Original with  
Department of Ecology  
Second Copy - Owner's Copy  
Third Copy - Driller's Copy

**WATER WELL REPORT**  
STATE OF WASHINGTON

Notice of Interm W001340

UNIQUE WELL I.D. #

Well Right Permit No.

(1) OWNER: Name Town of Lind Address P.O. Box P Lind, Wa 99341

(2) LOCATION OF WELL: County Adams N 1/4 NE 1/4 Sec 14 T 17 N R 33 W

(2a) STREET ADDRESS OF WELL: (or nearest address)

TAX PARCEL NO.:

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

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

(5) DIMENSIONS: Diameter of well \_\_\_\_\_ inches  
Drilled \_\_\_\_\_ feet Depth of completed well 2034'

(6) CONSTRUCTION DETAILS  
Casing installed:  Welded  Liner installed  Threaded  
Diam. from 1' to 27'  
Diam. from \_\_\_\_\_ to \_\_\_\_\_  
Diam. from \_\_\_\_\_ to \_\_\_\_\_

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

Screens:  Yes  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  No  Size of gravel/sand \_\_\_\_\_  
Material placed from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Surface seal:  Yes  No To what depth? 720'  
Material used in seal Cement  
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 \_\_\_\_\_  
Static level 440' ft. below top of well Date 10/31/00  
Artesian pressure \_\_\_\_\_ lbs. per square inch Date \_\_\_\_\_  
Artesian water is controlled by \_\_\_\_\_  
(Cap, valve, etc.)

(9) WELL TESTS: Drawdown to amount water level is lowered below static level  
Was a pump test made?  Yes  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 \_\_\_\_\_  
Boiler test \_\_\_\_\_ gal./min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
Adjust \_\_\_\_\_ 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 or DECOMMISSIONING PROCEDURE DESCRIPTION  
Formulas Describe by color, character, size of material and structure, and the kind and name of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
TOP SOIL & BROWN SILT	0'	1'
BROKEN BRN & GREY BASALT WITH BROWN SILT	1'	10'
HARD GREY BASALT	10'	40'
MED. SOFT BROWN BASALT	40'	71'
HARD GREY BASALT	71'	87'
SOFT BROKEN BRN BASALT	87'	89'
MED HARD GREY & BRN BASALT	89'	96'
HARD GREY BASALT	96'	104'
MED SOFT BROWN BASALT	104'	117'
HARD GREY BASALT	117'	170'
MED SOFT BROKEN BROWN & GREY BASALT-LITTLE WATER	170'	178'
MED HARD GREY & BROWN BASALT FRACTURED	178'	196'
MED SOFT BRN & GREY BRKN	196'	231'
MED HARD GREY & BROWN	231'	246'
SOFT BRN BRN BASALT	246'	258'
HARD GREY-SOME FRACTURES	248'	272'
SOFT VISCULAR DRK GRAY WITH A TRACE OF BLUE CLAYSTONE	272'	279'
HARD DRK GRAY BASALT	279'	315'
MED HARD GRAY BASALT	315'	323'
MED SOFT GRAY-GRN CLAY SAND	323'	332'
MED HARD GREY BASALT	332'	360'
HARD GREY BASALT	360'	416'
MED SOFT RED-BRN & GREY BASALT-SOME		
HARD GREEN CLAY-WATER 200 GPM	416'	431'
MED HARD GREY BASALT	431'	467'

Work Started 11/18/24/00 Completed 10/13/00

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.

Type or Print Name BJ Exploration Co License No. 0337  
(Licensed Driller/Engineer)

Trainee Name \_\_\_\_\_ License No. \_\_\_\_\_  
Drilling Company BJ Exploration Co., Inc.

(Signed) [Signature] License No. 0337  
404 N. GUNNAY KENNEDY BLVD, WA. 99336

Address \_\_\_\_\_

Contractor's BJ EXPL 320K Date 11/18/00  
Registration No. \_\_\_\_\_

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6000. The TDD number is (360) 407-6000.



Lind Well #8 (cont'd)

Jul. 13 2001 03:13PM P3

FRX NO. :

**WATER WELL REPORT**

STATE OF WASHINGTON

Notice of Inventory (WU) 14611

UNIQUE WELL I.D.#

Water Right Permit No.

Ecology  
Owner's Copy  
Driller's Copy

OWNER: Name Town of Lind Address P.O. Box F Lind, Wa. 99341

LOCATION OF WELL: County Adams 1/4          1/4 Sec          T.          N.R.          WM         

(2a) STREET ADDRESS OF WELL: (or nearest address) \_\_\_\_\_

TAX PARCEL NO.: \_\_\_\_\_

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

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

(5) DIMENSIONS: Diameter of well \_\_\_\_\_ inches  
Drilled \_\_\_\_\_ feet. Depth of completed well \_\_\_\_\_ ft.

(6) CONSTRUCTION DETAILS  
Casing installed:  Welded \_\_\_\_\_" Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
 Liner installed \_\_\_\_\_" Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
 Threaded \_\_\_\_\_" Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

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

Screens:  Yes  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 pack:  Yes  No  Str of gravel/sand \_\_\_\_\_  
Material placed from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Surface seal:  Yes  No To what depth? \_\_\_\_\_ ft.  
Material used in seal \_\_\_\_\_  
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 \_\_\_\_\_ ft. below top of well Date \_\_\_\_\_  
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? \_\_\_\_\_  
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  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Date of test  
Bafer test \_\_\_\_\_ gal/min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
Air-lift \_\_\_\_\_ gal/min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
region flow \_\_\_\_\_ g.p.m. Date \_\_\_\_\_  
Temperature of water \_\_\_\_\_ Was a chemical analysis made?  Yes  No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION  
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.

MATERIAL	FROM	TO
hard light grey basalt	457'	500'
red soft dk grey porous with		
some green claystone	580'	606'
hard grey basalt	608'	623'
red hard grey basalt w/ some		
clay seams	628'	670'
soft brkn visicular grey a		
rown basalt - 190 psi	676'	691'
very hard grey-fractured	691'	748'
red hard dk grey porous basalt		
dk blue stain in gas holes	748'	765'
hard lt grey basalt	765'	814'
red soft dk grey porous	814'	830'
hard lt grey basalt	830'	891'
red hard grey basalt-some		
clay seams	891'	894'
red soft grey basalt-clay	894'	899'
hard grey basalt	899'	903'
red-brn blk basalt-some yellow		
claystone - 205 psi	903'	912'
red hard grey basalt	912'	954'
red soft brkn red-brn & grey		
basalt - 220 psi	954'	959'
red hard grey basalt-some		
fractures	959'	985'
brkn brn-redbrn & grey visicular		
basalt-tan clay stone-	985'	994'
hard grey basalt	994'	1082'

Work Started \_\_\_\_\_ Completed \_\_\_\_\_

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.  
**Larry McLanahan** 0337

Type or Print Name \_\_\_\_\_ License No. \_\_\_\_\_  
(Licensed Driller/Engineer)

Trainee Name \_\_\_\_\_ License No. \_\_\_\_\_

Drilling Company WJ Exploration

(Signed) Larry McLanahan License No. 0337  
(Licensed Driller/Engineer)

Address 404 N. Conway Kennelick, Wa. 99336

Contractor's Registration No. SJBXPCI132QK Date 11/8/00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-8600. The TOD number is (360) 407-8006.



Lind Well #8 (cont'd)

FRX NO. :

Jul. 13 2001 03:13PM P4

Page 3

**WATER WELL REPORT**  
STATE OF WASHINGTON

Notice of Intent W091440

UNIQUE WELL I.D. # \_\_\_\_\_

Water Right Permit No. \_\_\_\_\_

with  
ent of Ecology  
Copy - Owner's Copy  
Copy - Driller's Copy

(1) OWNER: Name Iron of Lind Address P.O. Box F Lind, Wa. 99141

(2) LOCATION OF WELL: County Adams 1/4 Sec. \_\_\_\_\_ 1/4 Sec. \_\_\_\_\_ T. \_\_\_\_\_ N.R. \_\_\_\_\_ WM \_\_\_\_\_

(2a) STREET ADDRESS OF WELL: (or nearest address) \_\_\_\_\_

TAX PARCEL NO.: \_\_\_\_\_

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

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

(5) DIMENSIONS: Diameter of well \_\_\_\_\_ inches  
Dripped \_\_\_\_\_ feet. Depth of completed well \_\_\_\_\_ ft.

(6) CONSTRUCTION DETAILS  
Casing material:  Welded  Liner installed  Threaded  
Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Perforations  Yes  No  
Type of perforator used \_\_\_\_\_  
SIZE of perforations \_\_\_\_\_ in. by \_\_\_\_\_ in.  
perforations from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Screens:  Yes  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 pack:  Yes  No  Size of gravel/sand \_\_\_\_\_  
Material placed from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Surface seal:  Yes  No To what depth? \_\_\_\_\_ ft.  
Material used in seal \_\_\_\_\_  
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 \_\_\_\_\_ ft. below top of well Date \_\_\_\_\_  
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? \_\_\_\_\_  
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 \_\_\_\_\_  
Baker test \_\_\_\_\_ gal./min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
Artest \_\_\_\_\_ 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 or DECOMMISSIONING PROCEDURE DESCRIPTION  
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.

MATERIAL	FROM	TO
Med hard drk grey basalt w/ trace of white crystals-grn clay	1082'	1115'
Med hard grey & brn basalt	1115'	1142'
Hard lt grey basalt	1142'	1247'
Med soft grey & red basalt	1247'	1256'
Med hard grey lt red basalt	1256'	1260'
Hard grey basalt	1260'	1340'
Med hard drk grey basalt	1340'	1415'
Hard grey basalt	1415'	1439'
Med soft grey & red basalt		
285 psi - 360 psi	1439'	1454'
Hard grey basalt-fractures	1454'	1568'
Med soft grey basalt w/ trace of green clay	1568'	1574'
Med hard grey basalt	1574'	1635'
Hard lt grey basalt	1635'	1856'
Med soft drk grey basalt-trace of white & grn crystals	1856'	1867'
Hard drk grey basalt	1867'	1875'
Fract. drk grey-440 psi	1875'	1880'
Hard drk grey-grn clay seams	1880'	1910'
Med soft grey & brn basalt	1910'	1933'
Med hard grey-ent/grn crystals	1933'	1943'
Hard grey basalt	1943'	1979'
Soft brn radbrn & grey	1979'	2008'
Soft grey porous & some white & green crystals	2008'	2018'
Hard grey basalt	2018'	2033'

Work Started \_\_\_\_\_ Completed \_\_\_\_\_

WELL CONSTRUCTION CERTIFICATION:

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

Type or Print Name Larry McLanahan License No. 0337  
(Licensed Driller/Engineer)

Trainee Name \_\_\_\_\_ License No. \_\_\_\_\_

Drilling Company BJ Exploration

(Signed) [Signature] License No. 0337

Address 104 N. Conway Edinburg, Wa. 99125

Contractor's Registration No. BJEXPCI1324K Date 11/8/00

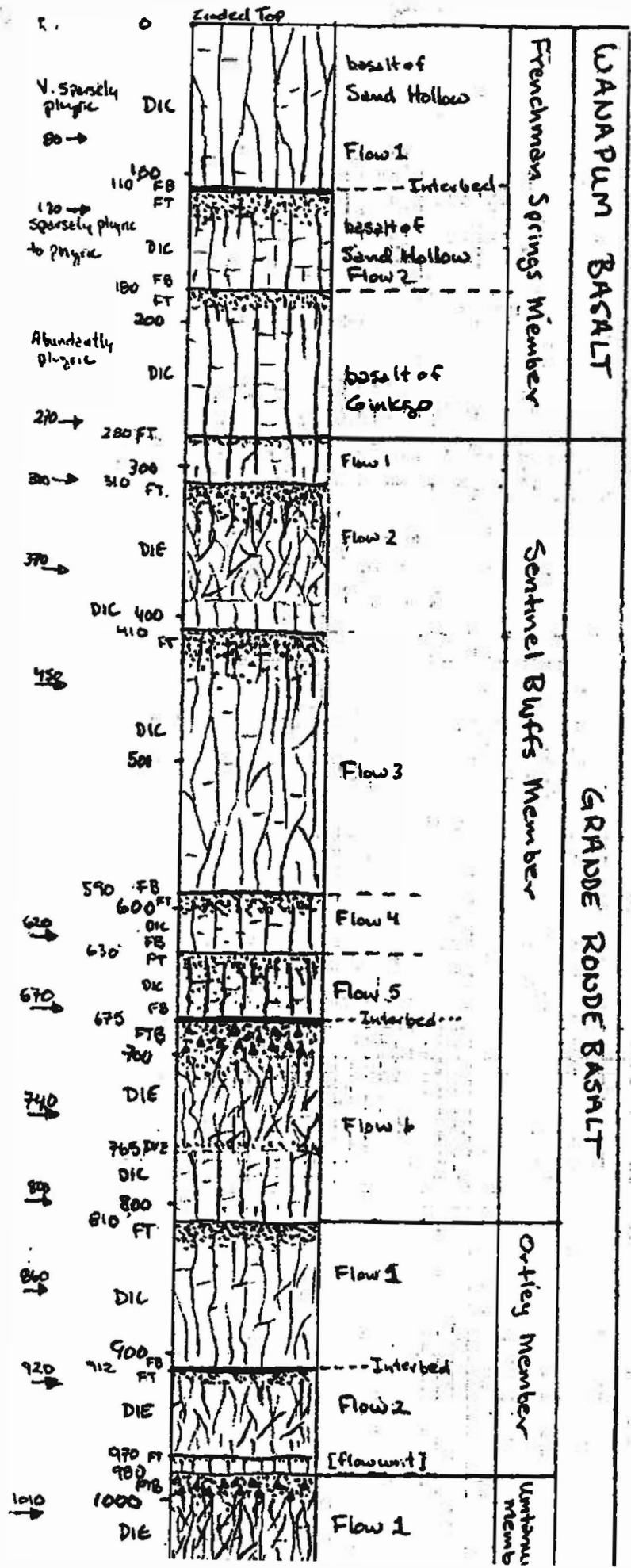
(USE ADDITIONAL SHEETS IF NECESSARY)

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Lind Well #8 (cont'd)



Preliminary Geologic Log

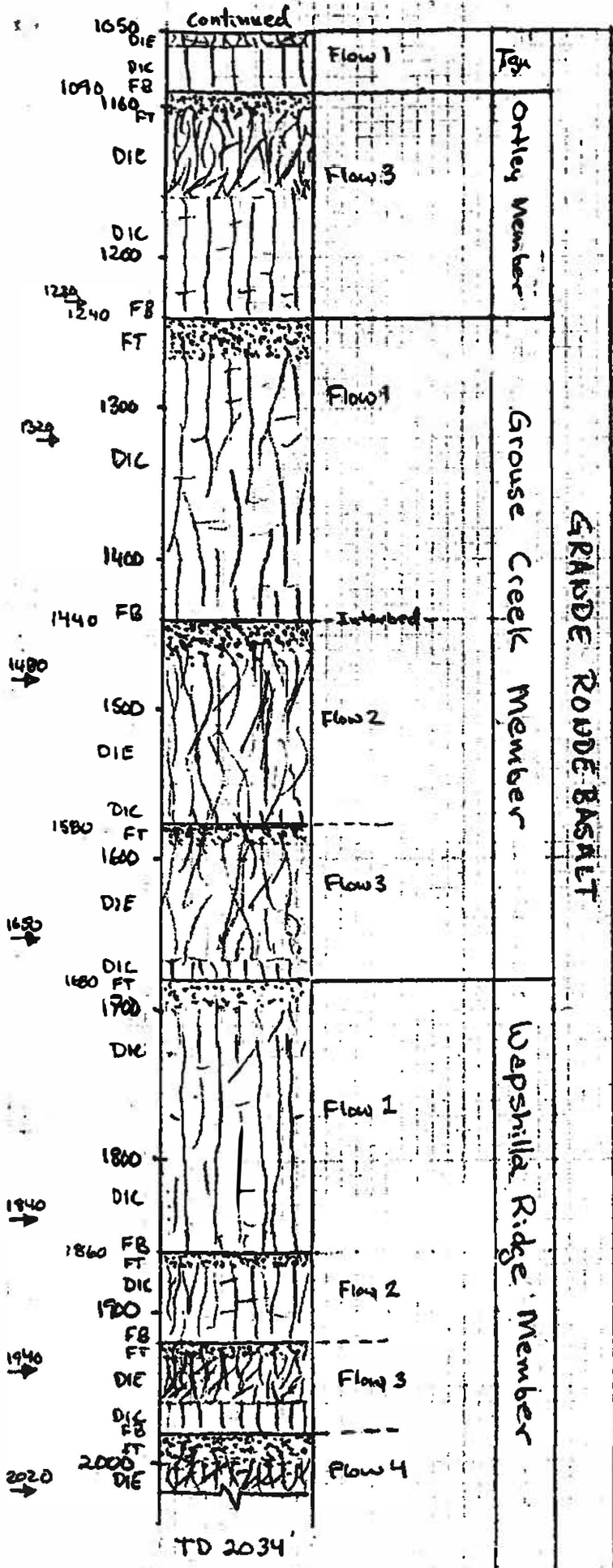
City of Lind Well  
 (W091440)  
 Logged by Terry L. Tolson 10/2001  
 Kennedy/Jenks Geotechnics

→ indicates samples selected for geochemistry

- FT Flowing
- FTB Flowing breccia
- DIC Dense interior - Columnar
- DIE Dense interior - Columnar
- FB Normal Flow Bottom
- PL Pillow Complex

Unit	Depth	Thickness
Frenchman Springs	0 - 280	280'
Sentinel Bluffs	280 - 810	530'
Ordley	810 - 912	102'
Uniform	912 - 1000	88'

Lind Well #8 (cont'd)



Preliminary Geologic Log  
City of Lind Well  
(continued)

Page 2 of 2

Logged by Terry L. Tolan 10/2004  
Kennedy/Tolans Consultants



Soap Lake Well #2

STATE OF WASHINGTON  
DEPARTMENT OF CONSERVATION  
AND DEVELOPMENT

WELL LOG

No. Appl. #2225

Date March 28, 1952

Cert. #1324-A

Record by Frank L. Zimmerman

Source Drillar's Record

Location: State of WASHINGTON

County Grant

Area

Map

SW 1/4 NW 1/4 Sec 24 T. 22 N. R. 26 E.

DIAGRAM OF SECTION

Drilling Co. Frank L. Zimmerman

Address Box 465, Moses Lake, Wash.

Method of Drilling Drilled Date Mar. 28 1952

Owner City of Soap Lake

Address Soap Lake, Wash.

Land surface datum 1100 ft. above  
below

CORRE- LATION	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.)

	Top soil	3	3
	Large gravel	19	22
	Sand & gravel	59	81
	Sandy clay	13	94
	Hard gray basalt	88	182
	Faulty blue basalt	14	196
	Hard gray basalt	106	302
	Faulty gray basalt	12	314
	Hard gray basalt	31	345
	Clay		
	Fine sand	8	400
	Hard gray basalt	5	405
	Porphy blue basalt, water-bearing	30	435
	(over)		

Turn up

Sheet \_\_\_\_\_ of \_\_\_\_\_ sheets

The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this well report.

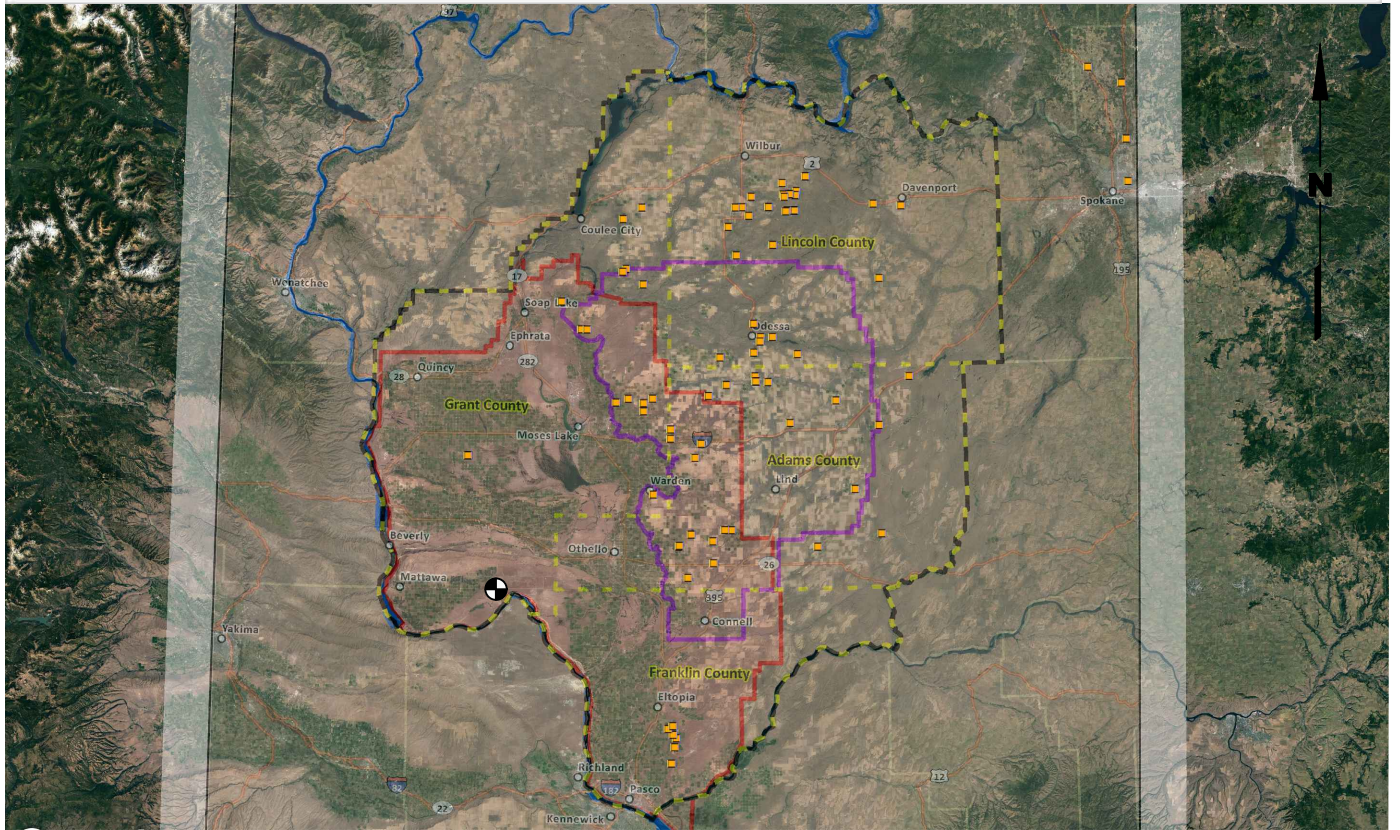
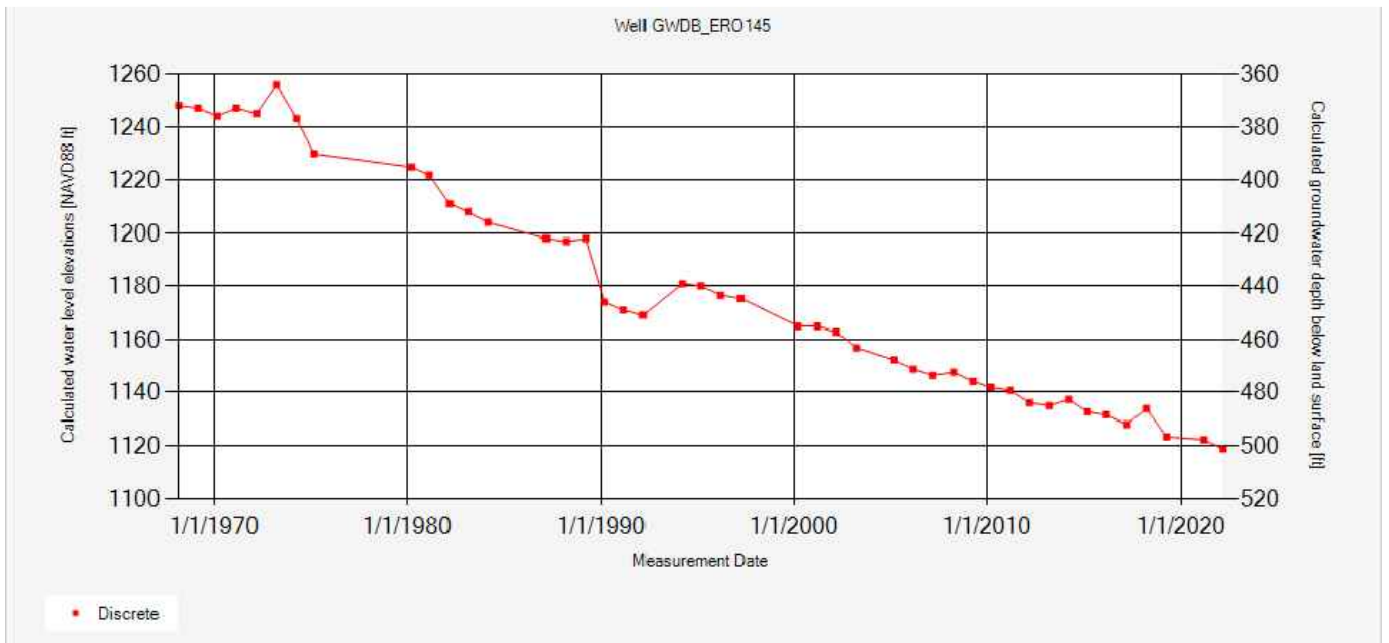


# Other Entity Groundwater Monitoring Data

# Select Ecology — Eastern Regional Office Monitoring Data



Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 12:59 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



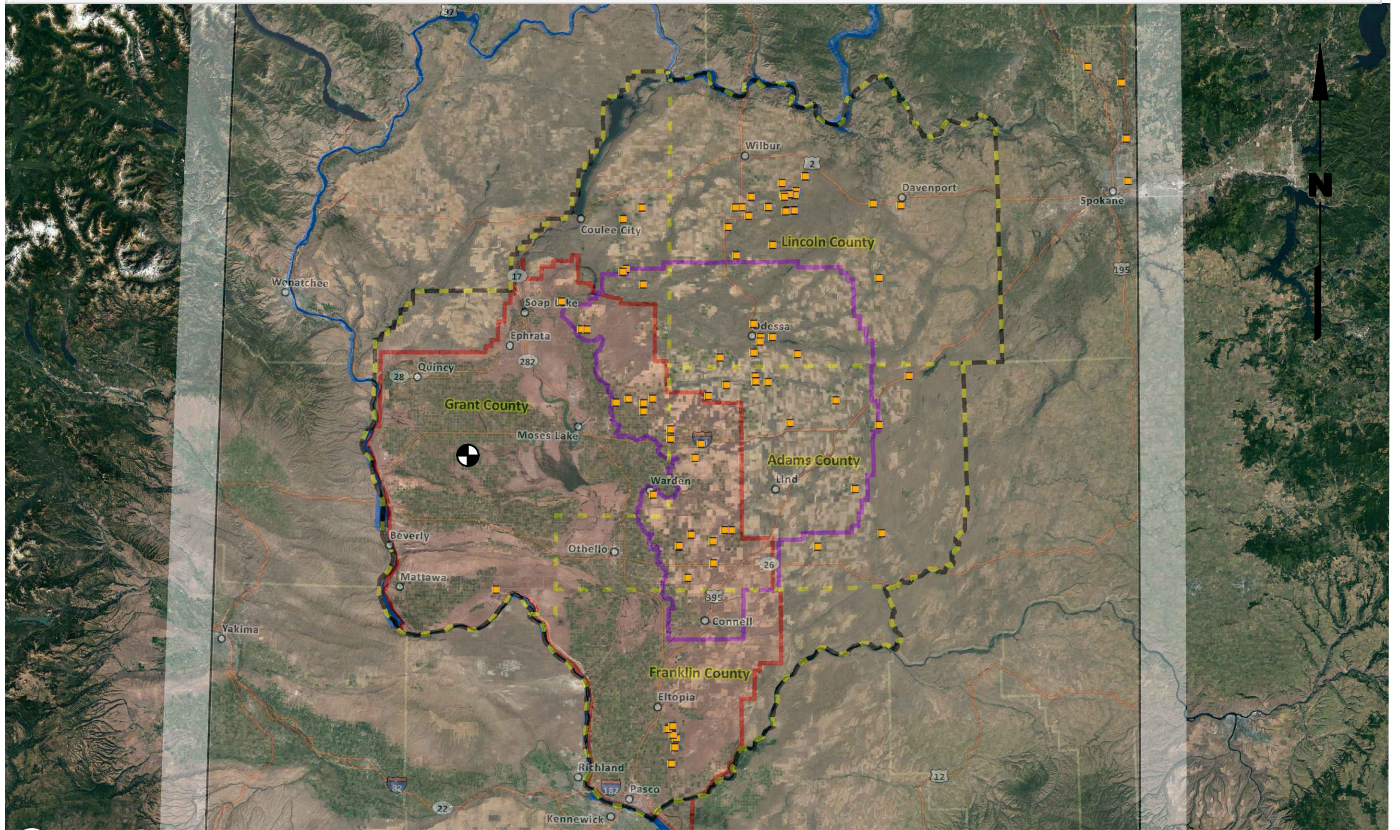
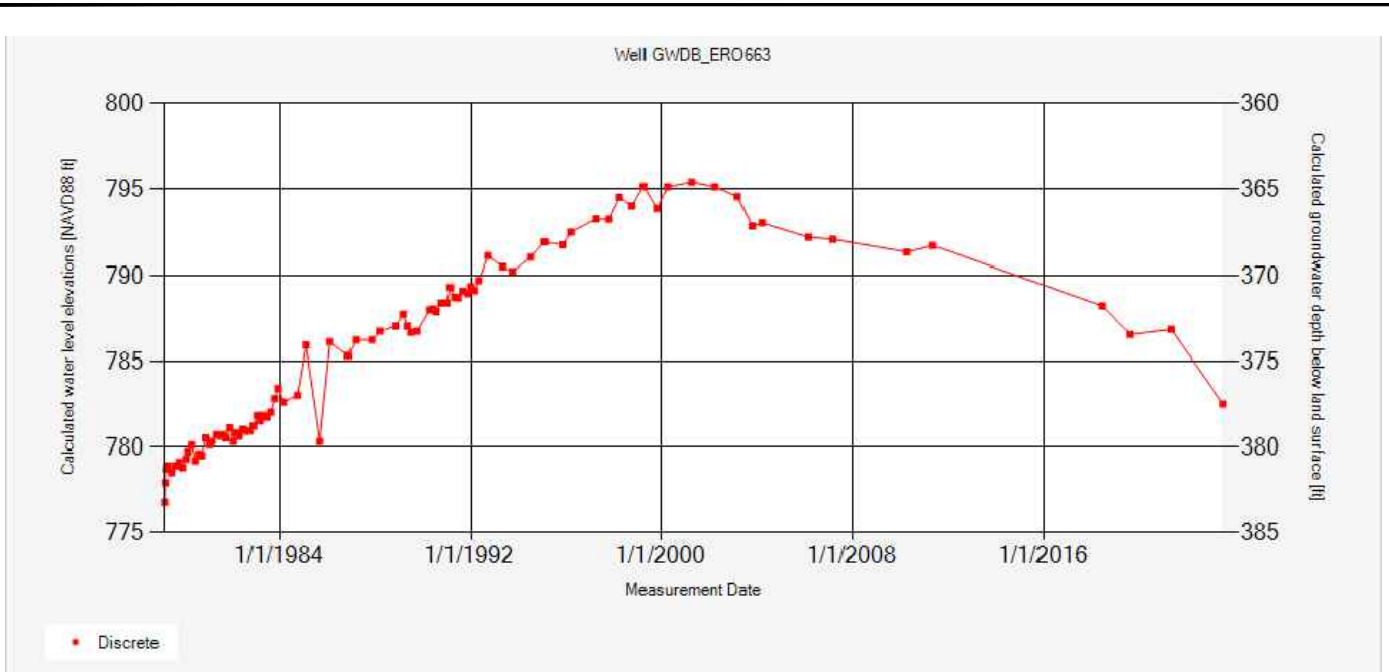
CBSWC Preliminary Watershed Management Plan  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring  
ERO145 Water Level Hydrograph**

Attachment  
**3-A**

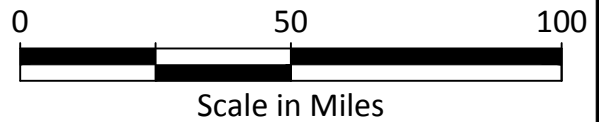


Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 1:16 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
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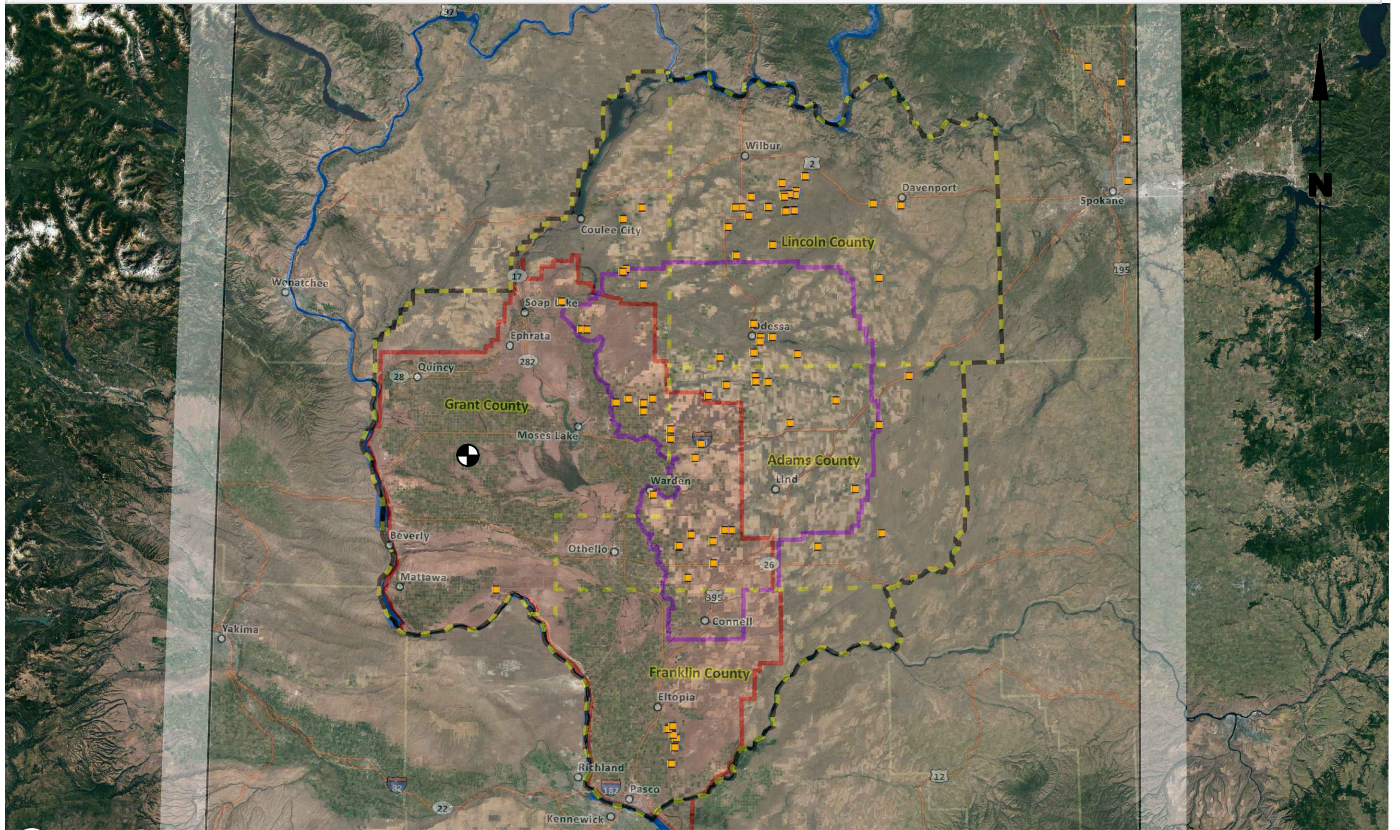
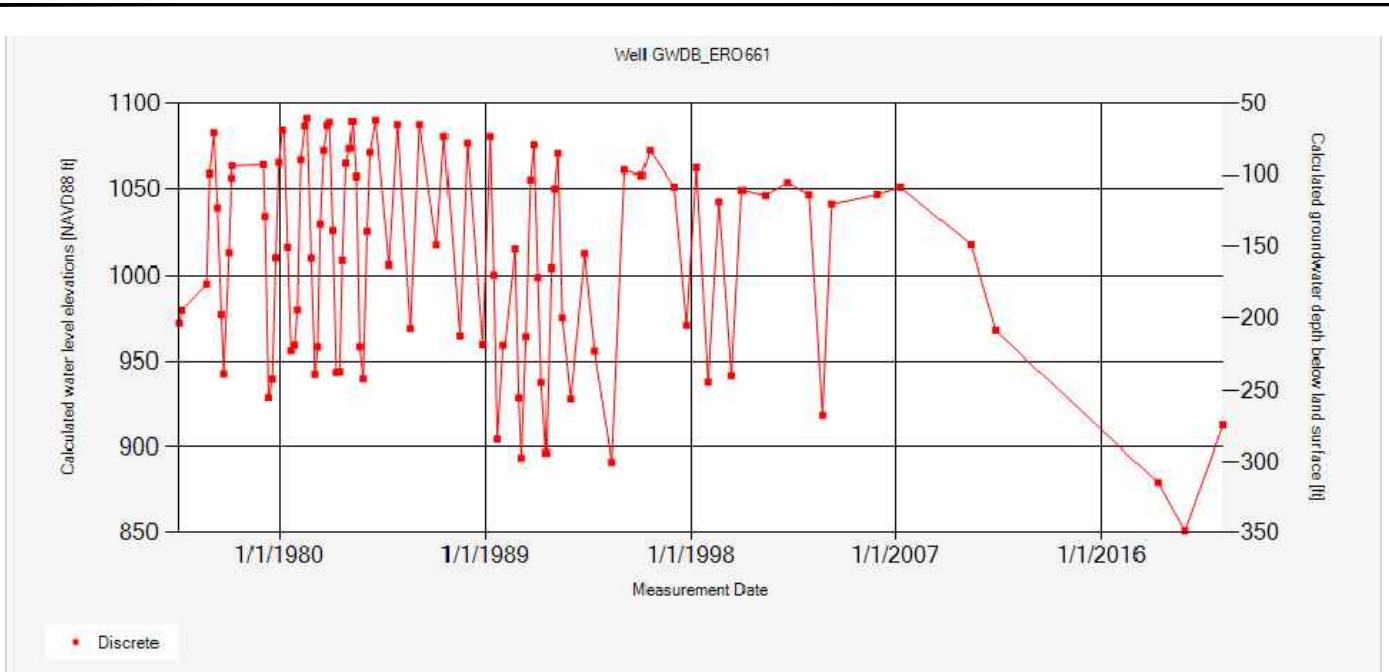


**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO663 Water Level Hydrograph**

Attachment  
**3-B**





**Legend**

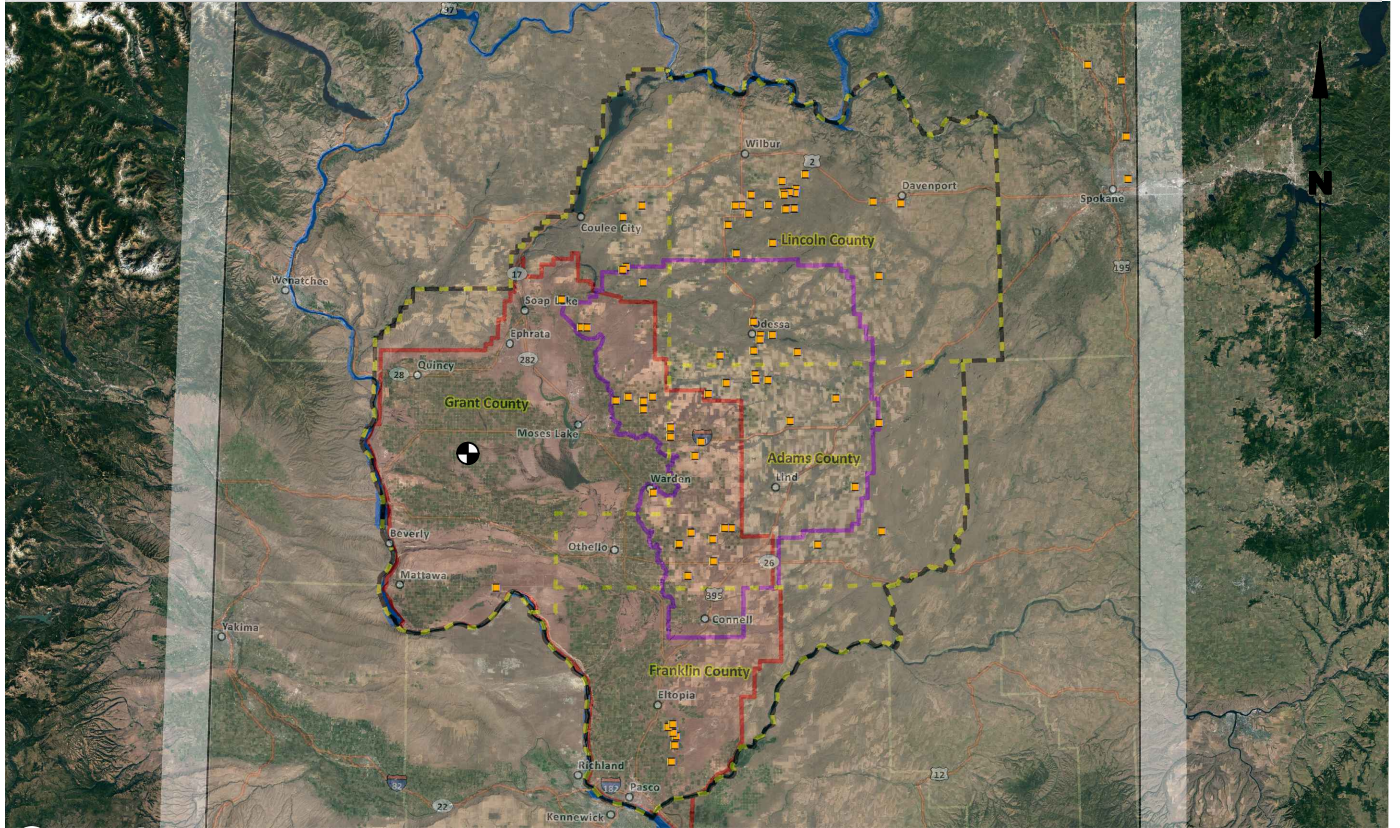
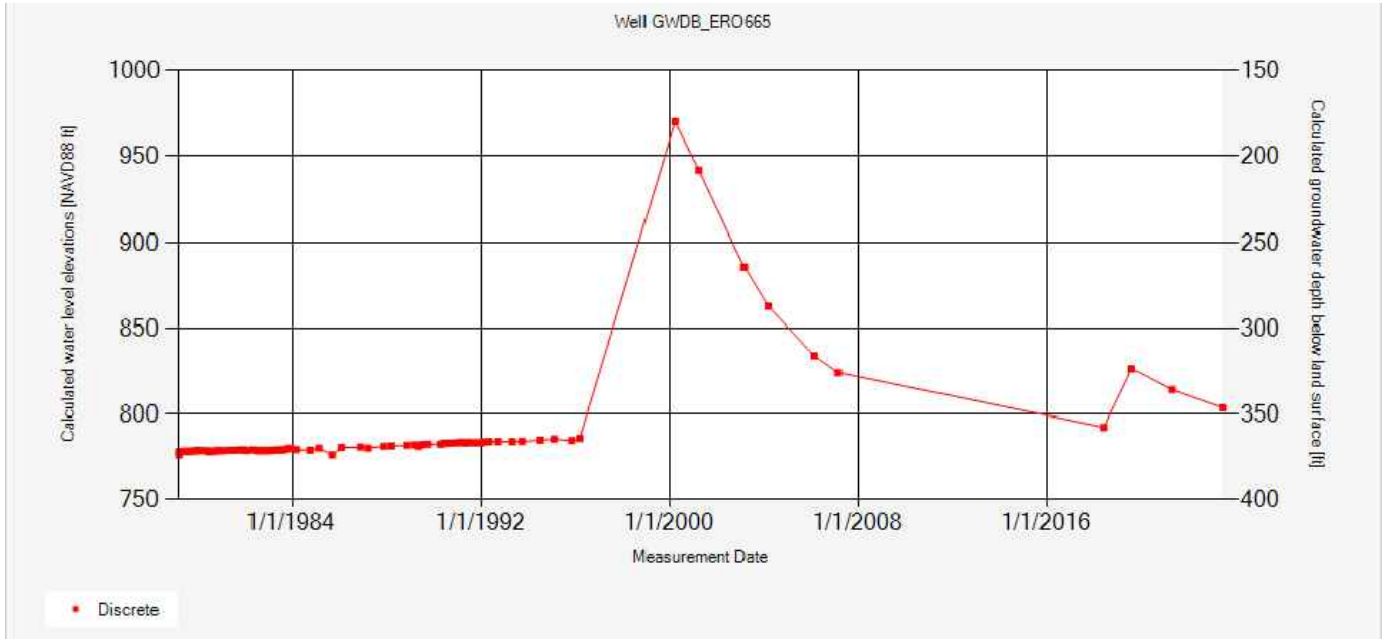
● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

● Corresponding Well Location

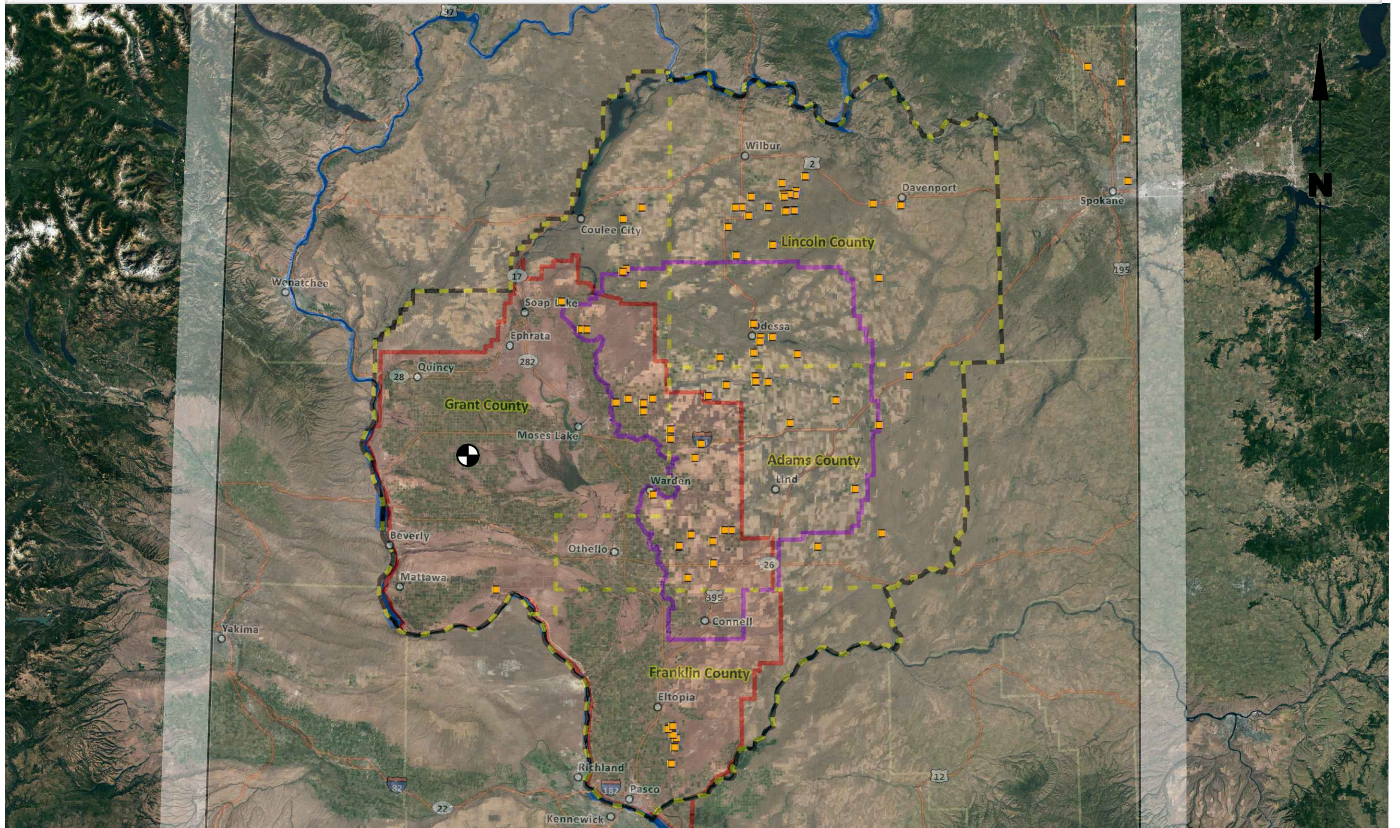
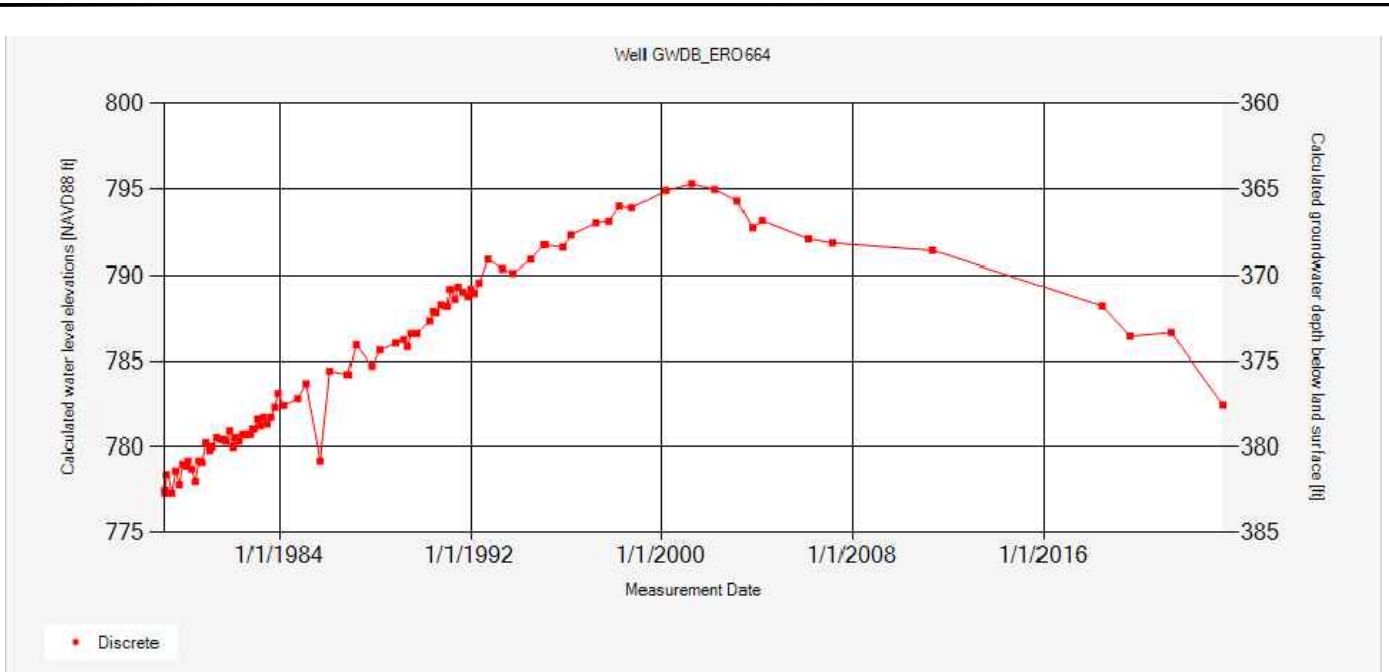


**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

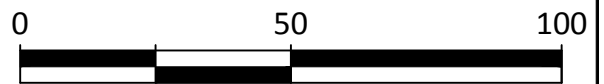


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**Legend**

● Corresponding Well Location



Scale in Miles

**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



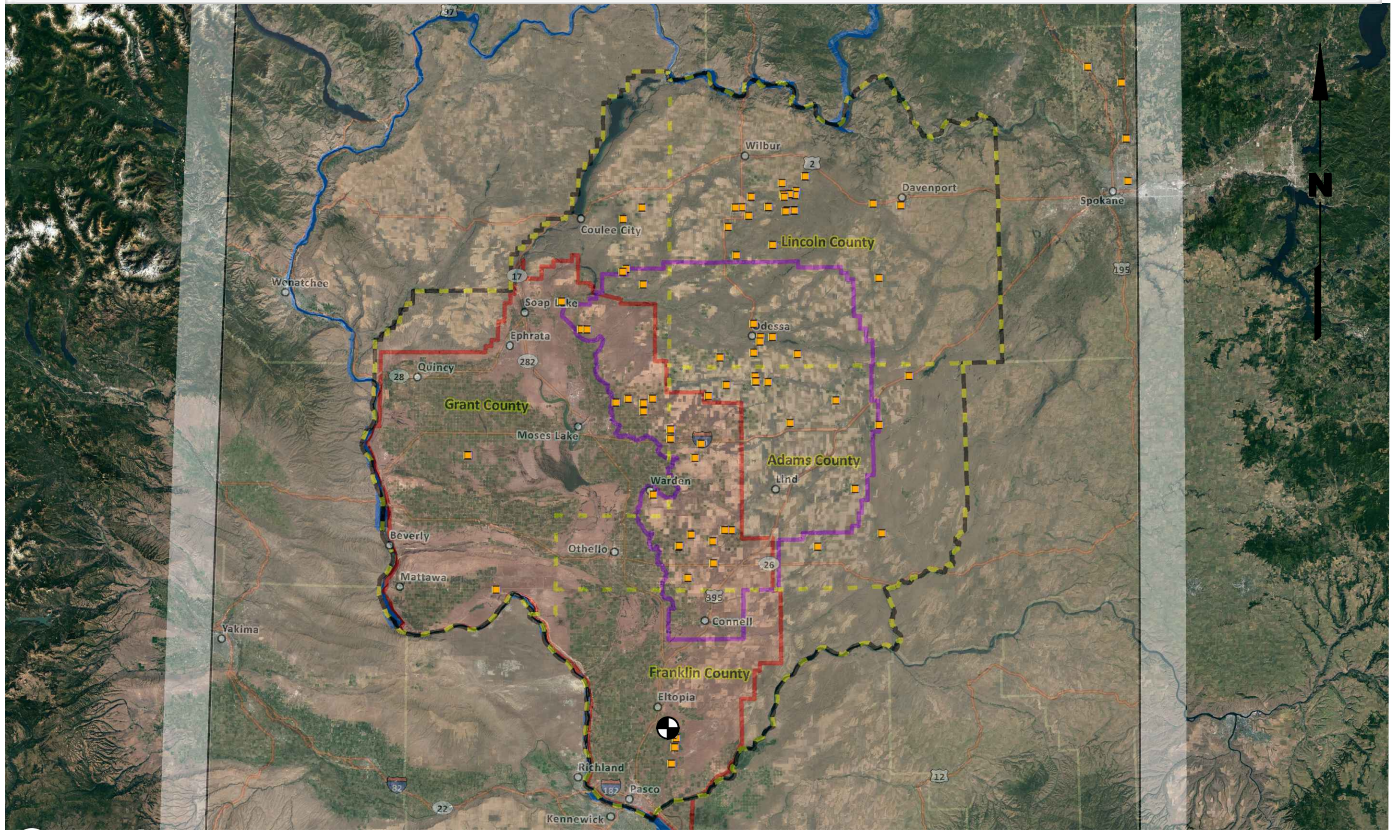
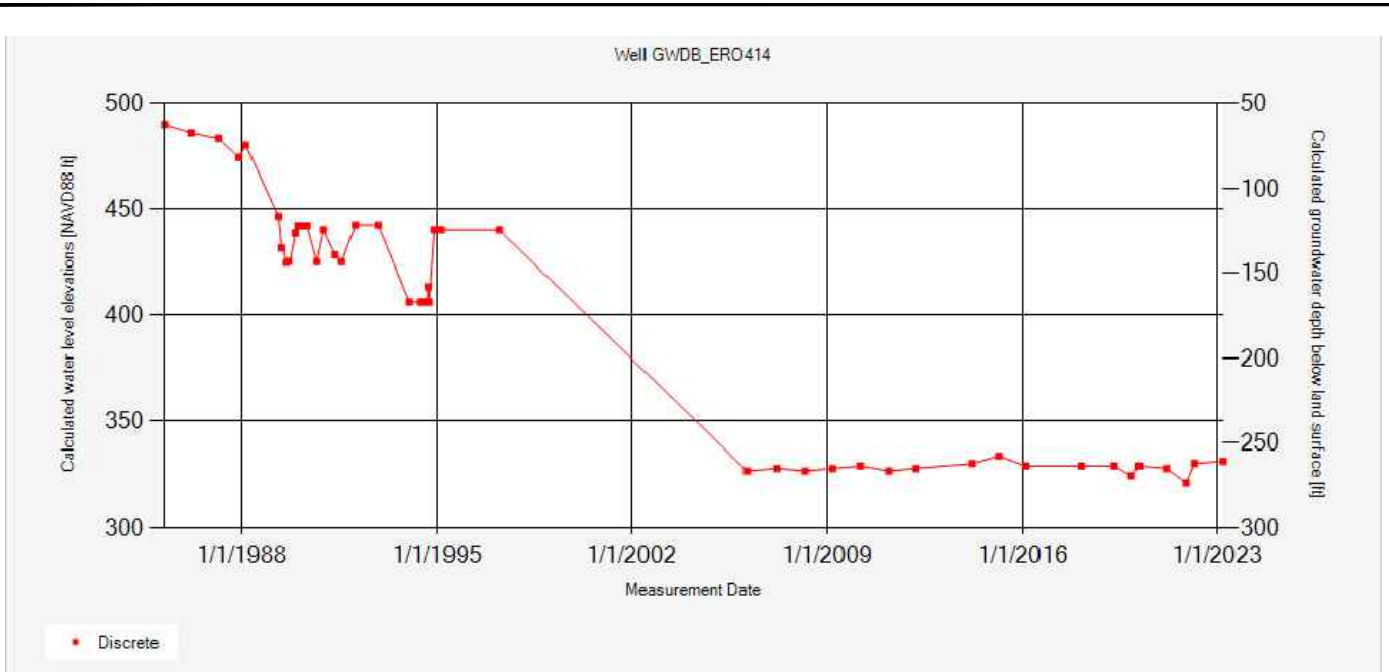
**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO664 Water Level Hydrograph**

Attachment  
**3-E**

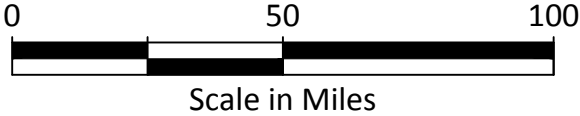


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**Legend**

● Corresponding Well Location



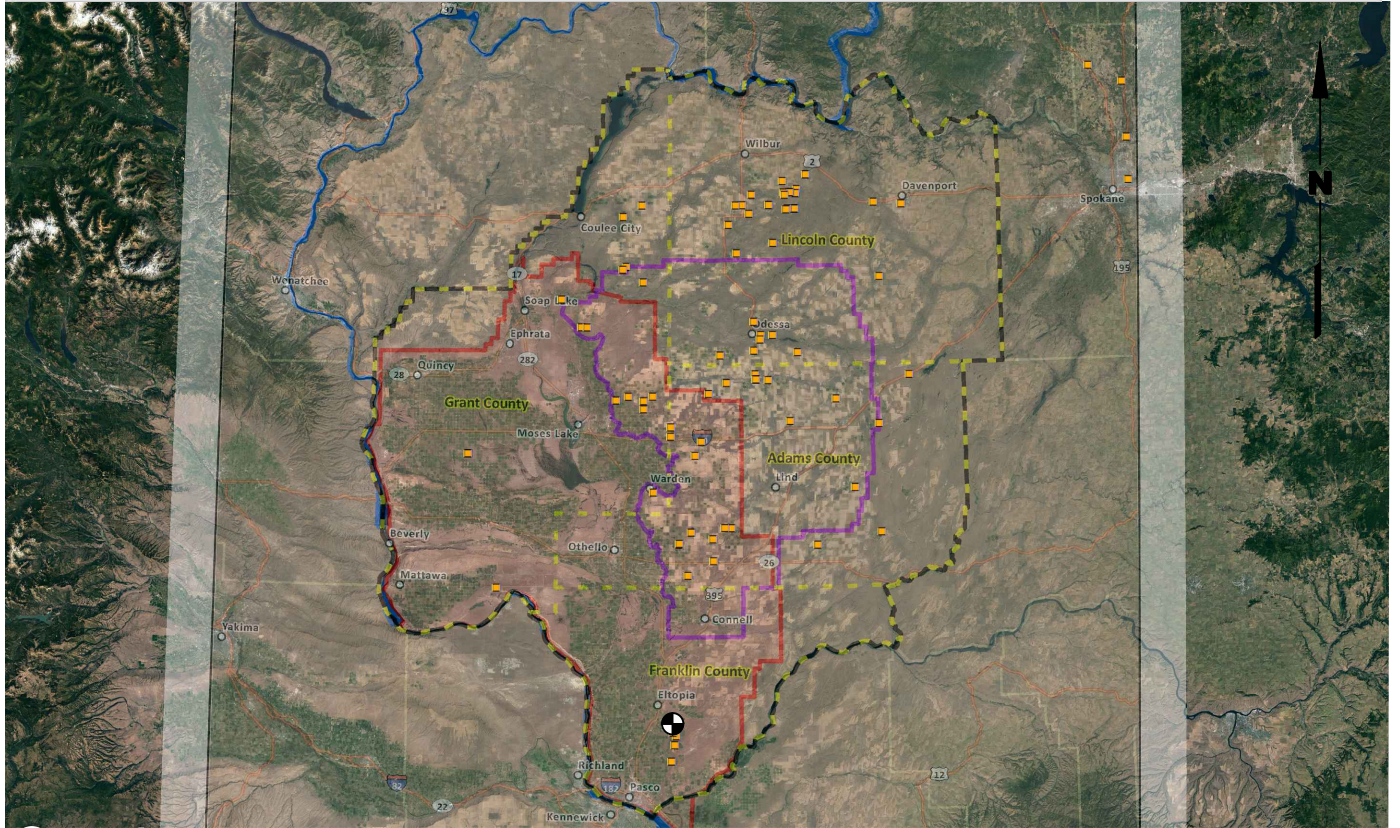
**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



<p>CBSWC Preliminary Watershed Management Plan Franklin, Lincoln, Adams, and Grant Counties, WA</p>	<p><b>Ecology ERO Groundwater Monitoring ERO414 Water Level Hydrograph</b></p>	<p>Attachment <b>3-F</b></p>
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**Legend**

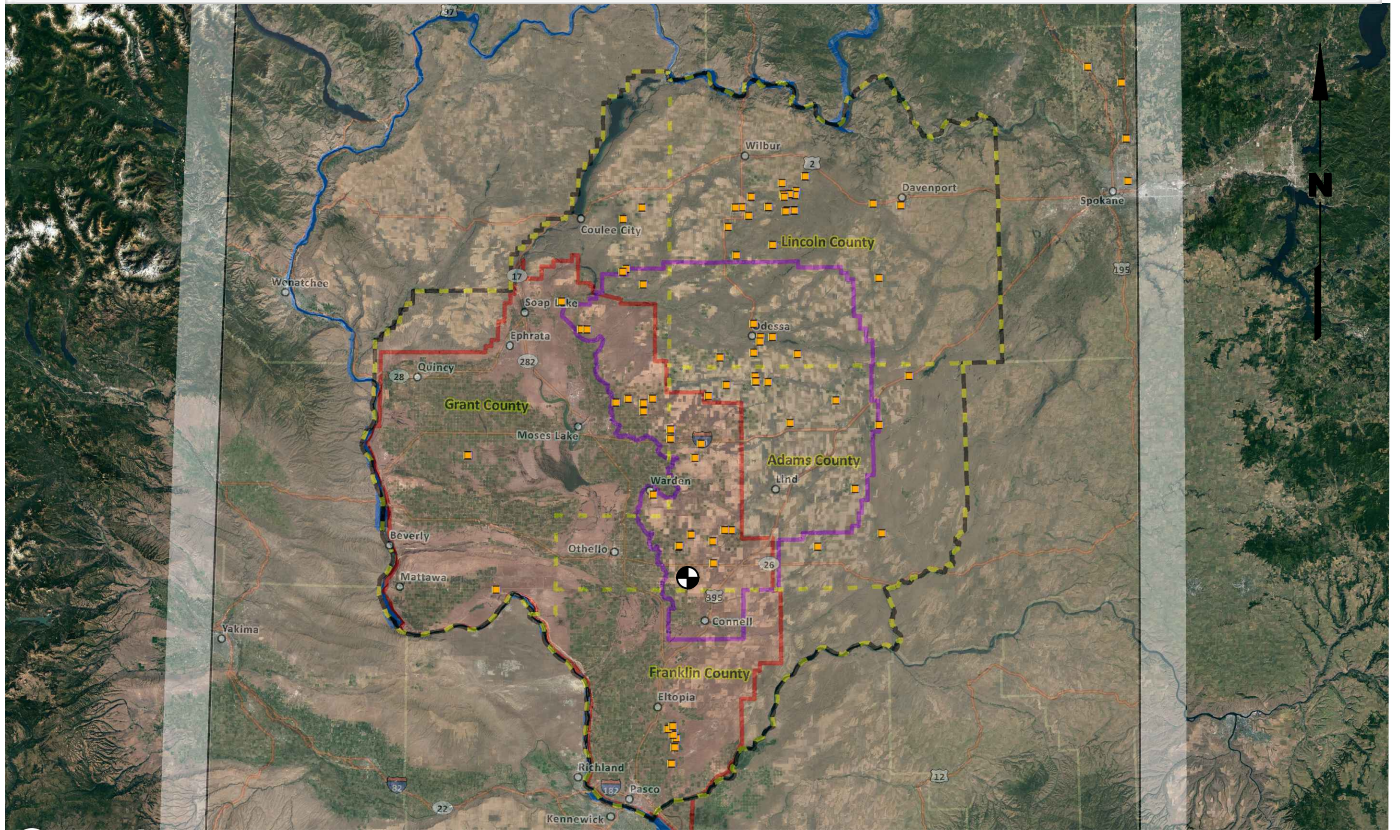
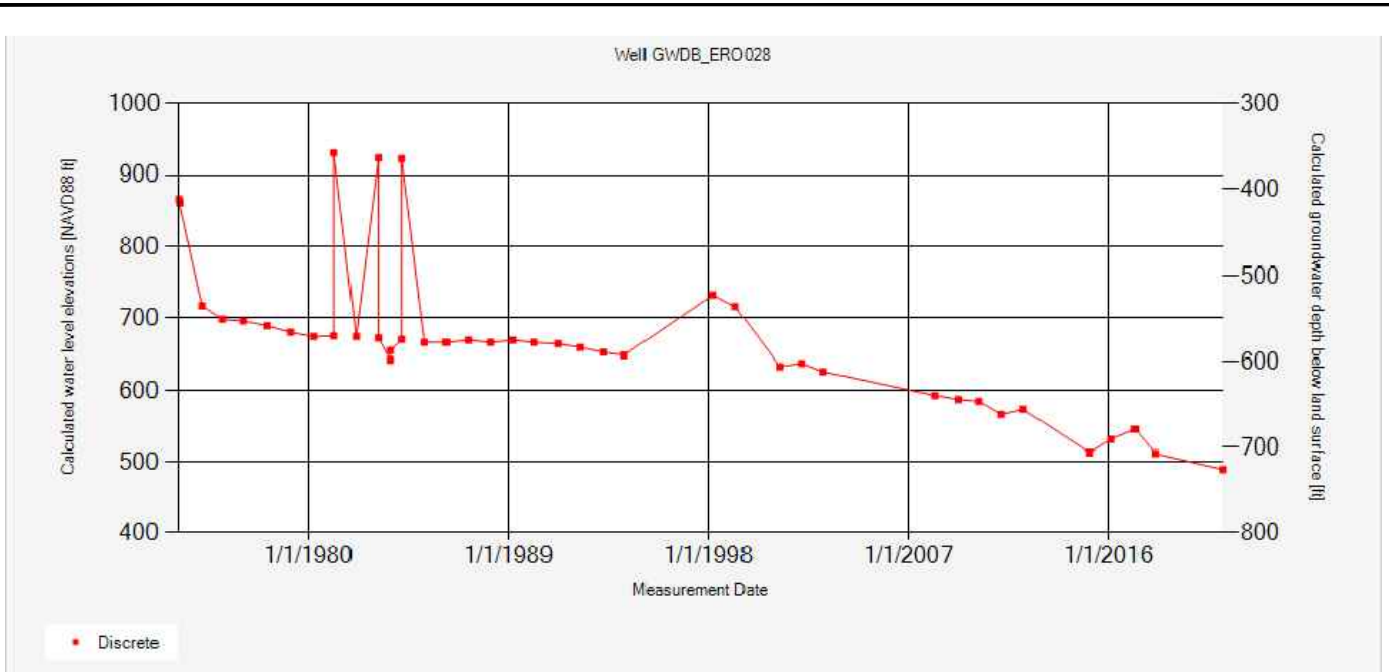
● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

● Corresponding Well Location

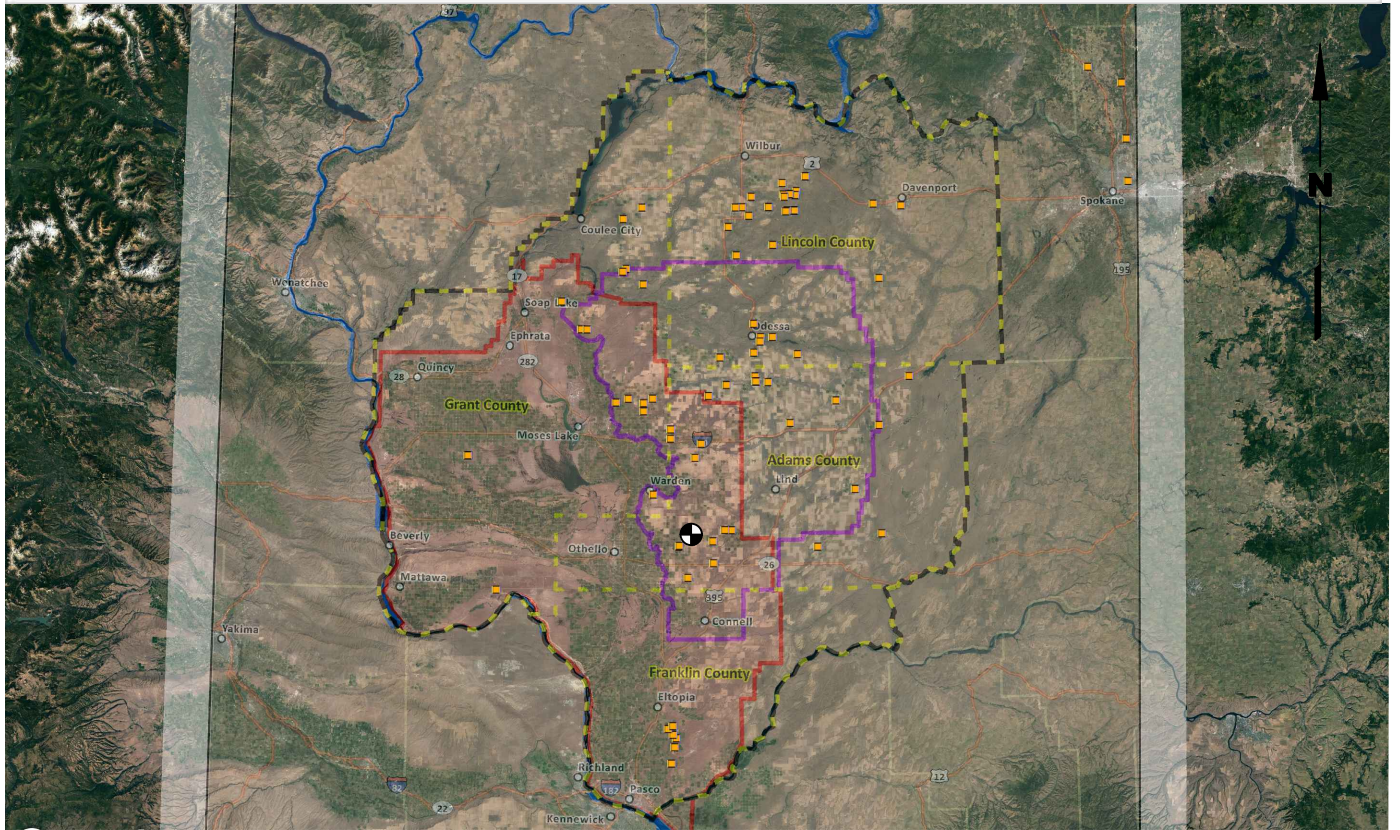


**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



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**Legend**

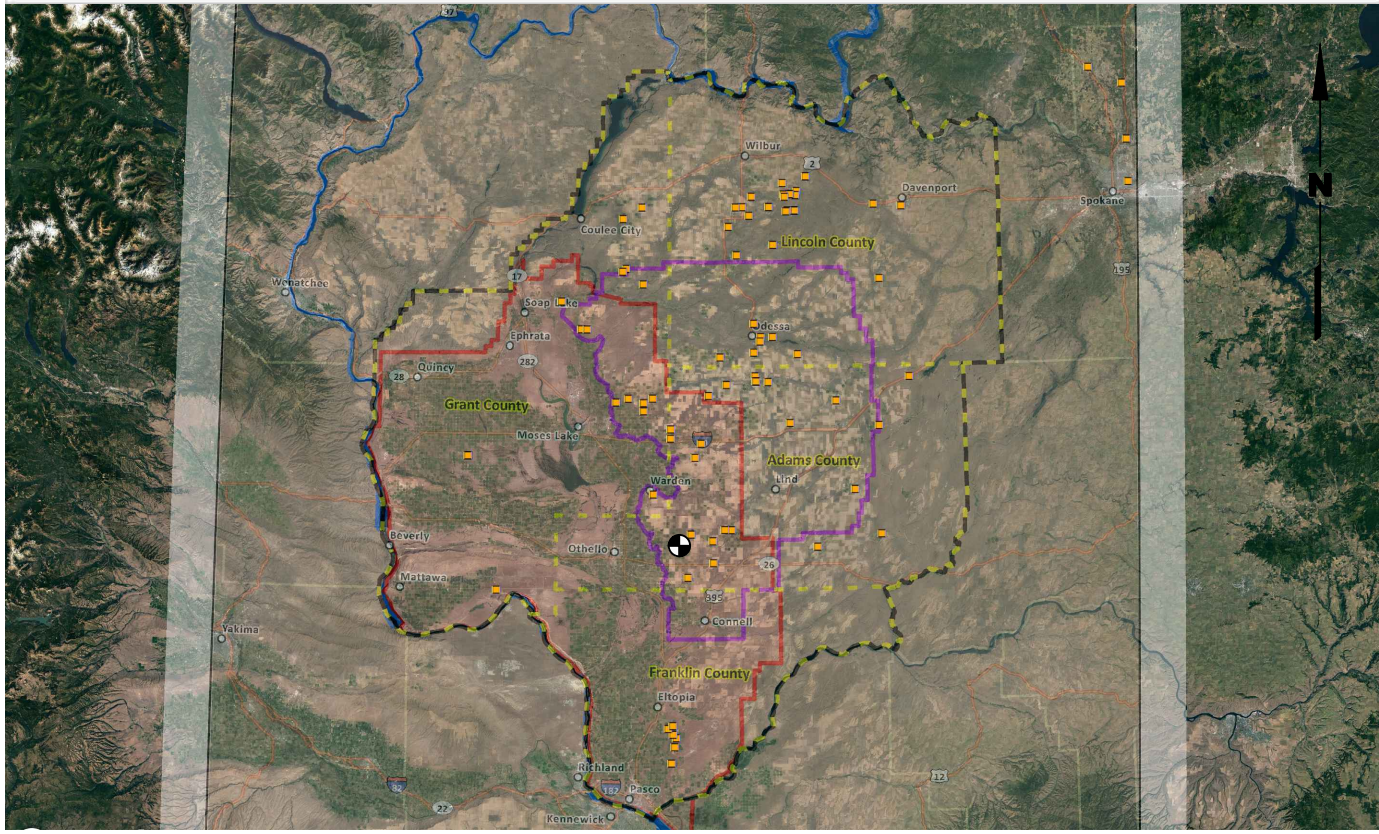
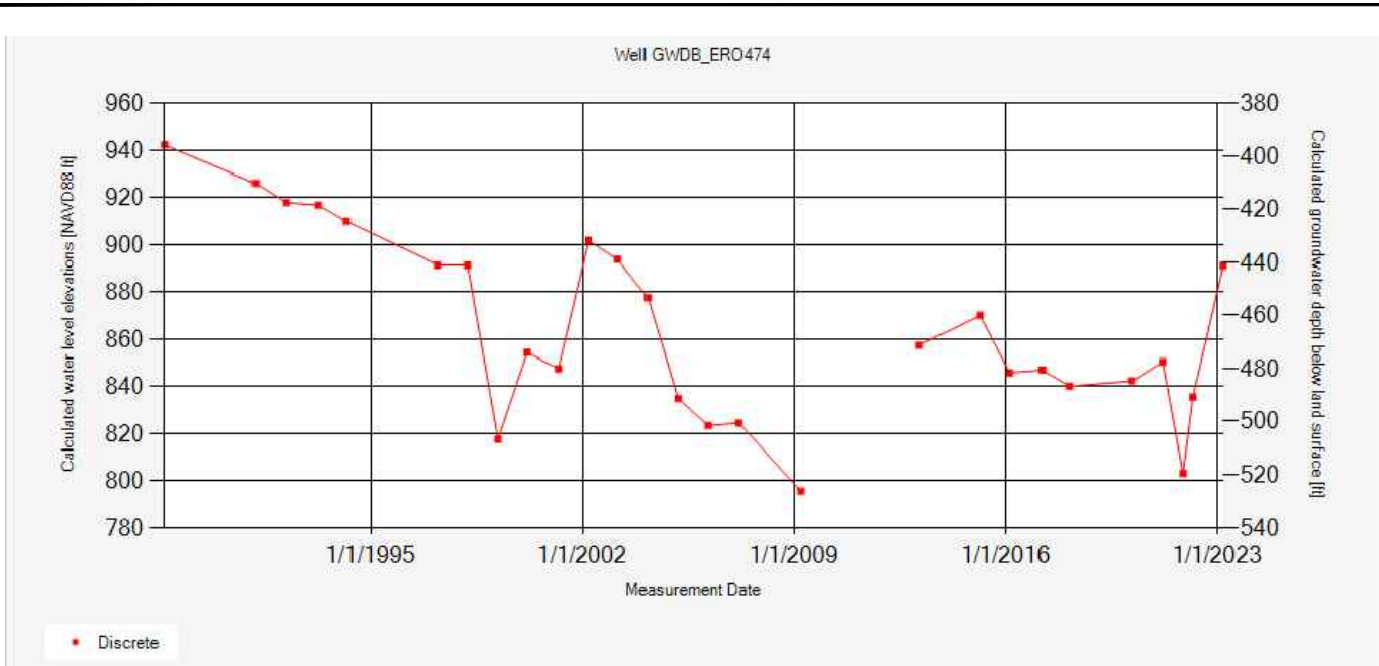
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**Note**

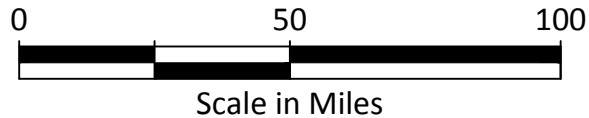
1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





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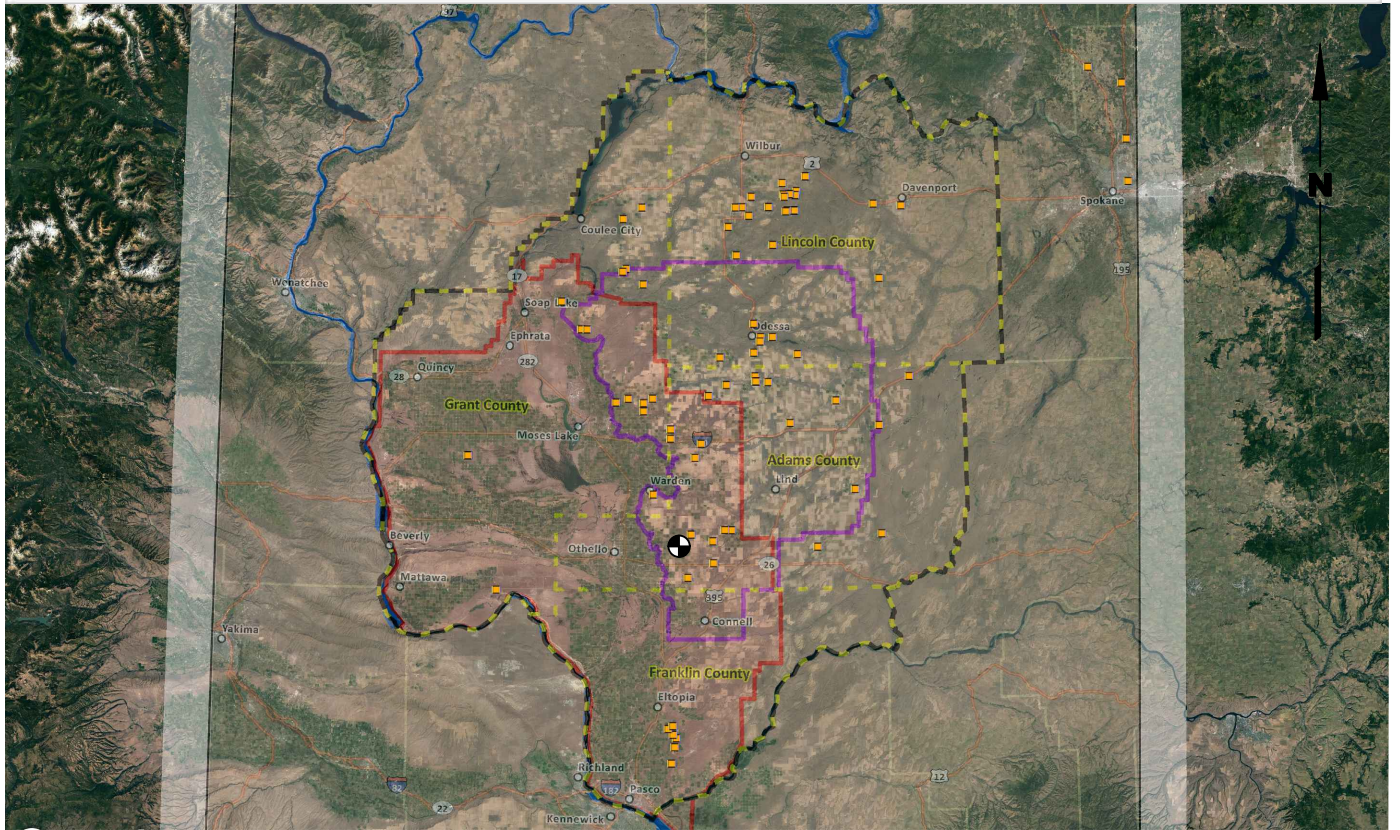
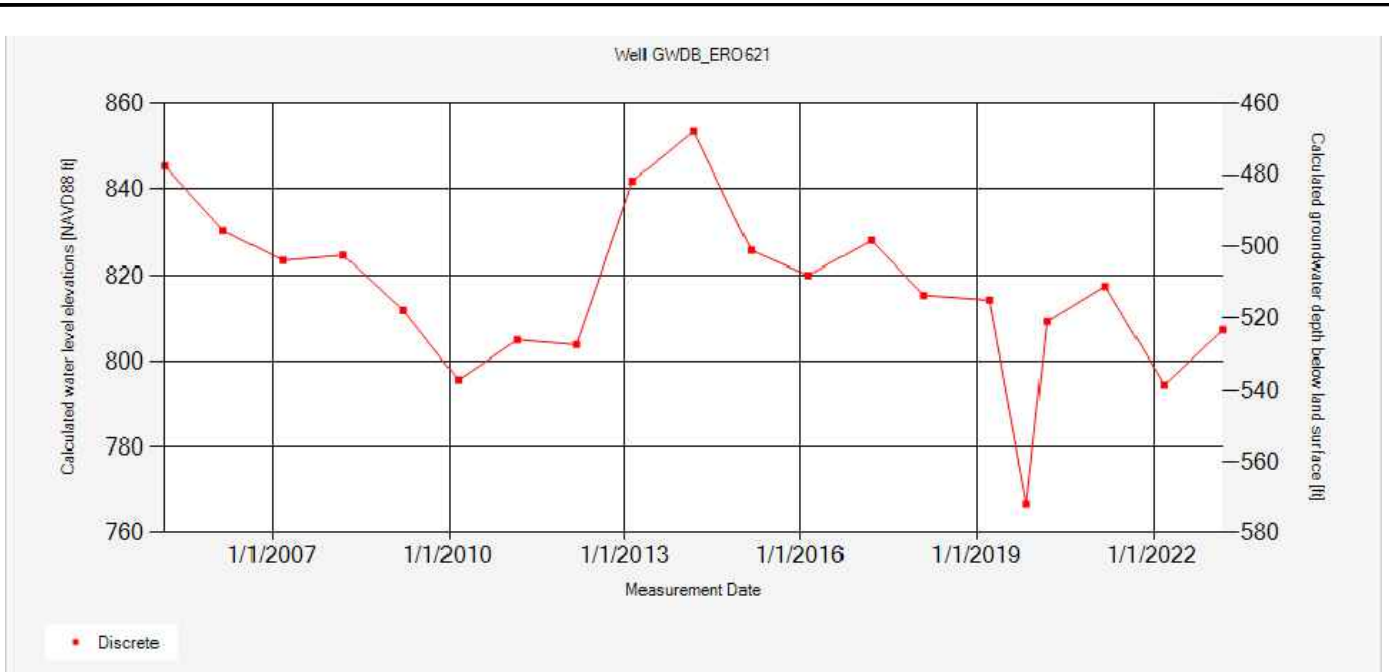
● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

● Corresponding Well Location

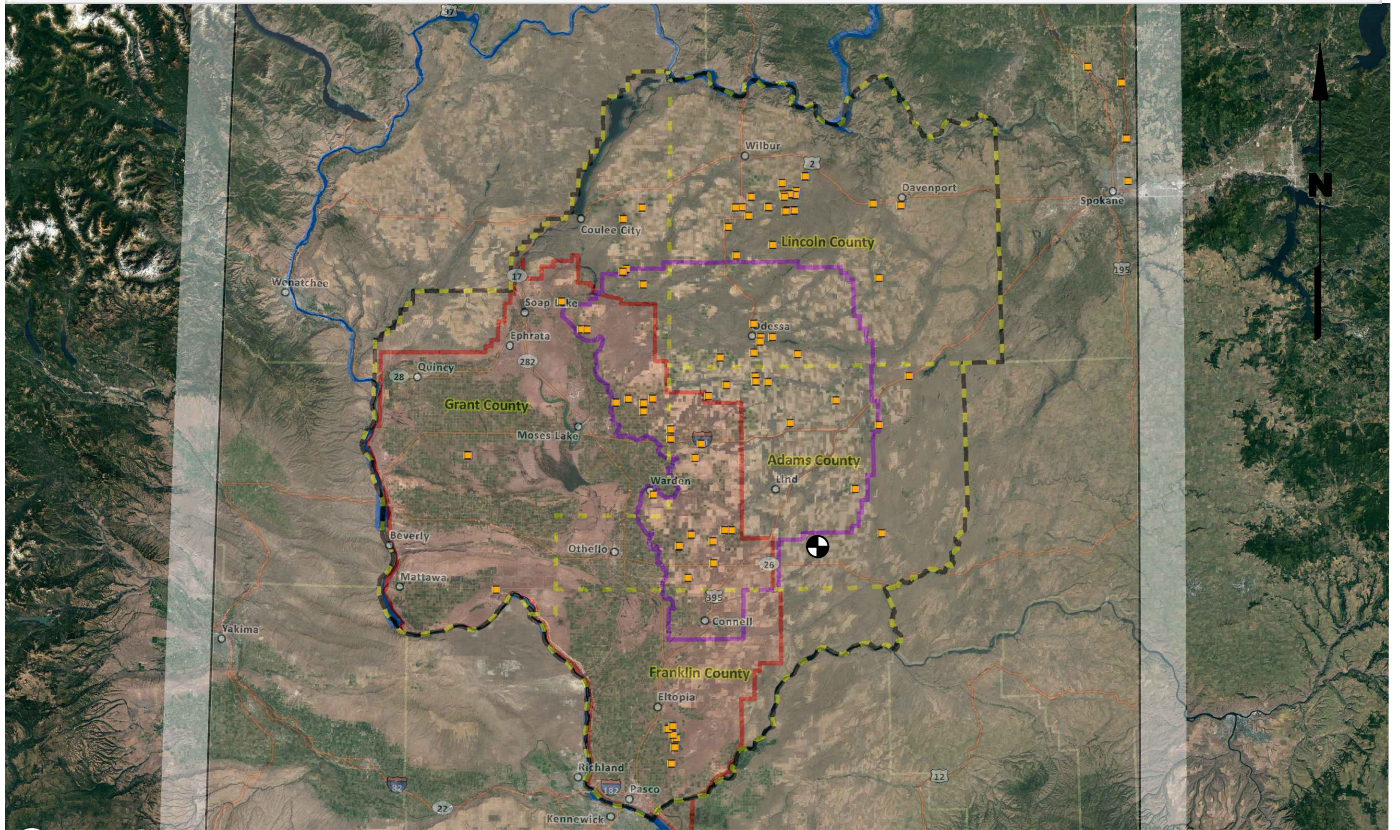
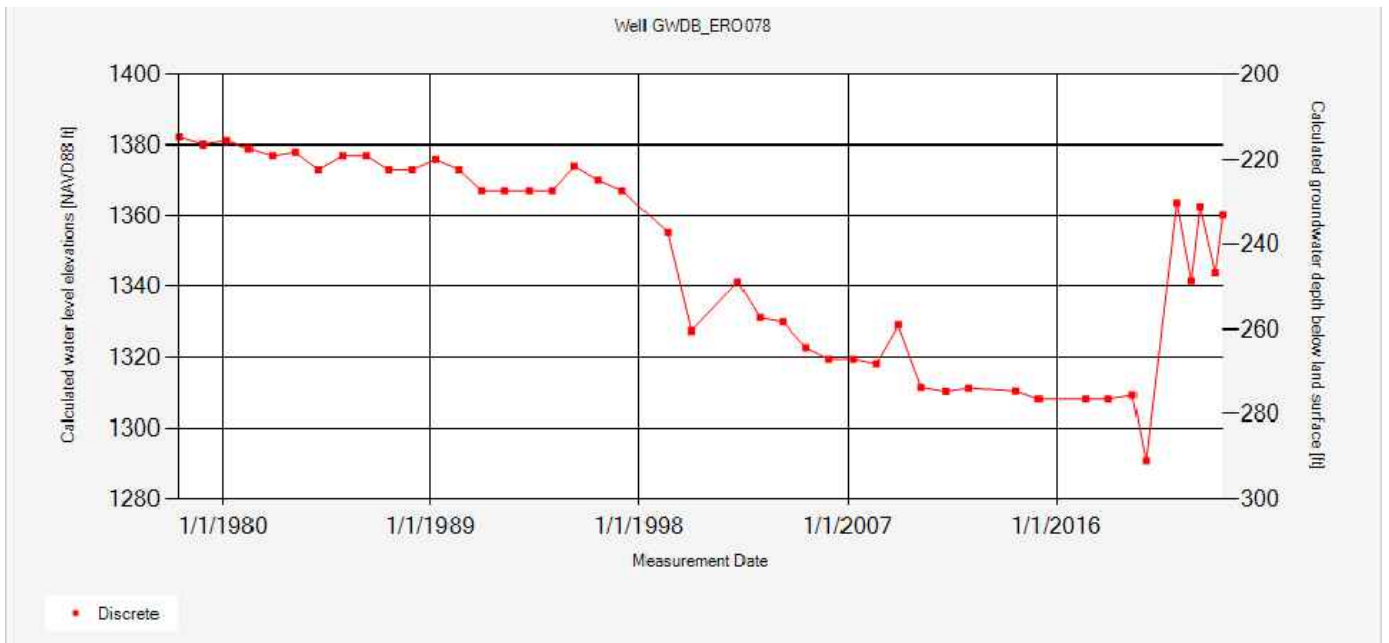


**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 6:32 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

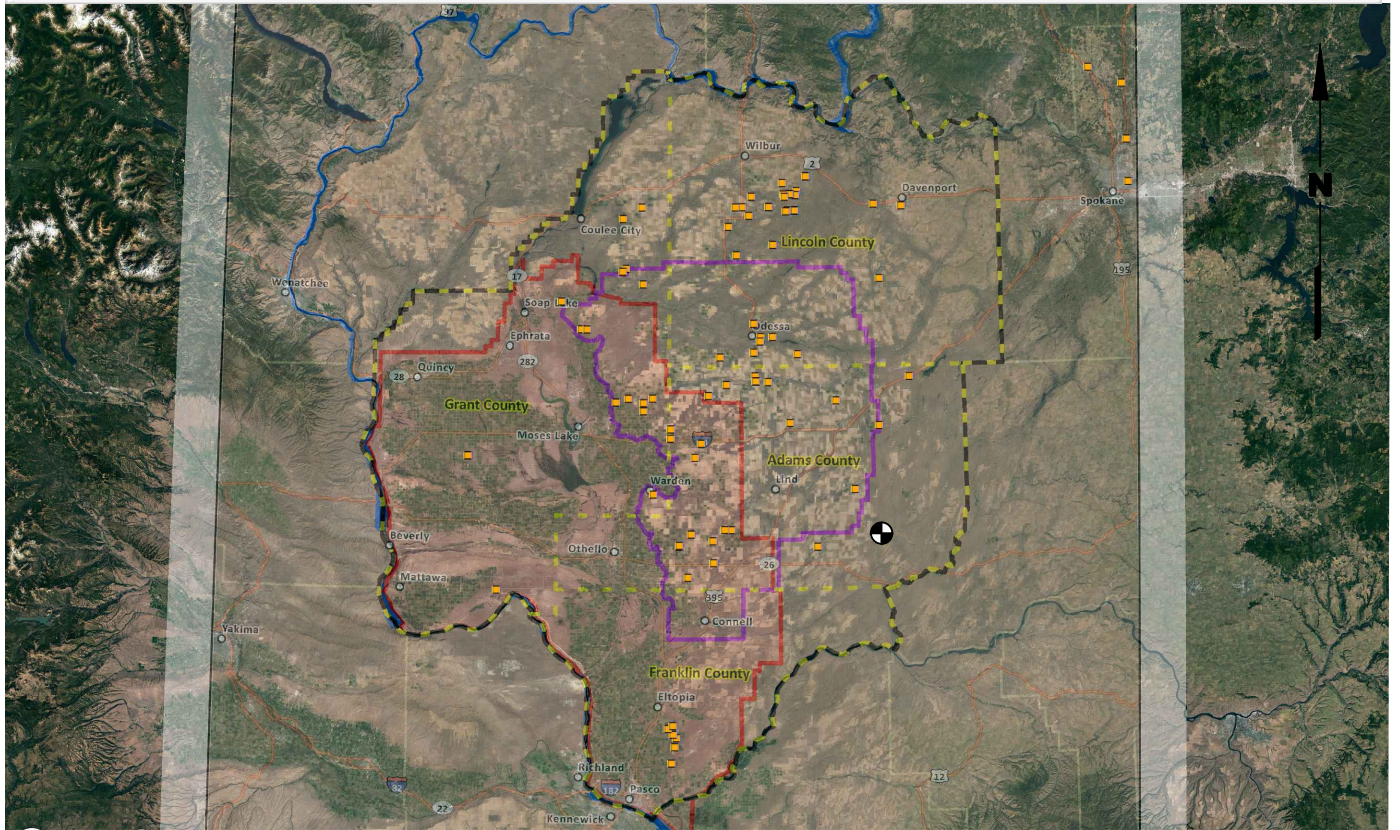
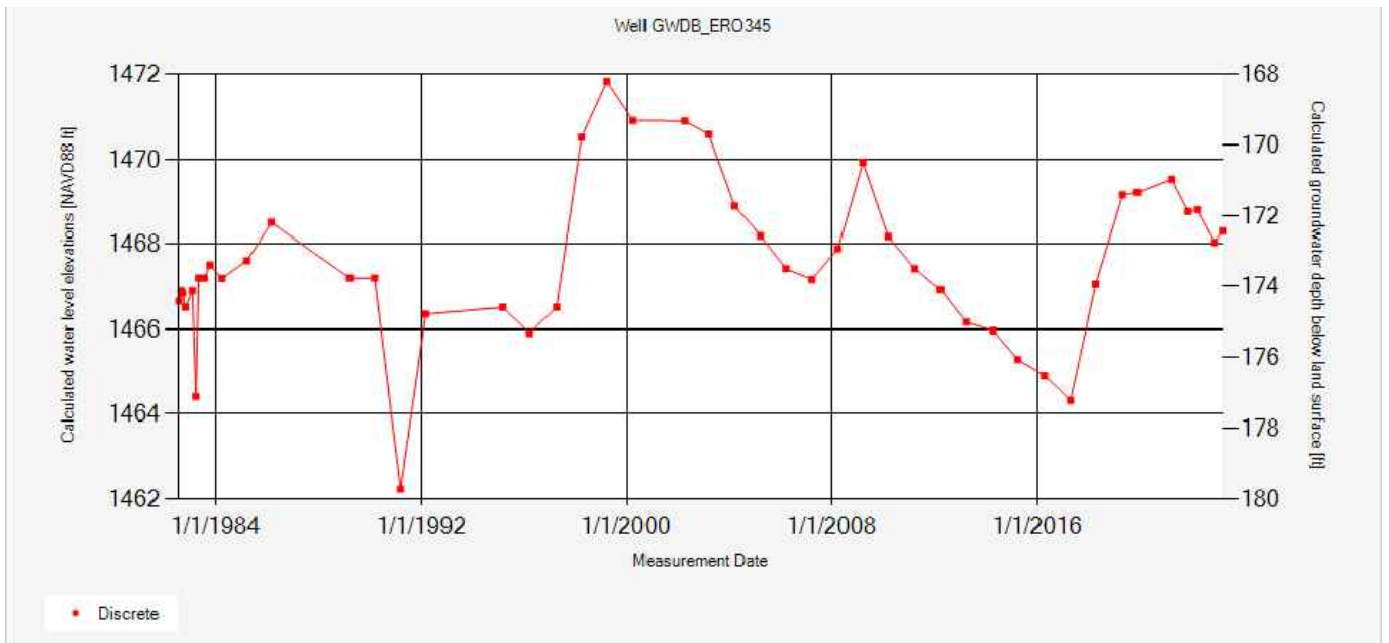


**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO078 Water Level Hydrograph**

Attachment  
**3-L**





**Legend**

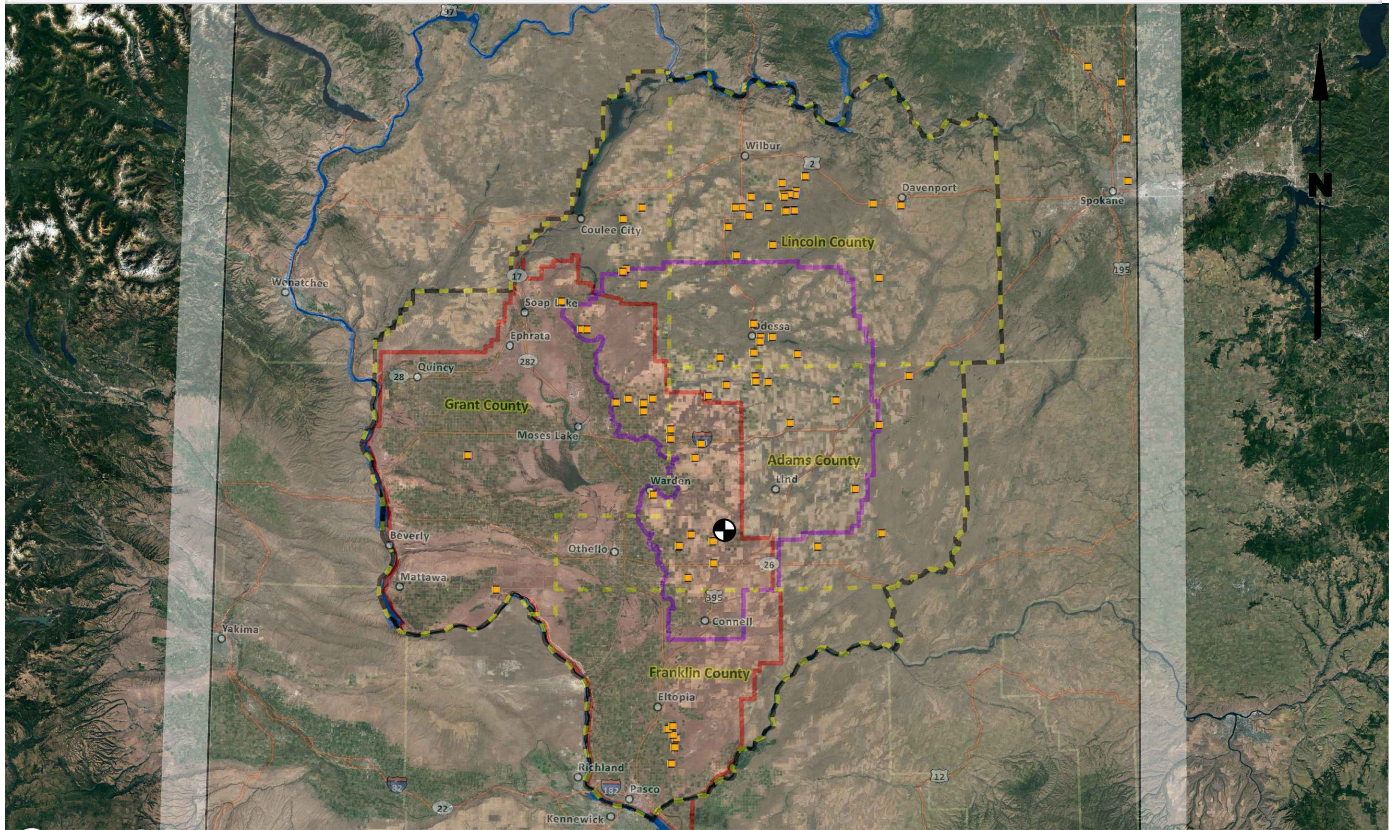
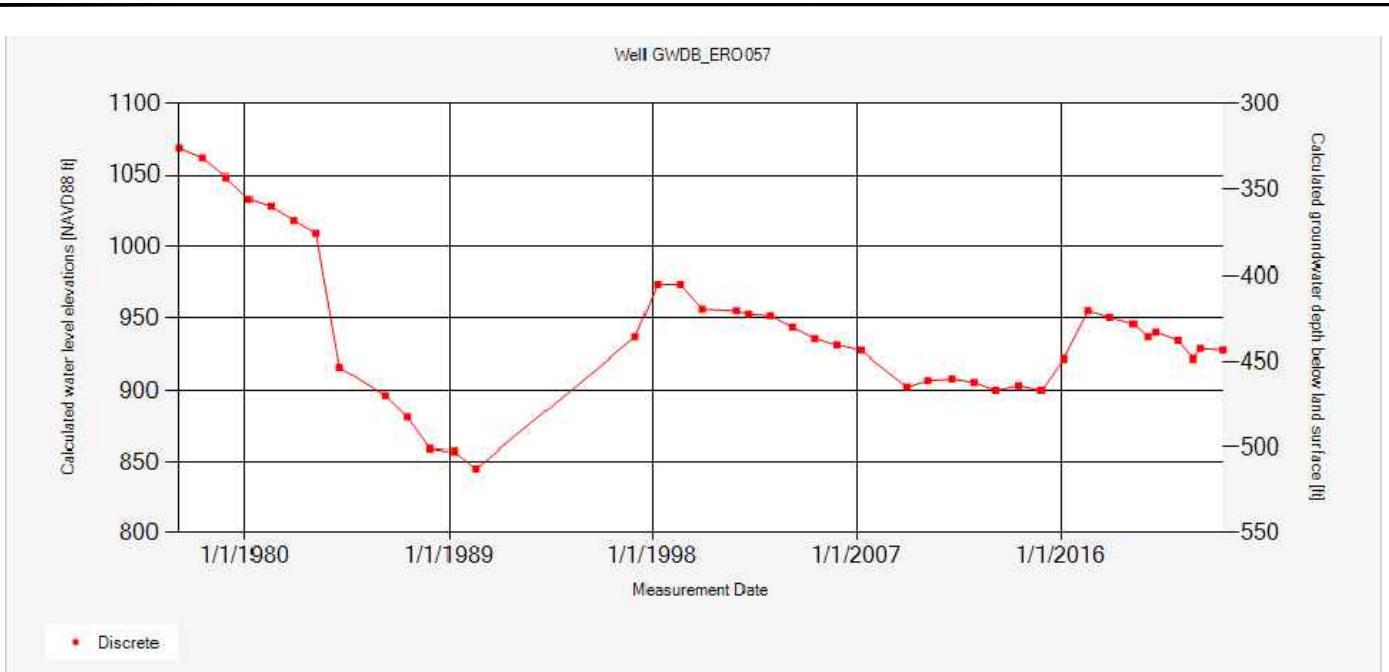
● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

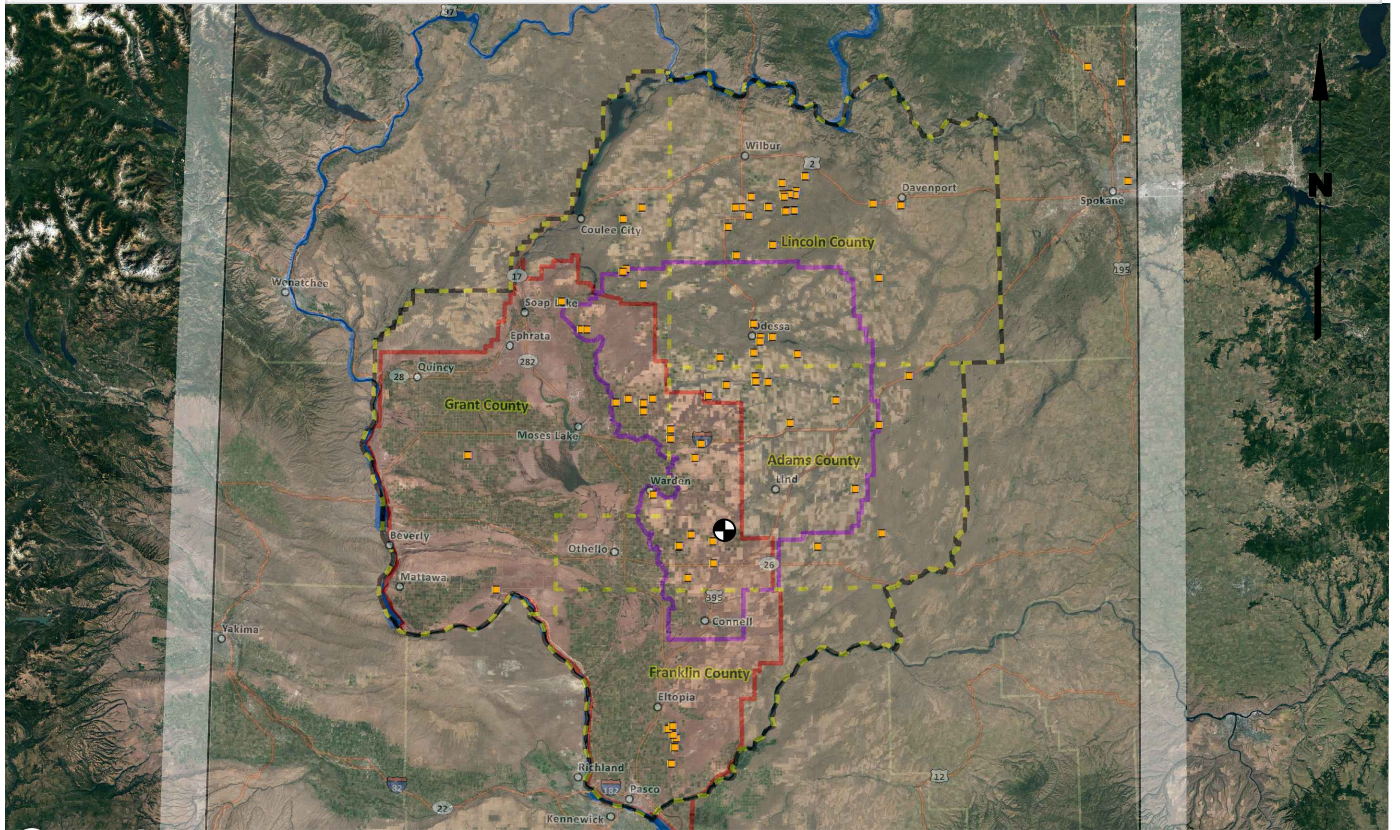
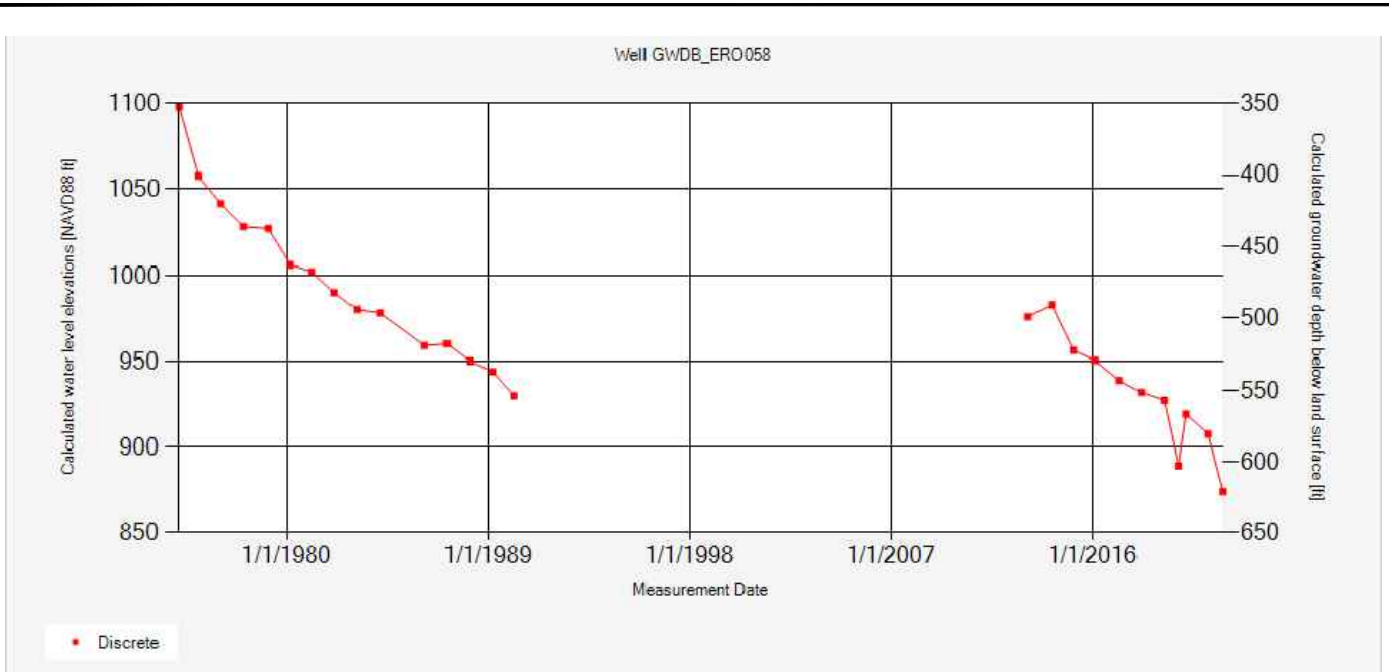
● Corresponding Well Location



**Note**

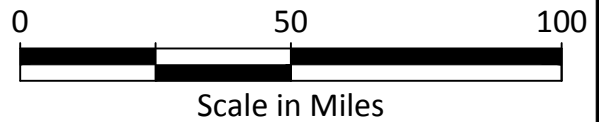
1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

● Corresponding Well Location

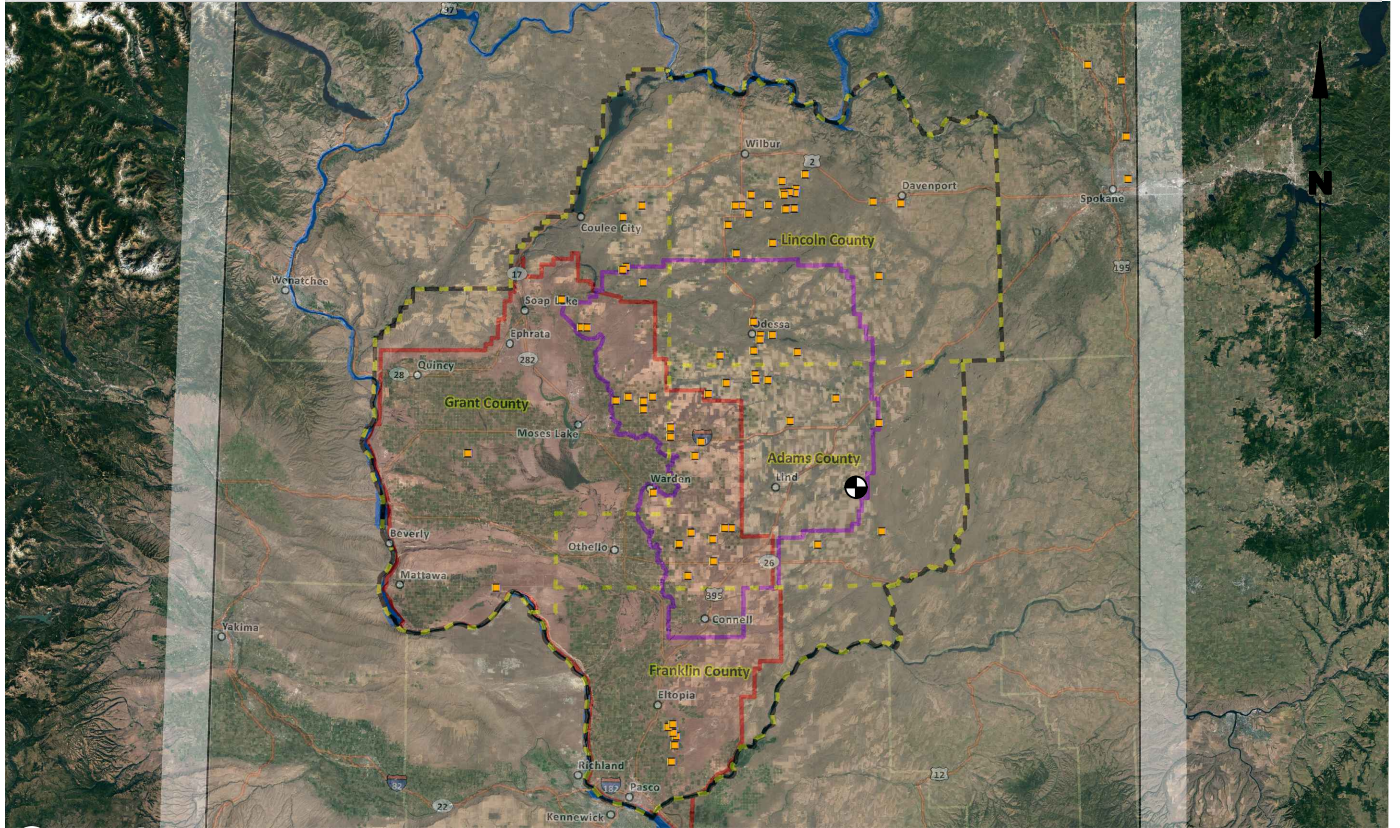
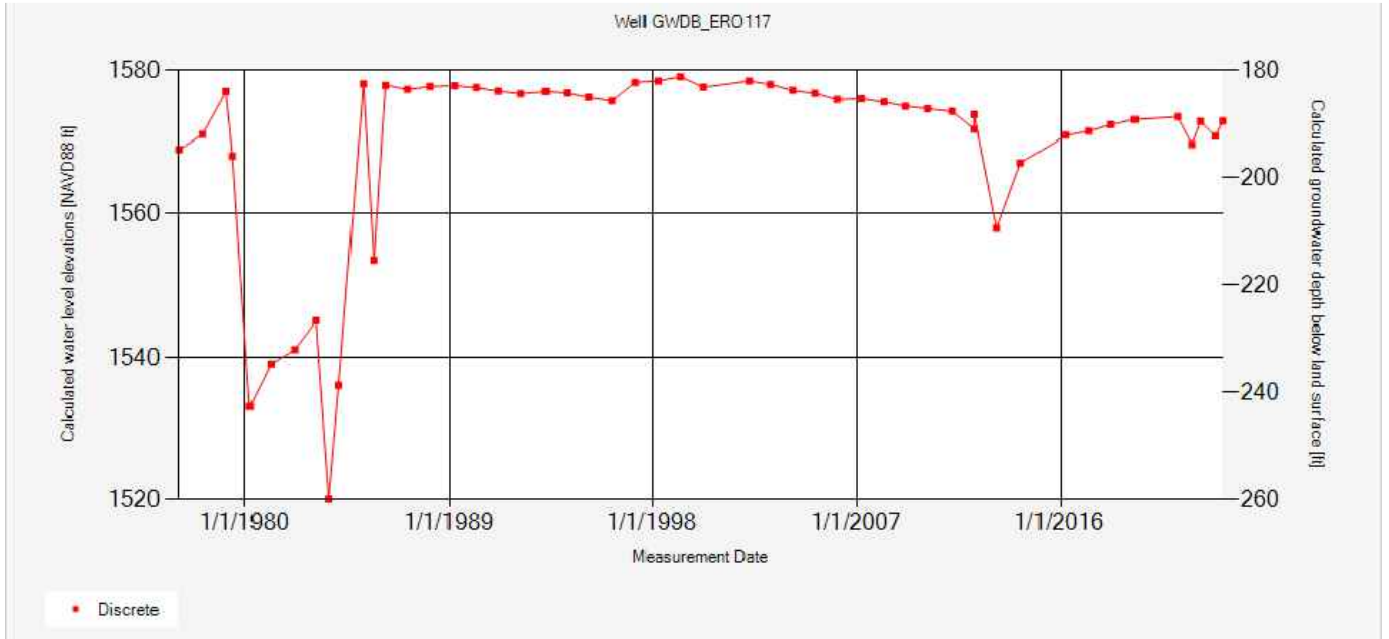


**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 6:34 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



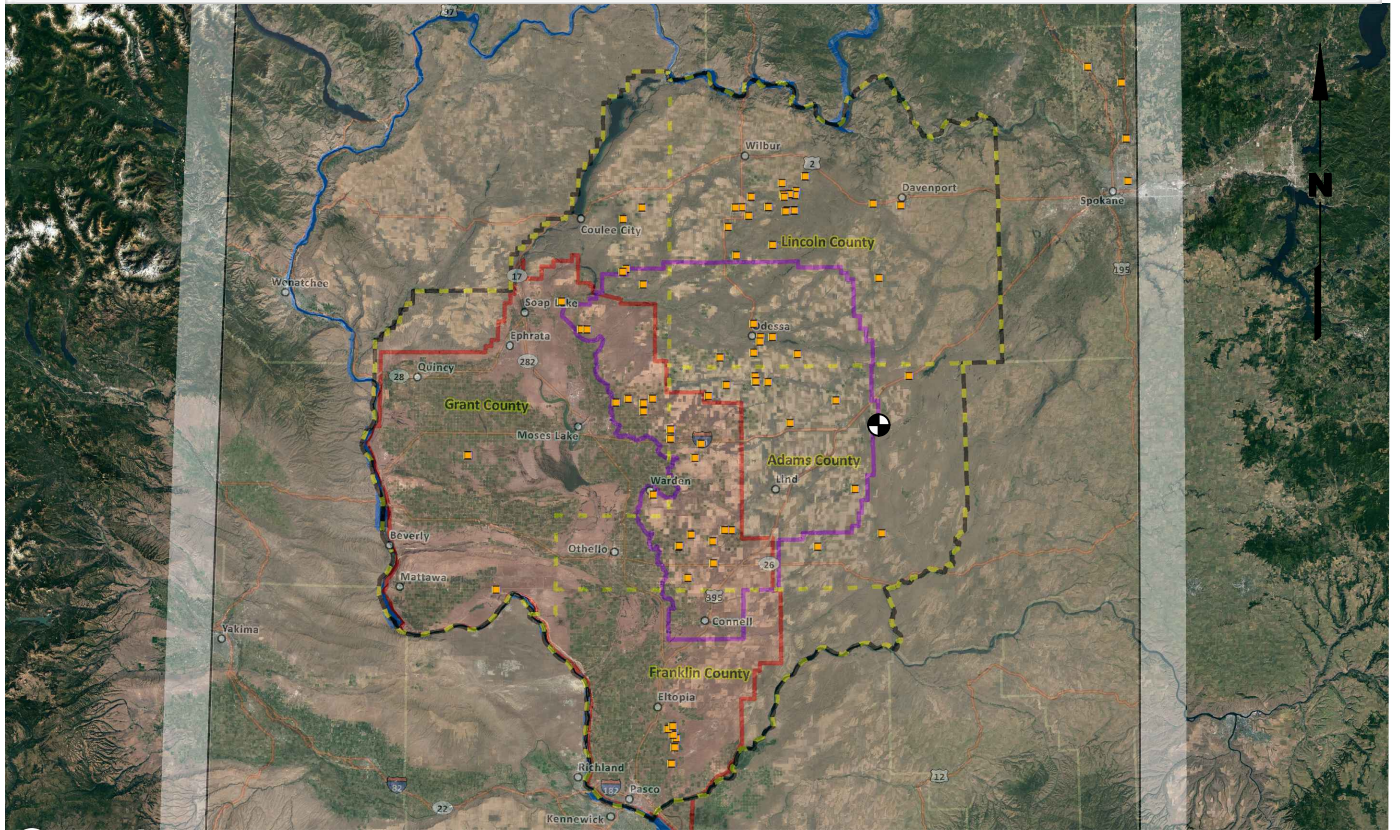
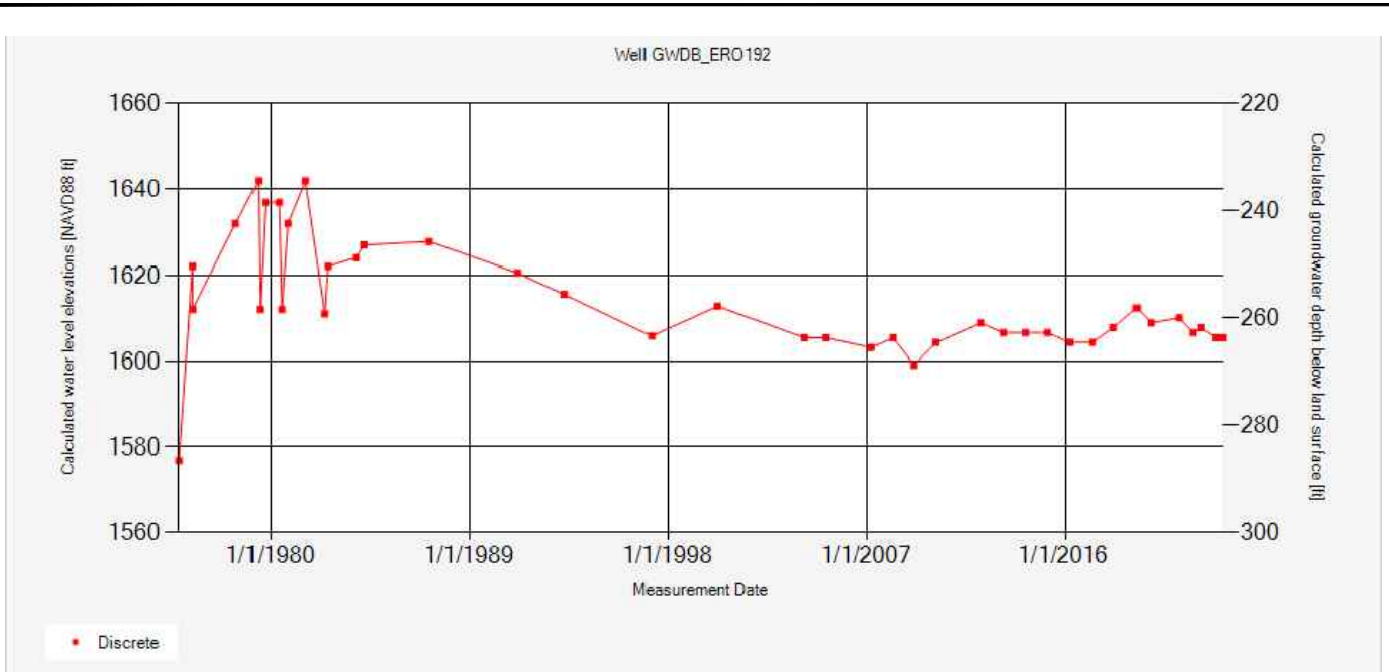
**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO117 Water Level Hydrograph**

Attachment  
**3-P**



Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 6:35 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

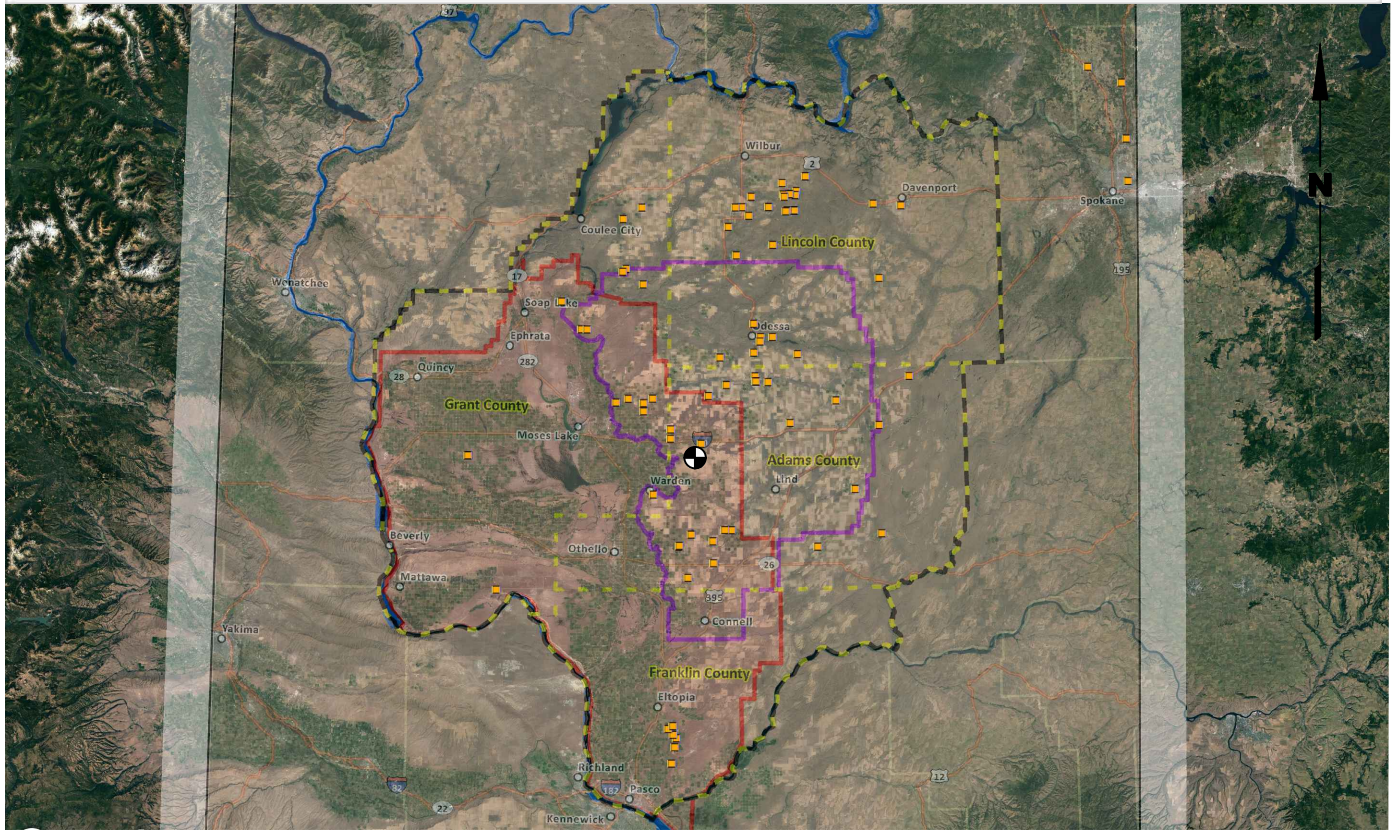
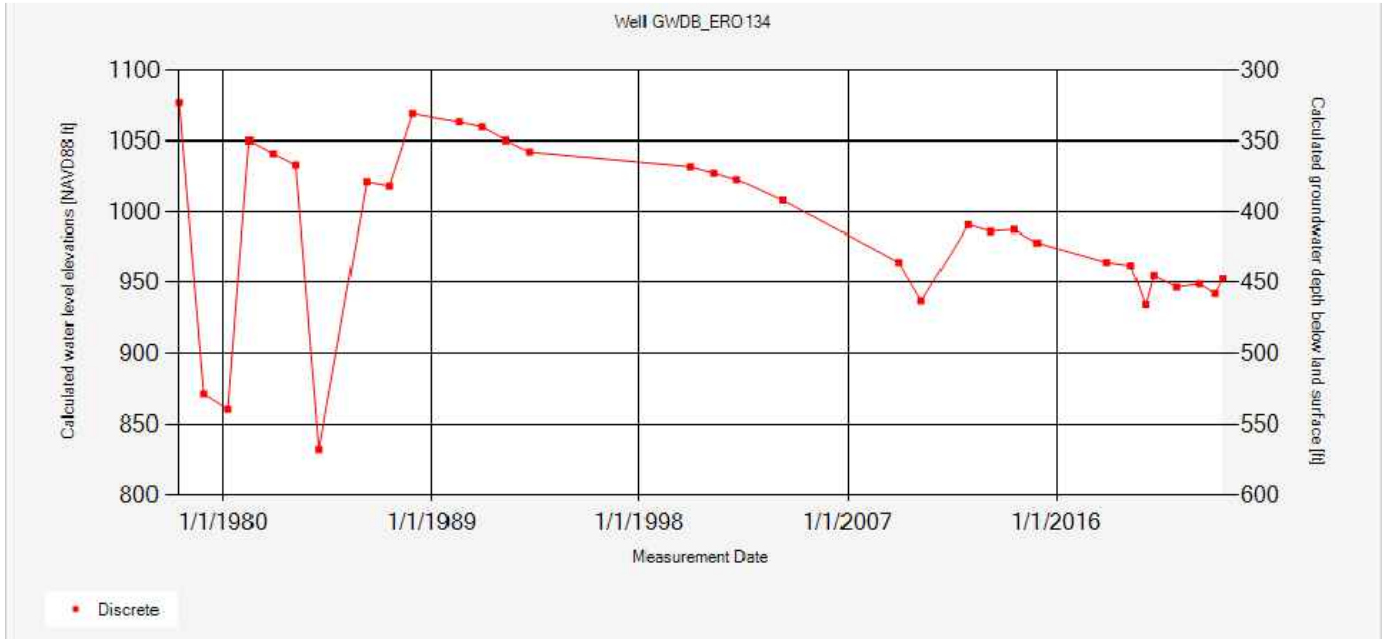


**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO192 Water Level Hydrograph**

Attachment  
**3-Q**





**Legend**

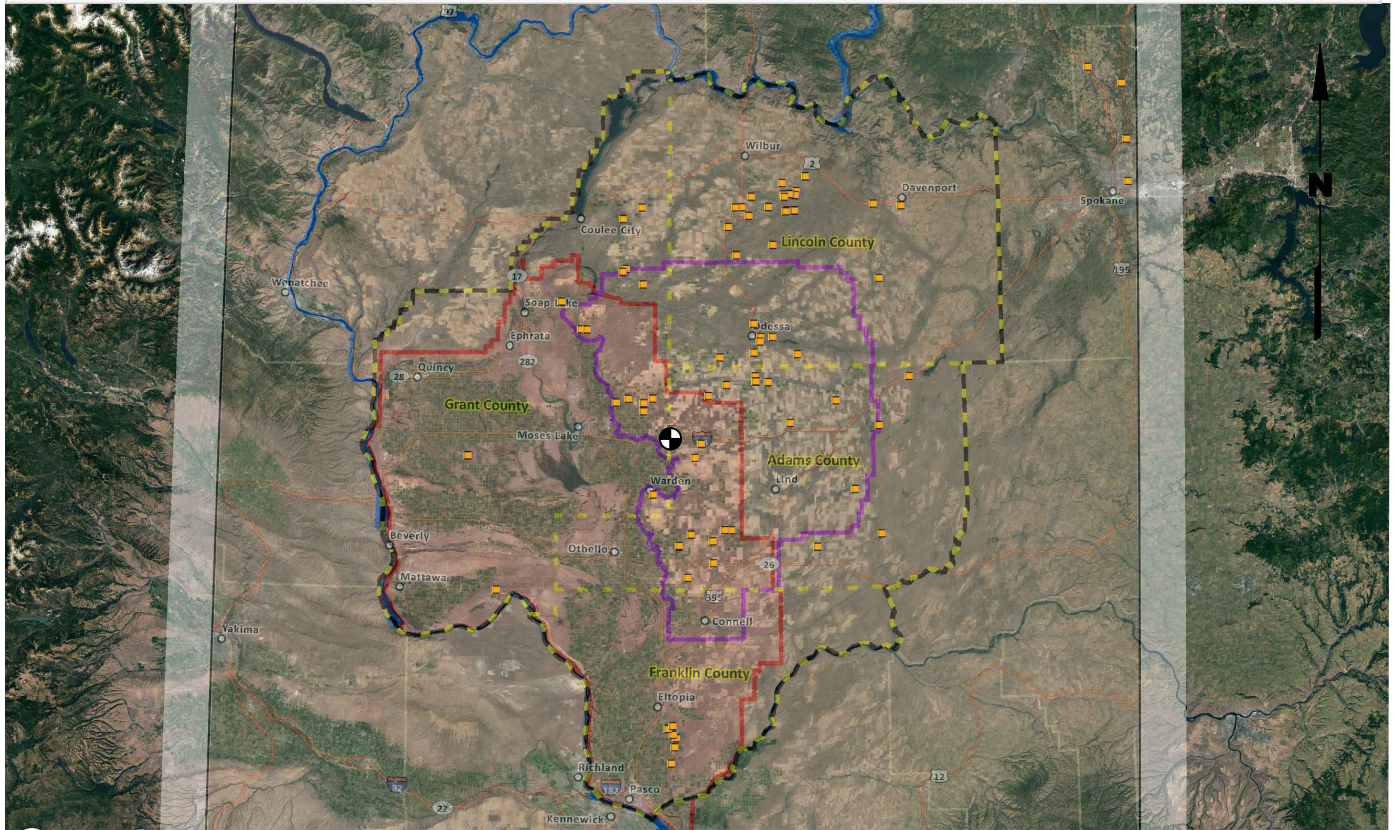
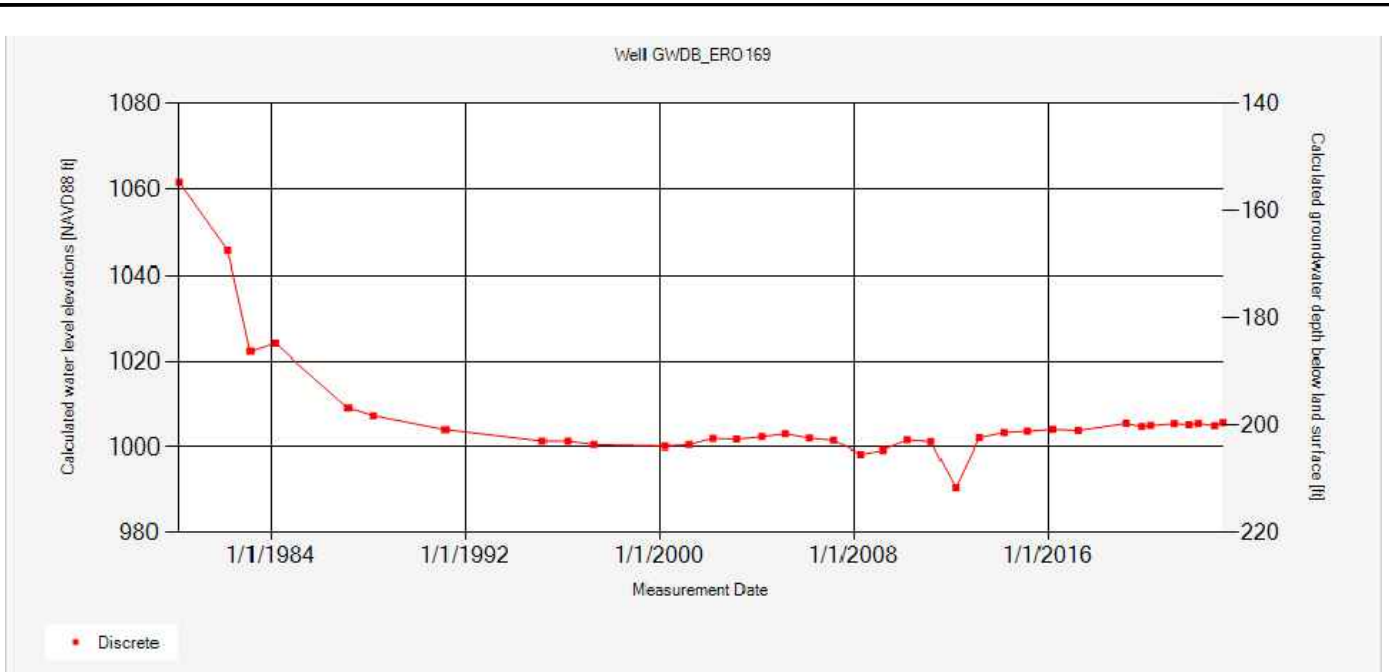
● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.





**Legend**

● Corresponding Well Location

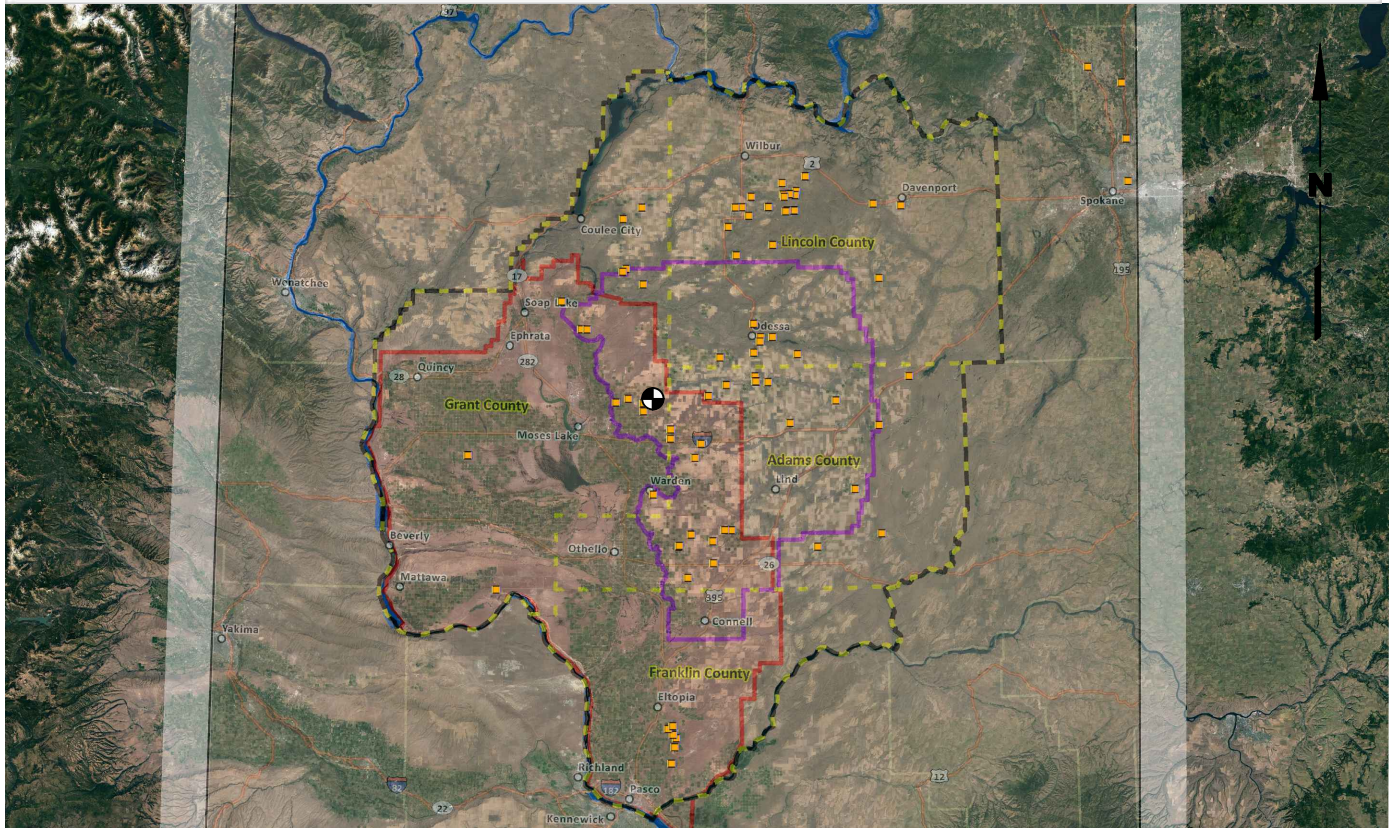
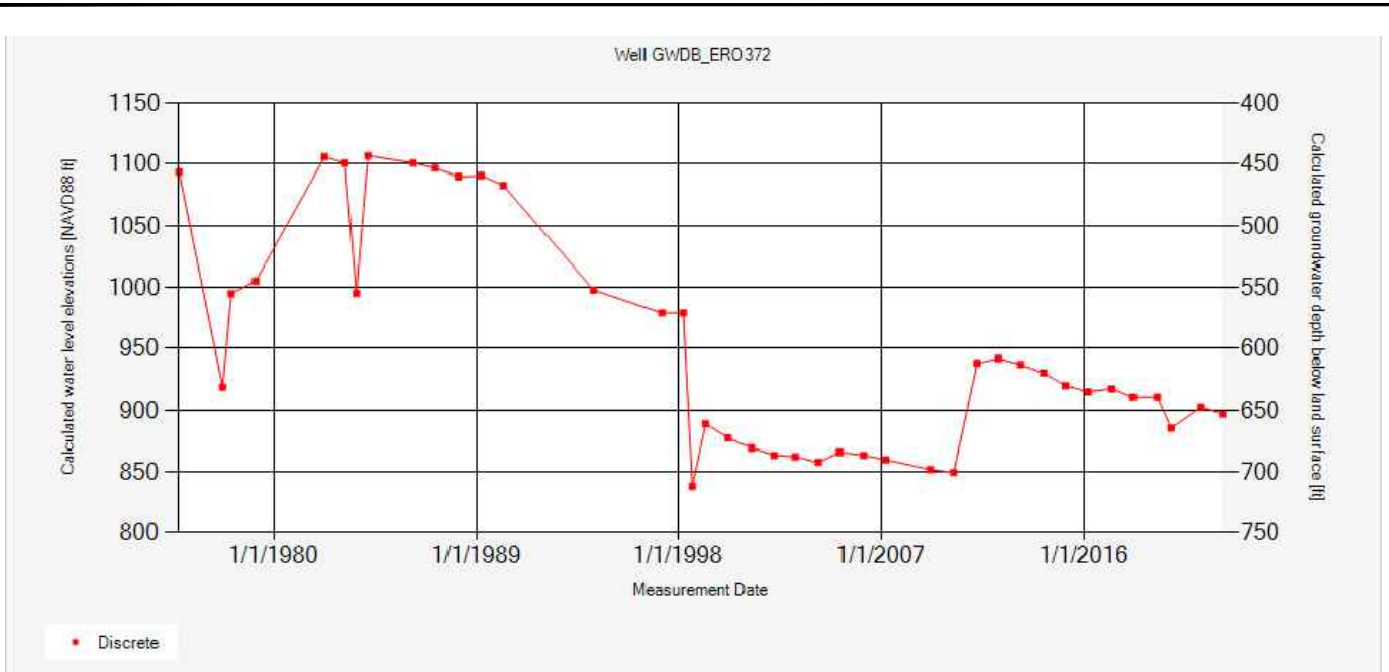


**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

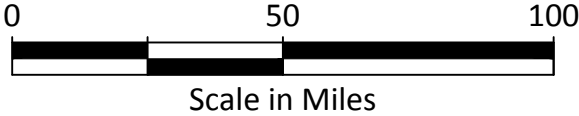


Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 6:57 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



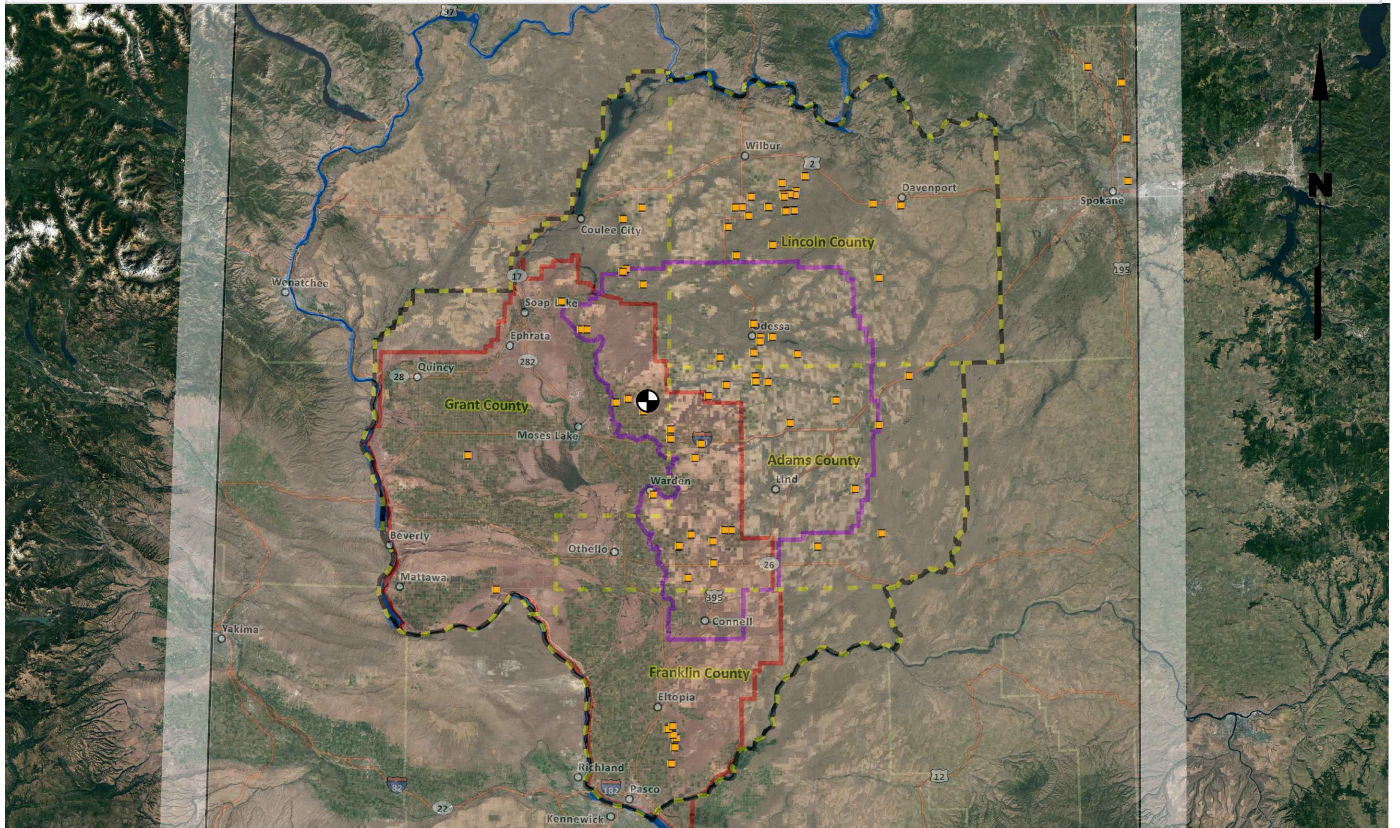
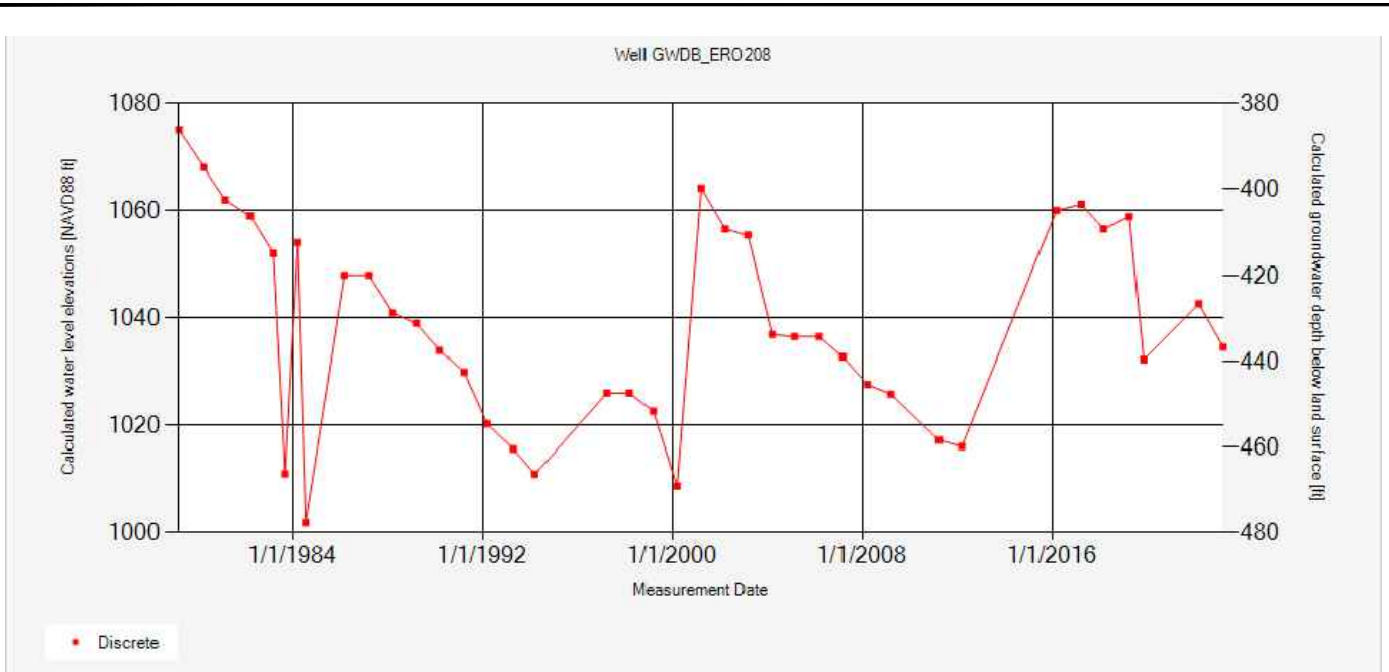
**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO372 Water Level Hydrograph**

Attachment  
**3-T**

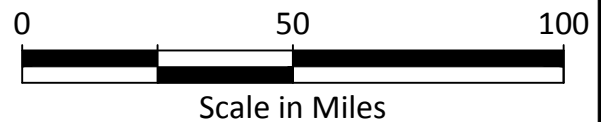


Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 7:00 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



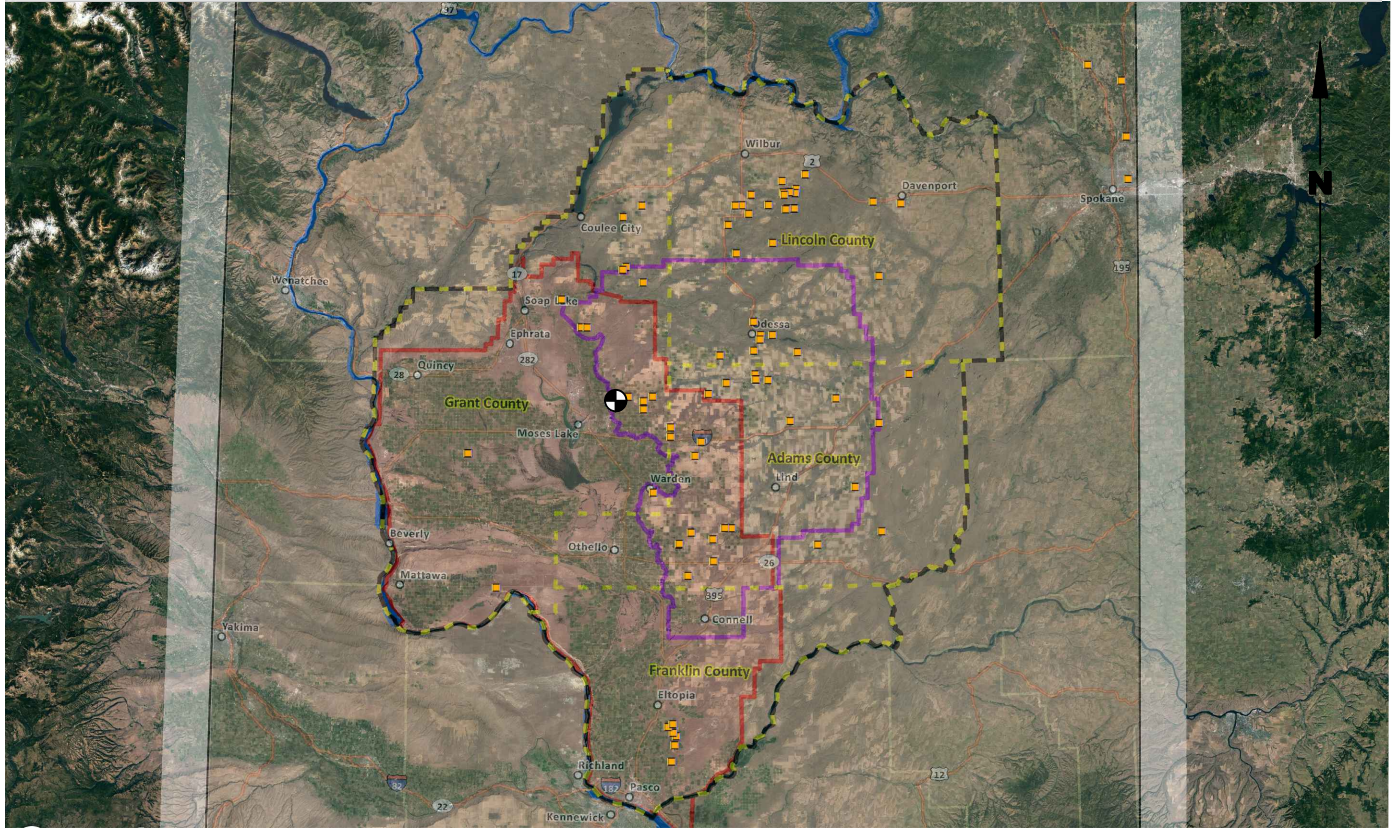
**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO208 Water Level Hydrograph**

Attachment  
**3-U**



Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 7:06 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



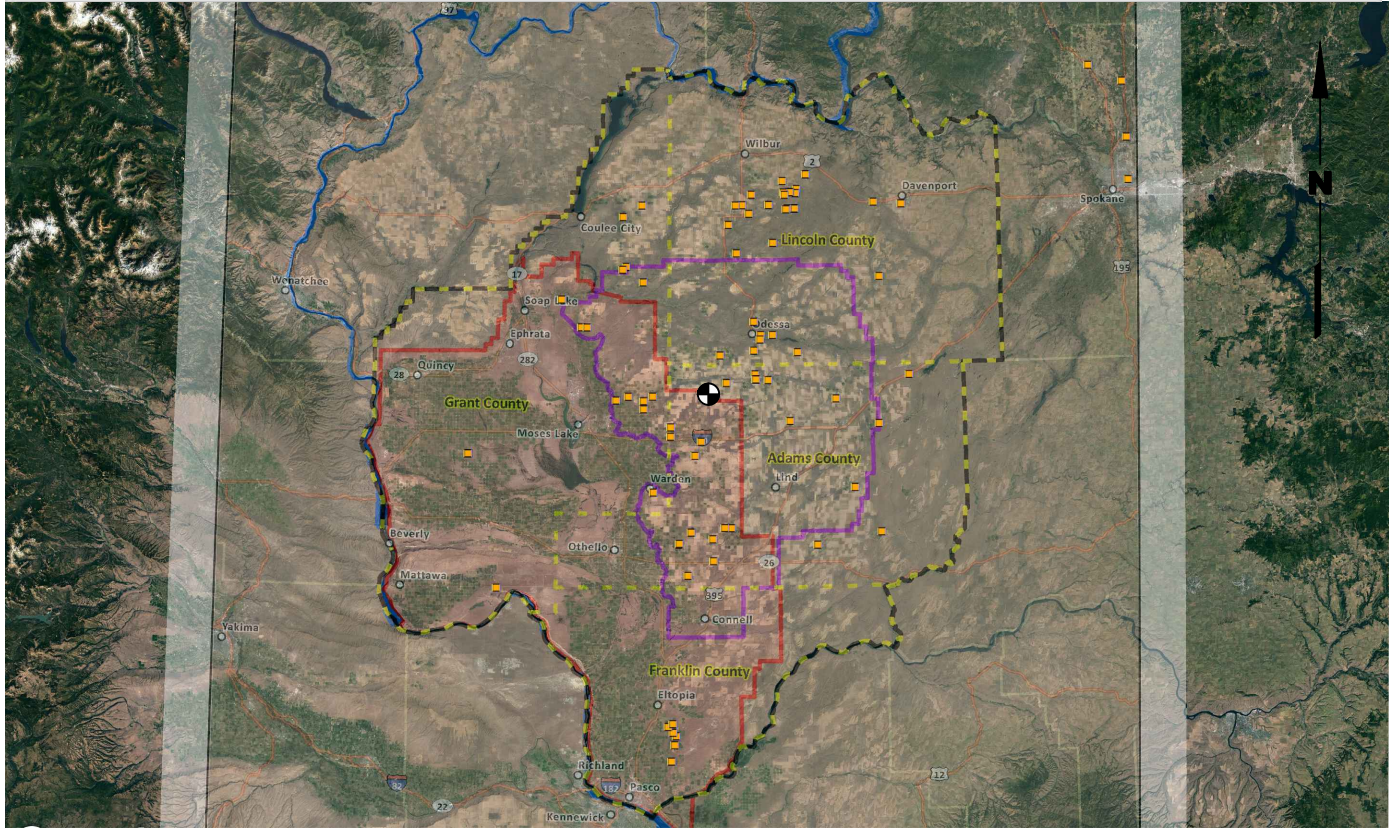
**CBSWC Preliminary Watershed Management Plan**  
Franklin, Lincoln, Adams, and Grant Counties, WA

**Ecology ERO Groundwater Monitoring**  
**ERO198 Water Level Hydrograph**

Attachment  
**3-V**

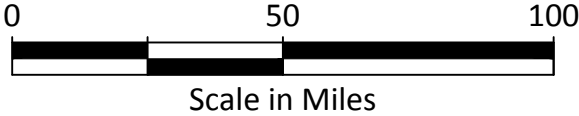


Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 7:10 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

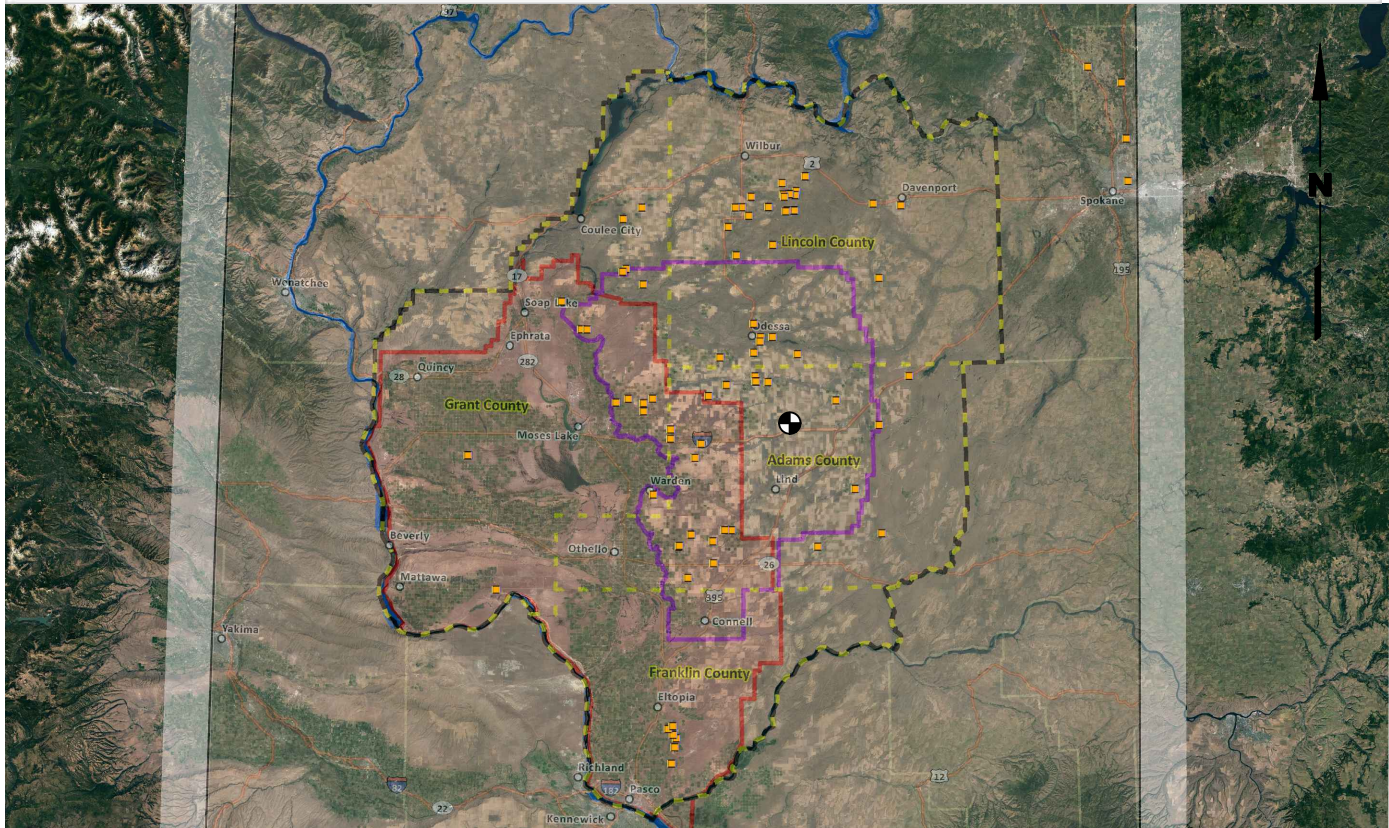
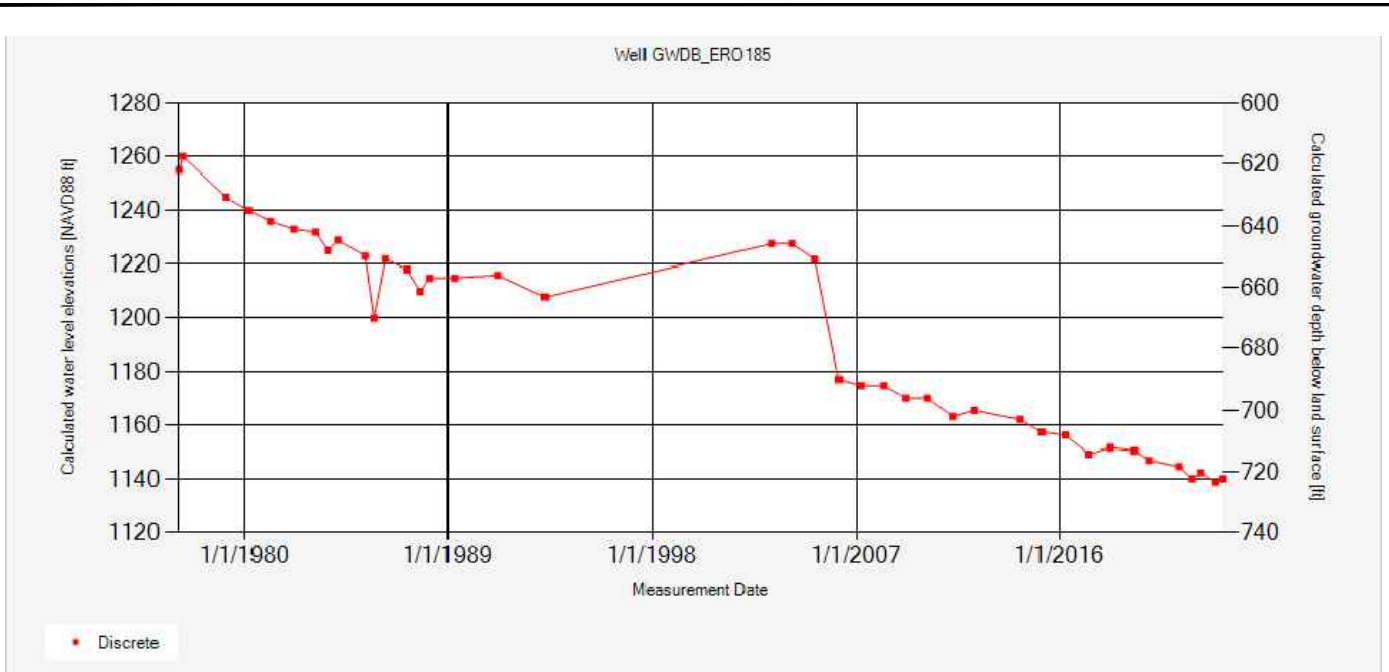
1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



<p>CBSWC Preliminary Watershed Management Plan Franklin, Lincoln, Adams, and Grant Counties, WA</p>	<p><b>Ecology ERO Groundwater Monitoring ERO219 Water Level Hydrograph</b></p>	<p>Attachment <b>3-W</b></p>
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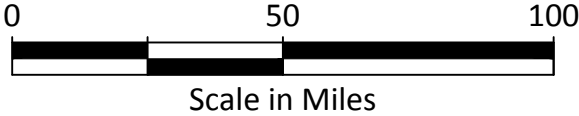


Landau Associates | Y:\2085\001\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/9/2023 7:14 PM | caduser



**Legend**

● Corresponding Well Location



**Note**

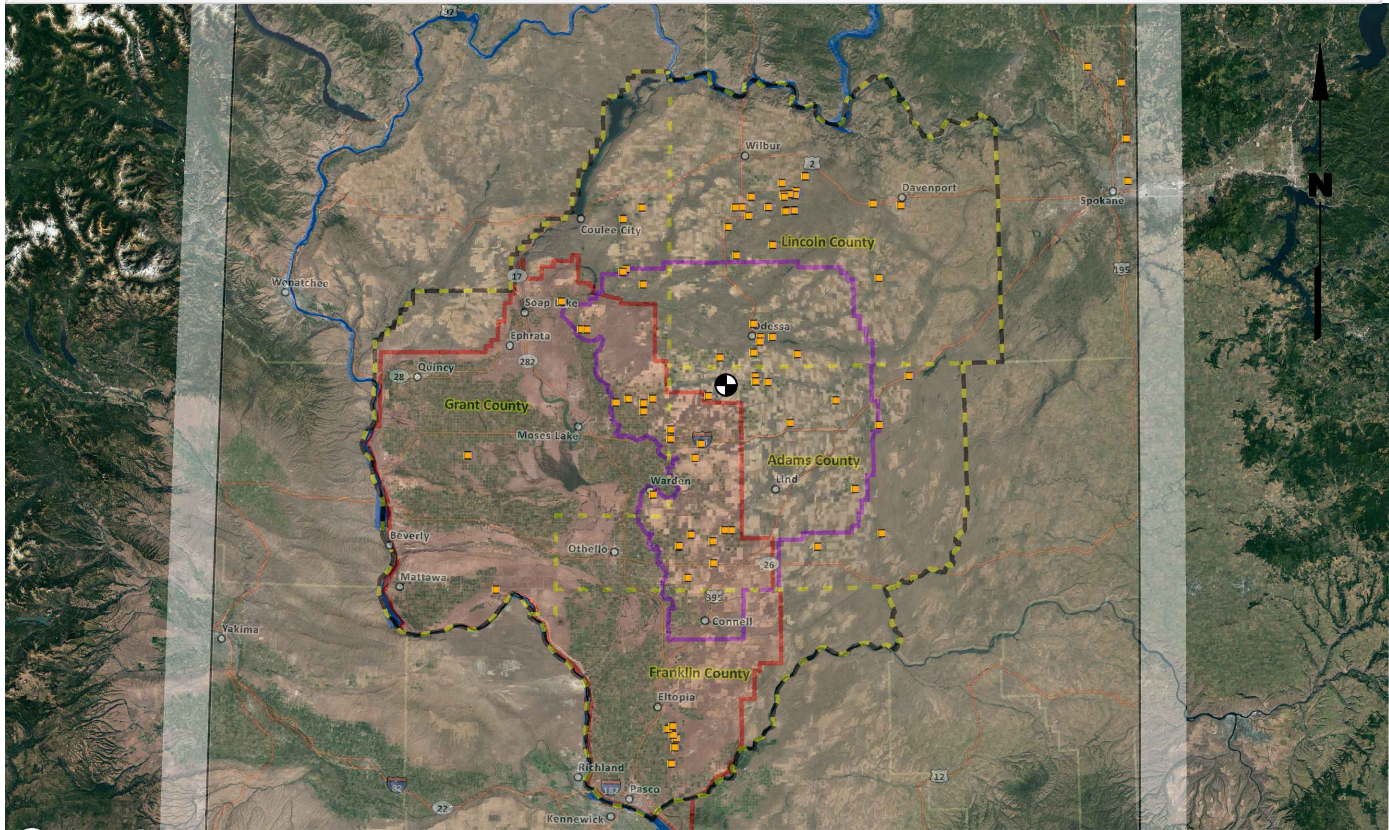
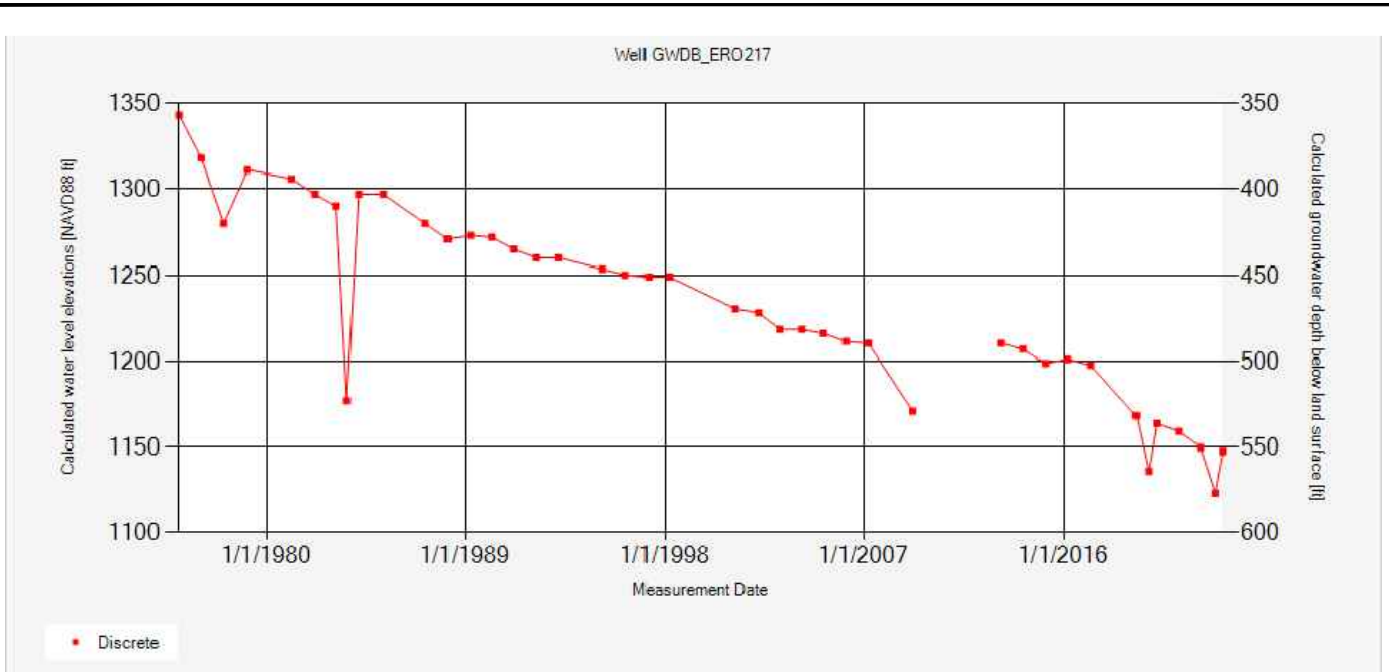
1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



<p>CBSWC Preliminary Watershed Management Plan Franklin, Lincoln, Adams, and Grant Counties, WA</p>	<p><b>Ecology ERO Groundwater Monitoring ERO185 Water Level Hydrograph</b></p>	<p>Attachment <b>3-X</b></p>
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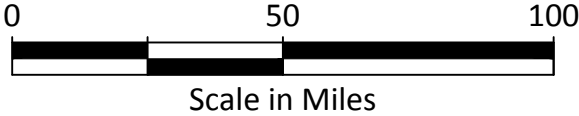


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**Legend**

● Corresponding Well Location



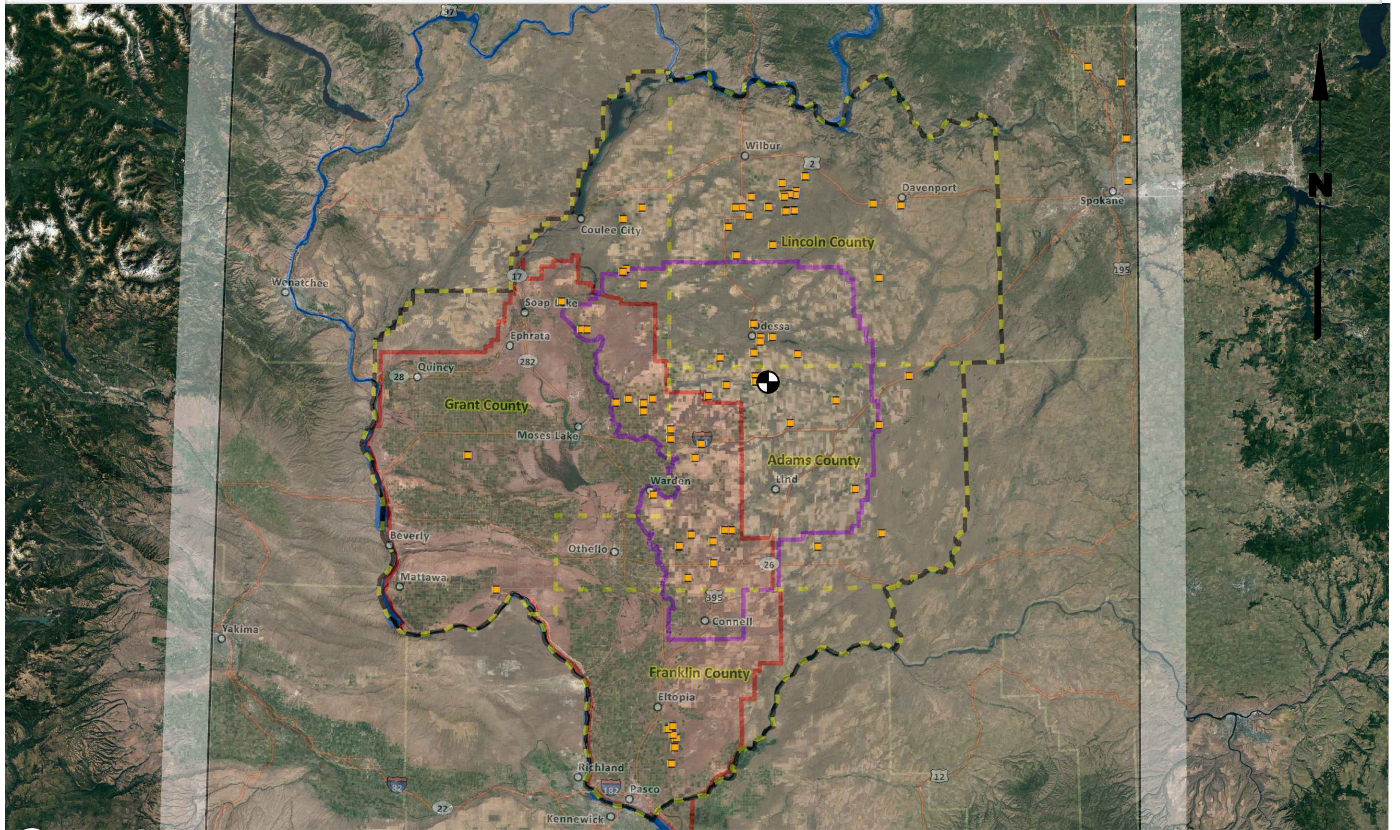
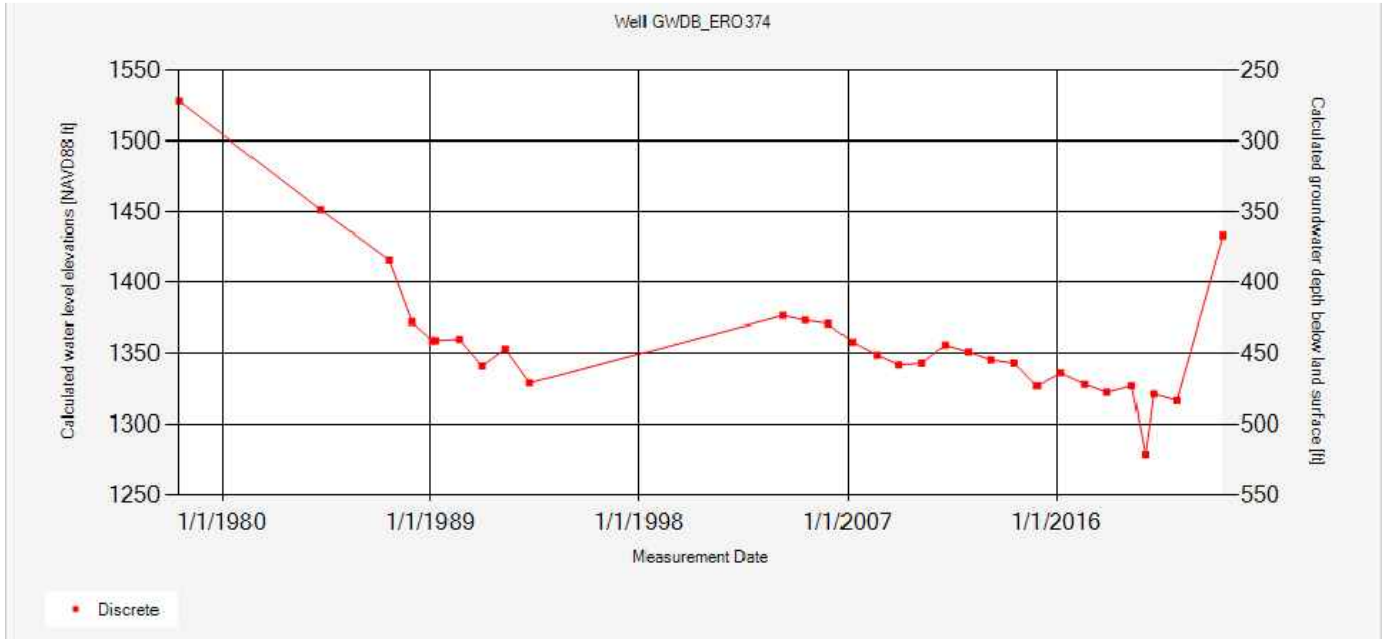
**Note**

1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



<p>CBSWC Preliminary Watershed Management Plan Franklin, Lincoln, Adams, and Grant Counties, WA</p>	<p><b>Ecology ERO Groundwater Monitoring ERO217 Water Level Hydrograph</b></p>	<p>Attachment <b>3-Y</b></p>
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**Legend**

● Corresponding Well Location



**Note**

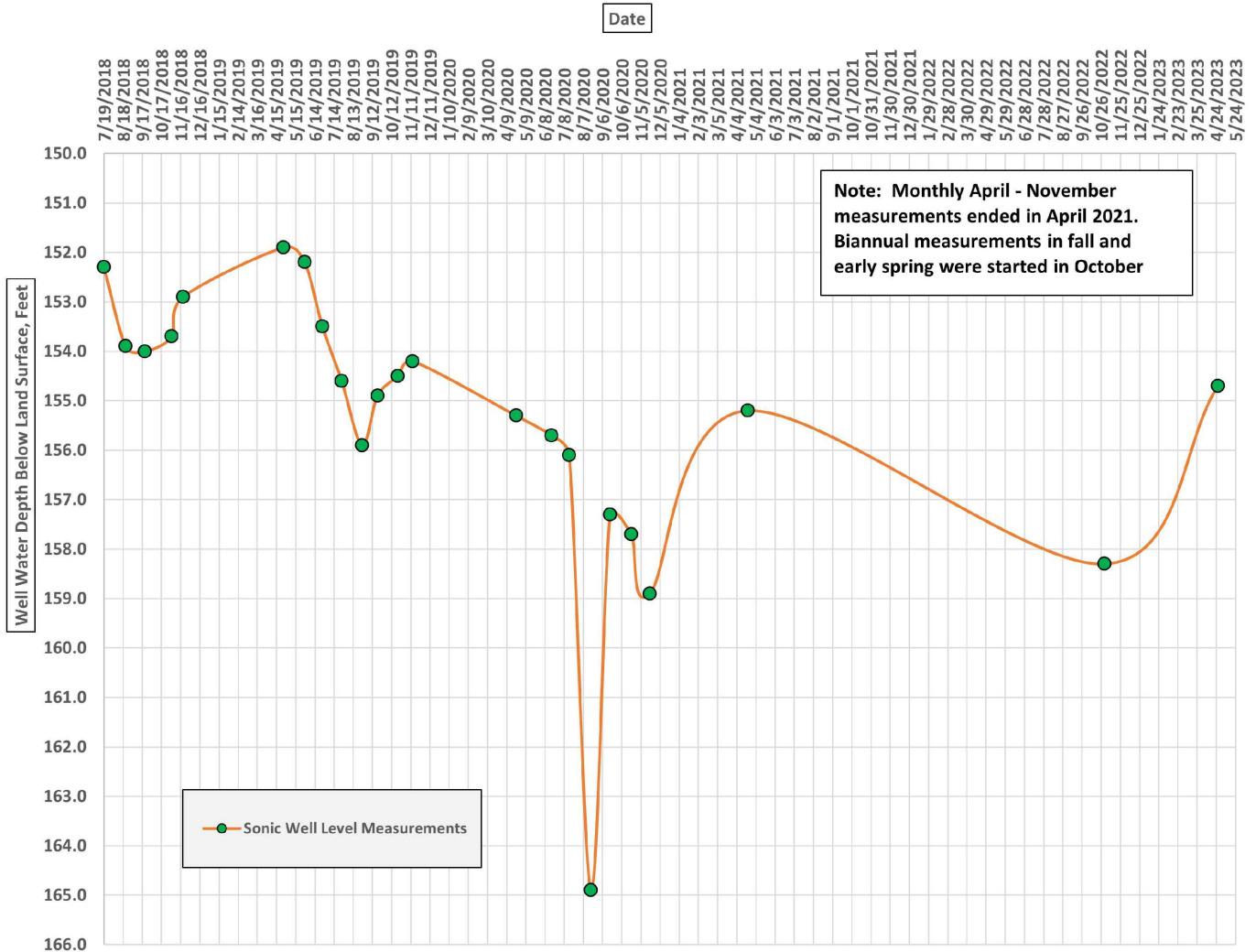
1. The water level hydrograph shown here was obtained from the Washington Department of Ecology Environmental Information Management (EIM) Database, accessed November 9, 2023.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



# Select Lincoln County Conservation District Monitoring Data

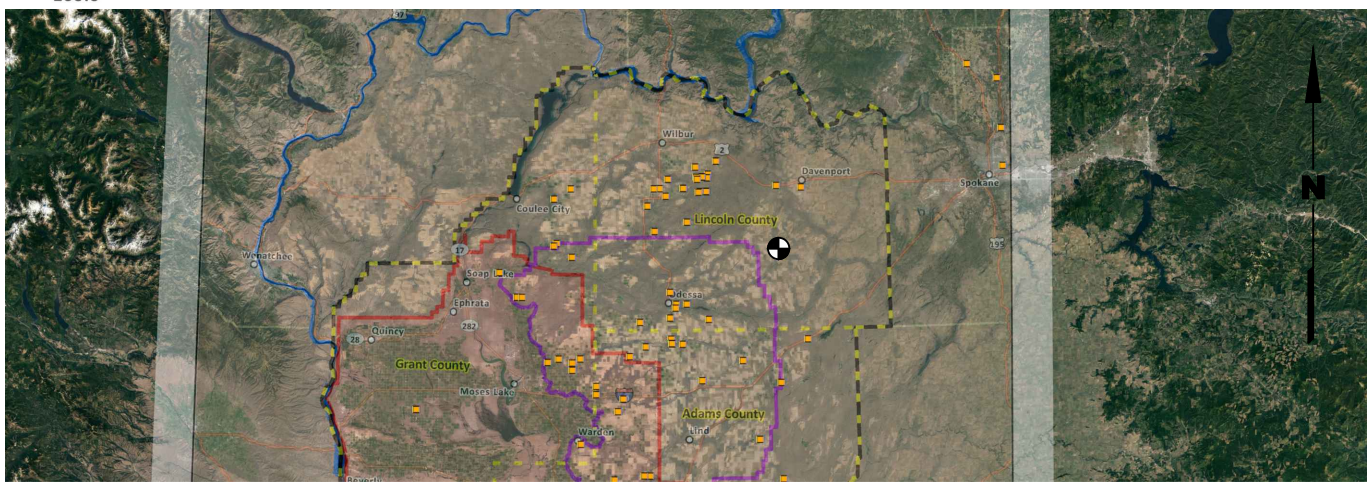
Sonic Meter Well Level Measurements for Domestic Well ALR010

7/19/2018 - 04/27/2023



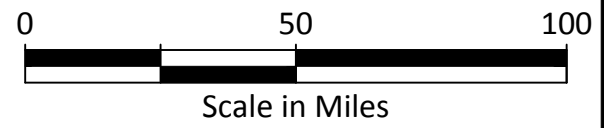
Note: Monthly April - November measurements ended in April 2021. Biannual measurements in fall and early spring were started in October

Sonic Well Level Measurements



Legend

● Corresponding Well Location



Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Landau Associates | Y:\2085\001\T\ERO Current Network Well Logs\Figures\Drawing1.dwg | 11/15/2023 3:10 PM | caduser



CBSWC Preliminary Watershed Management Plan  
Franklin, Lincoln, Adams, and Grant Counties, WA

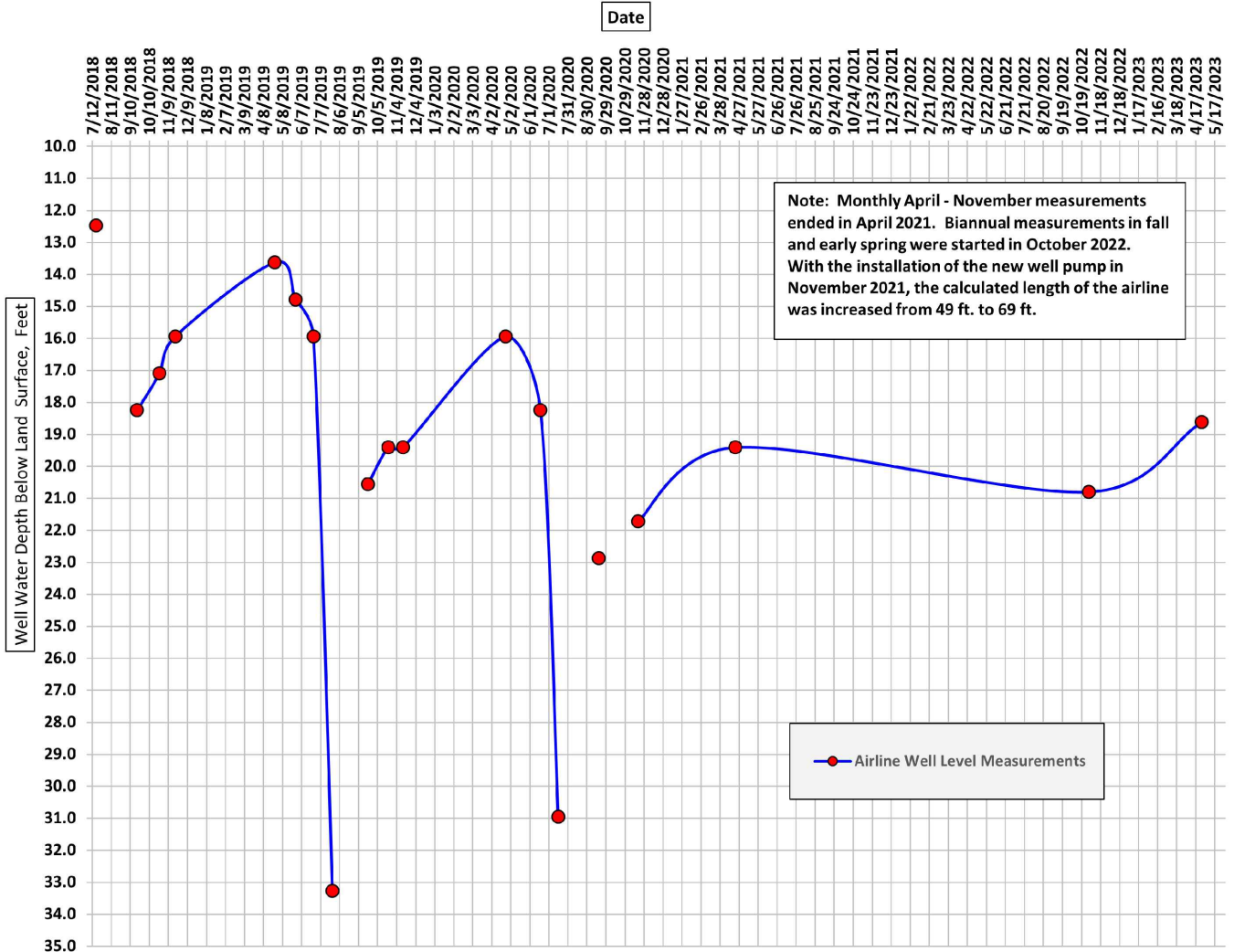
Lincoln County Conservation District  
ALR010 Water Level Hydrograph

Attachment  
3-AA



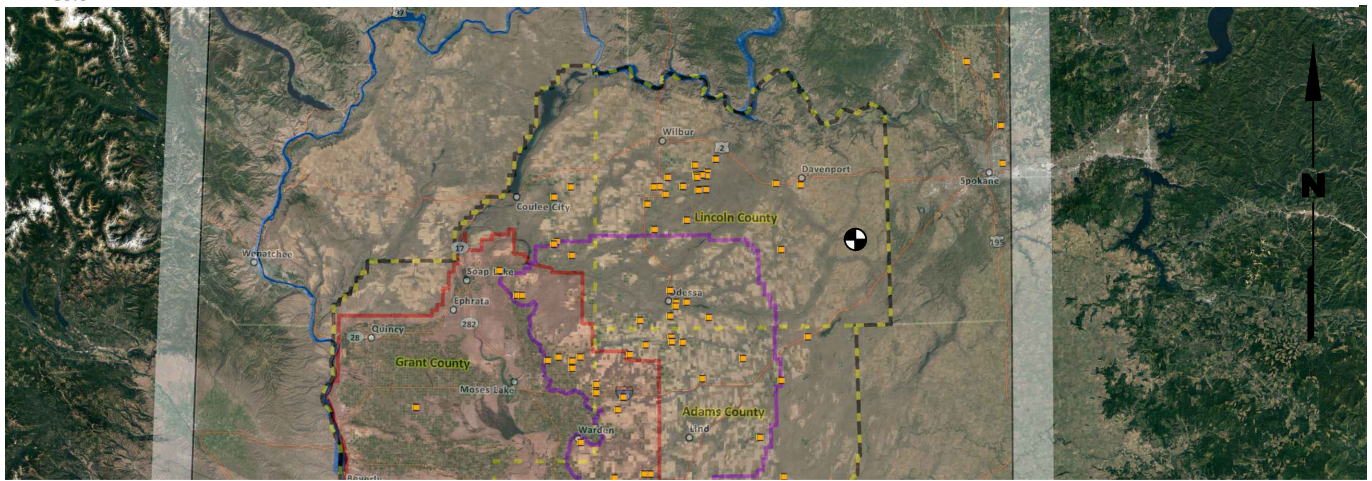
Airline Well Level Measurements for the Edwall #2 Municipal Well / APP852

7/12/2018 - 04/27/2023



Note: Monthly April - November measurements ended in April 2021. Biannual measurements in fall and early spring were started in October 2021. With the installation of the new well pump in November 2021, the calculated length of the airline was increased from 49 ft. to 69 ft.

● Airline Well Level Measurements



Legend

● Corresponding Well Location

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

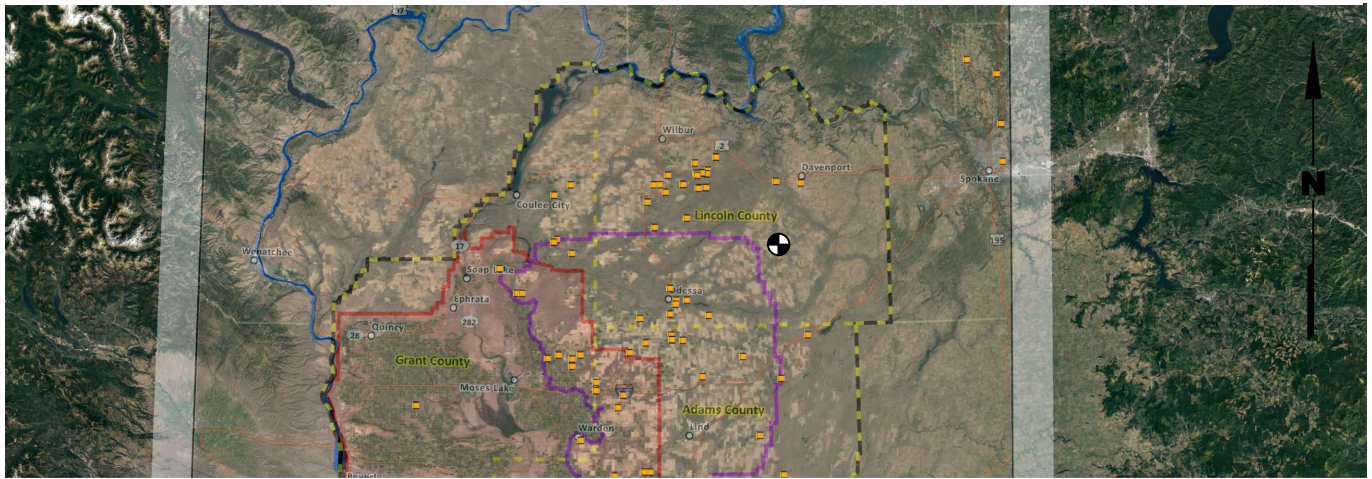
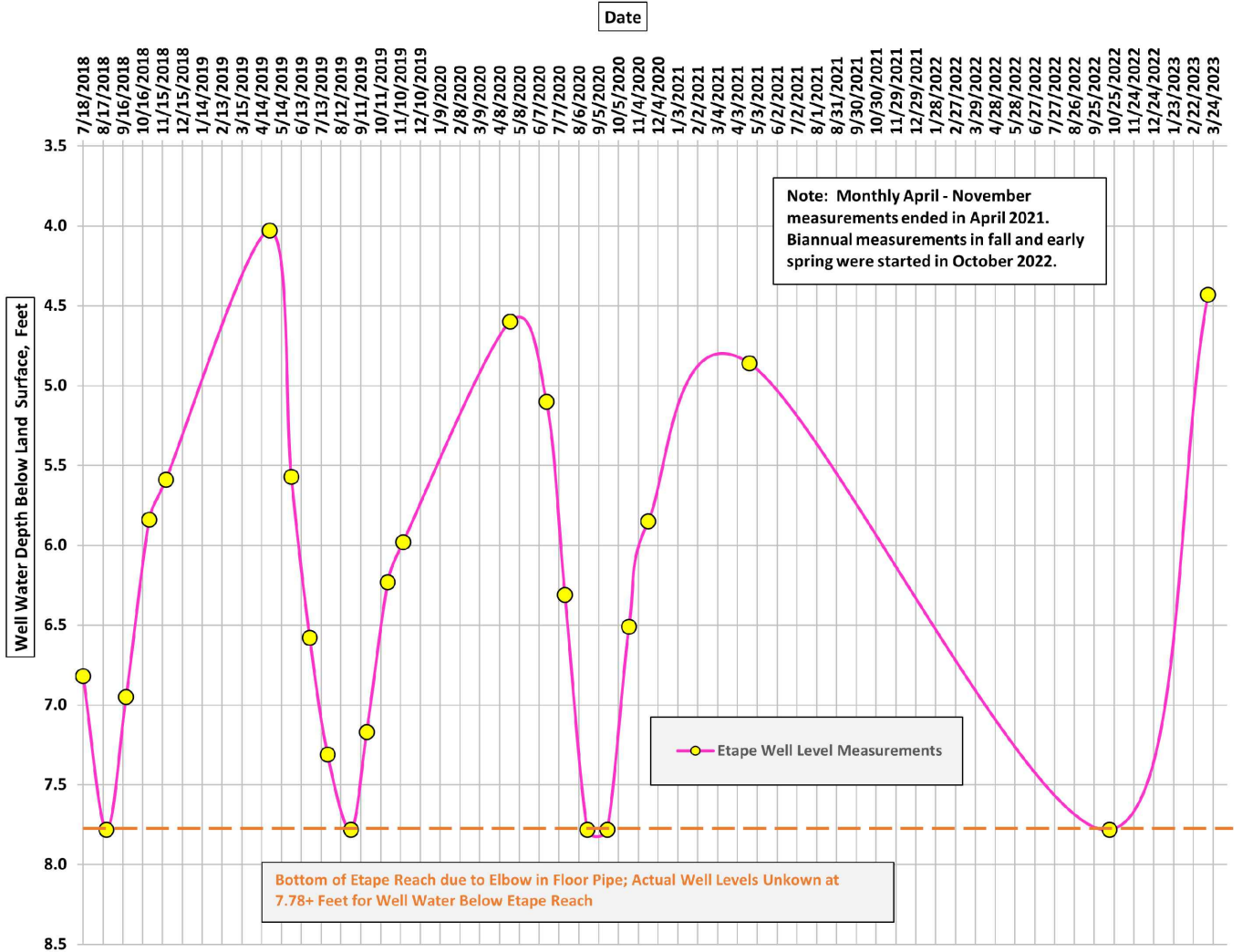
CBSWC Preliminary Watershed Management Plan  
Franklin, Lincoln, Adams, and Grant Counties, WA

Lincoln County Conservation District  
APP852 Water Level Hydrograph

Attachment  
3-AB

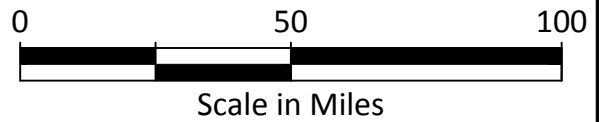
Etape Well Level Measurements for the Harrington #1 Municipal Well

7/18/2018 - 03/16/2023



Legend

● Corresponding Well Location



Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

CBSWC Preliminary Watershed Management Plan  
Franklin, Lincoln, Adams, and Grant Counties, WA

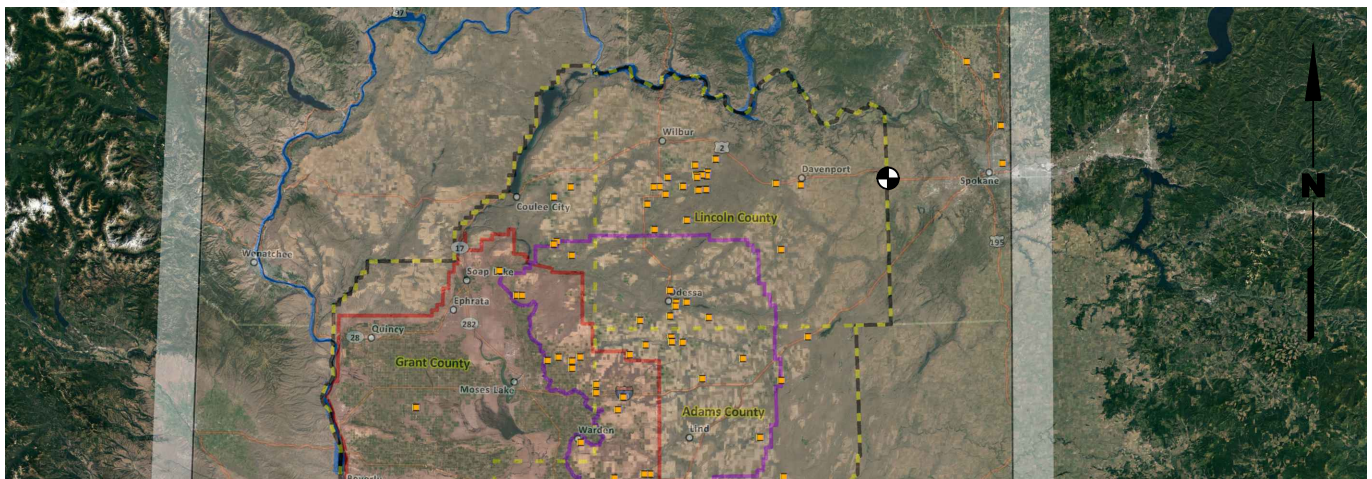
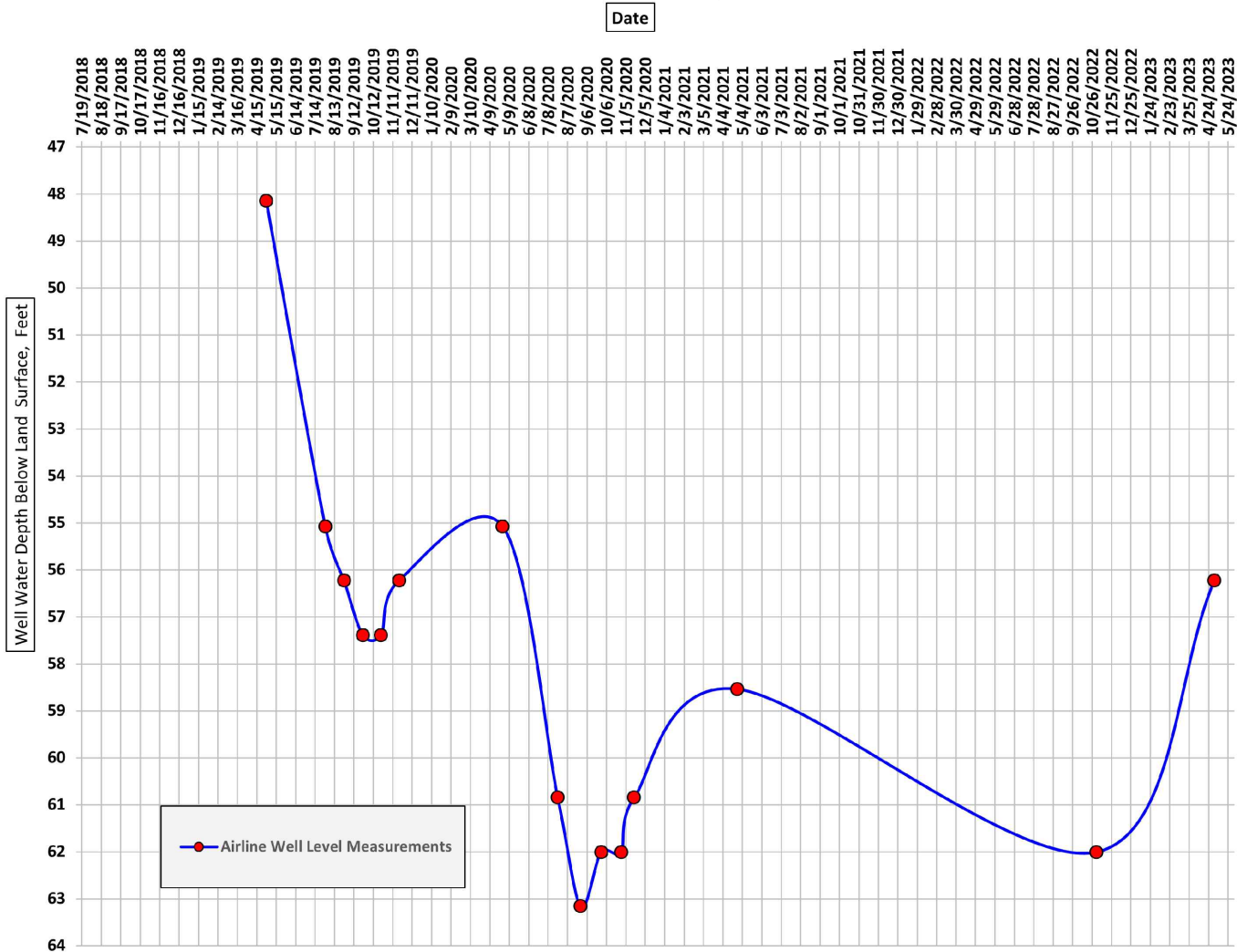
Lincoln County Conservation District  
ABR765 Water Level Hydrograph

Attachment  
3-AC



Airline Well Level Measurements for the Reardan - Euclid Road Municipal Well / ABR822

7/19/2018 - 05/03/2023



Legend

● Corresponding Well Location



Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

CBSWC Preliminary Watershed Management Plan  
Franklin, Lincoln, Adams, and Grant Counties, WA

Lincoln County Conservation District  
ABR822 Water Level Hydrograph

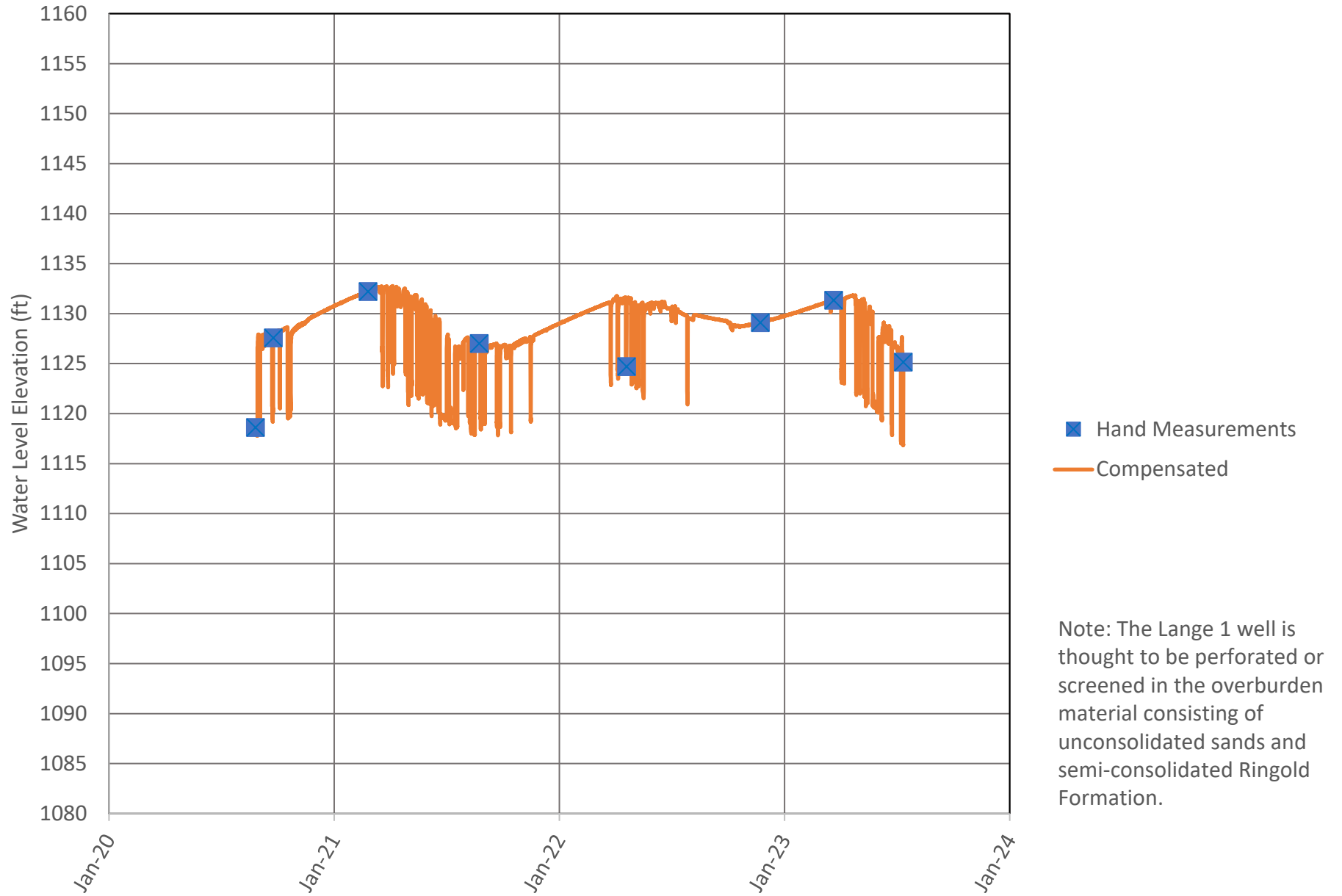
Attachment  
3-AD



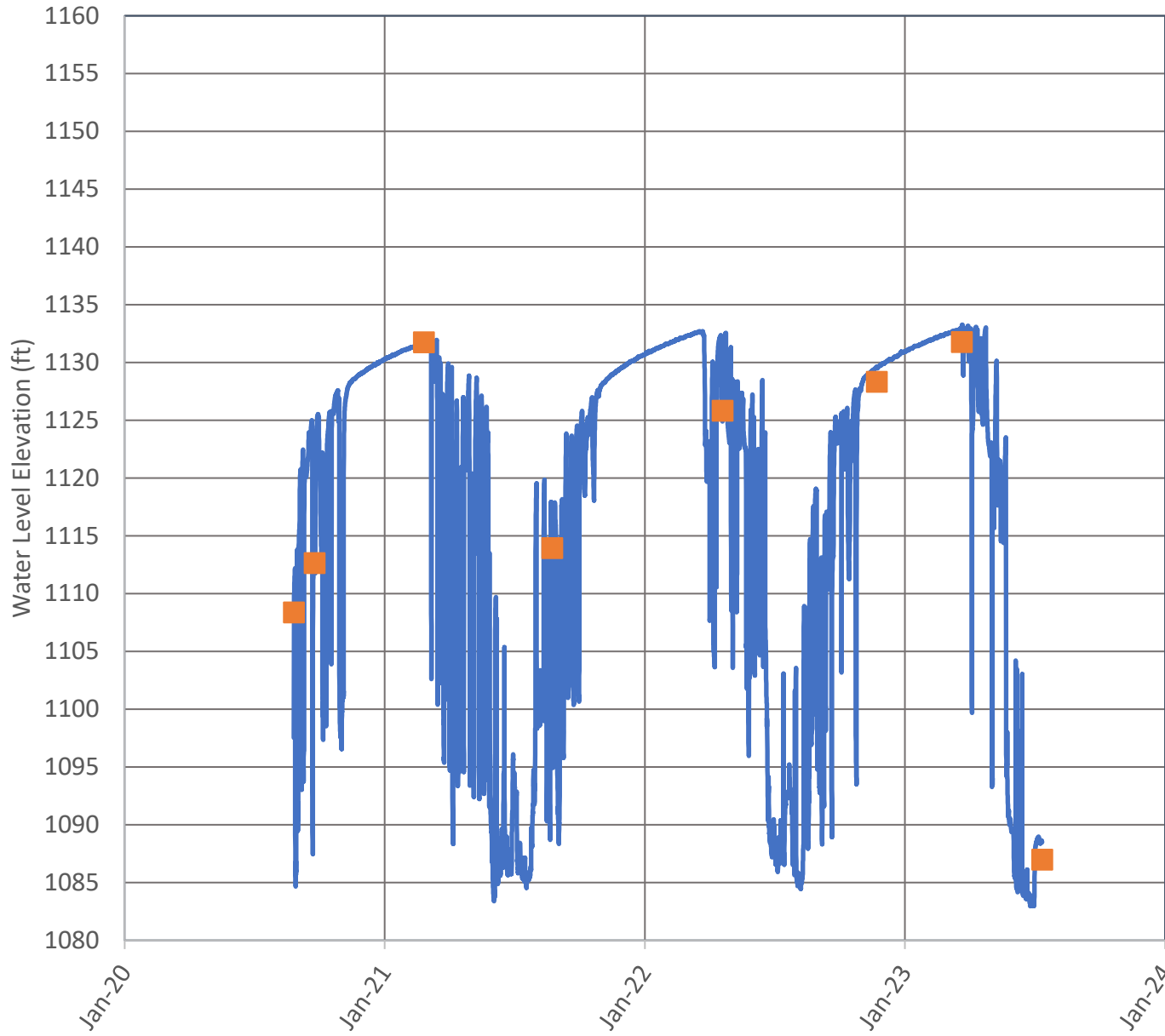
# Select Black Sands Irrigation District Monitoring Data



# Lange 1



# Weber

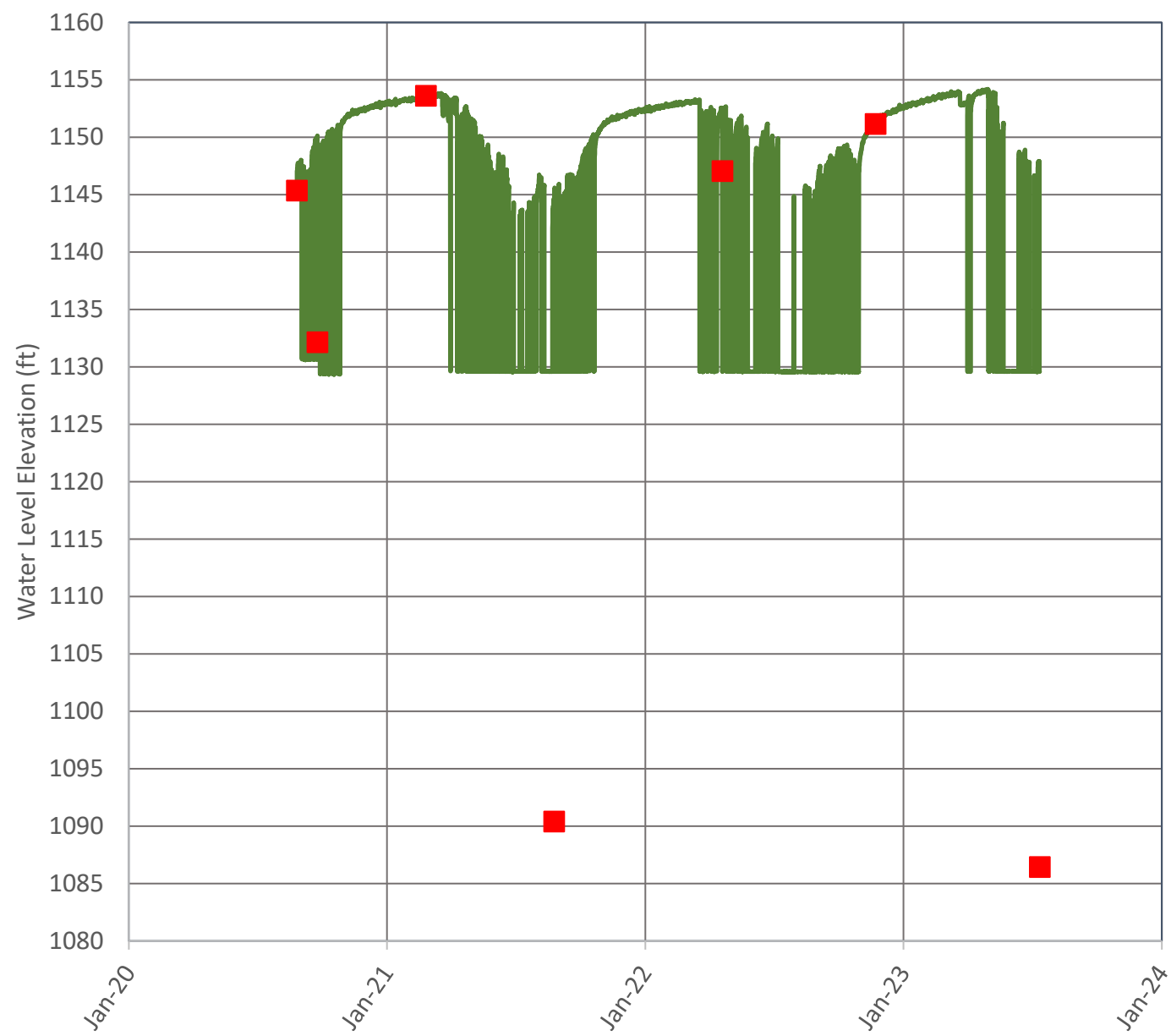


Hand Measurements  
Compensated

Note: The Weber well is thought to be perforated or screened in the overburden material consisting of unconsolidated sands and semi-consolidated Ringold Formation.



### Williamson



■ Hand Measurements  
— Compensated

Note: The Williamson well is thought to be perforated or screened in the overburden material consisting of unconsolidated sands and semi-consolidated Ringold Formation.

# **Alternatives — Conceptual Illustrations**



## // Alternatives for CBSWC Consideration

Three Types of Water Resource Management Alternatives:

- ▲ Project Alternatives (Alternative Group A)
- ▲ Tool Alternatives (Alternative Group B)
- ▲ Planning Alternatives (Alternative Group C)



# // Alternatives for CBSWC Consideration – Project Alternatives

## Project Alternatives:

- ▲ A1: Odessa Groundwater Replacement Program
- ▲ A2: Full Columbia Basin Project Completion
- ▲ A3: Water Conservation
- ▲ A4: Aquifer Recharge by Passive Rehydration
- ▲ A5: Aquifer Recharge by Deep Well Injection Network
- ▲ A6: New Source Treatment and Regional Distribution





# // Alternatives for CBSWC Consideration – Project Alternatives

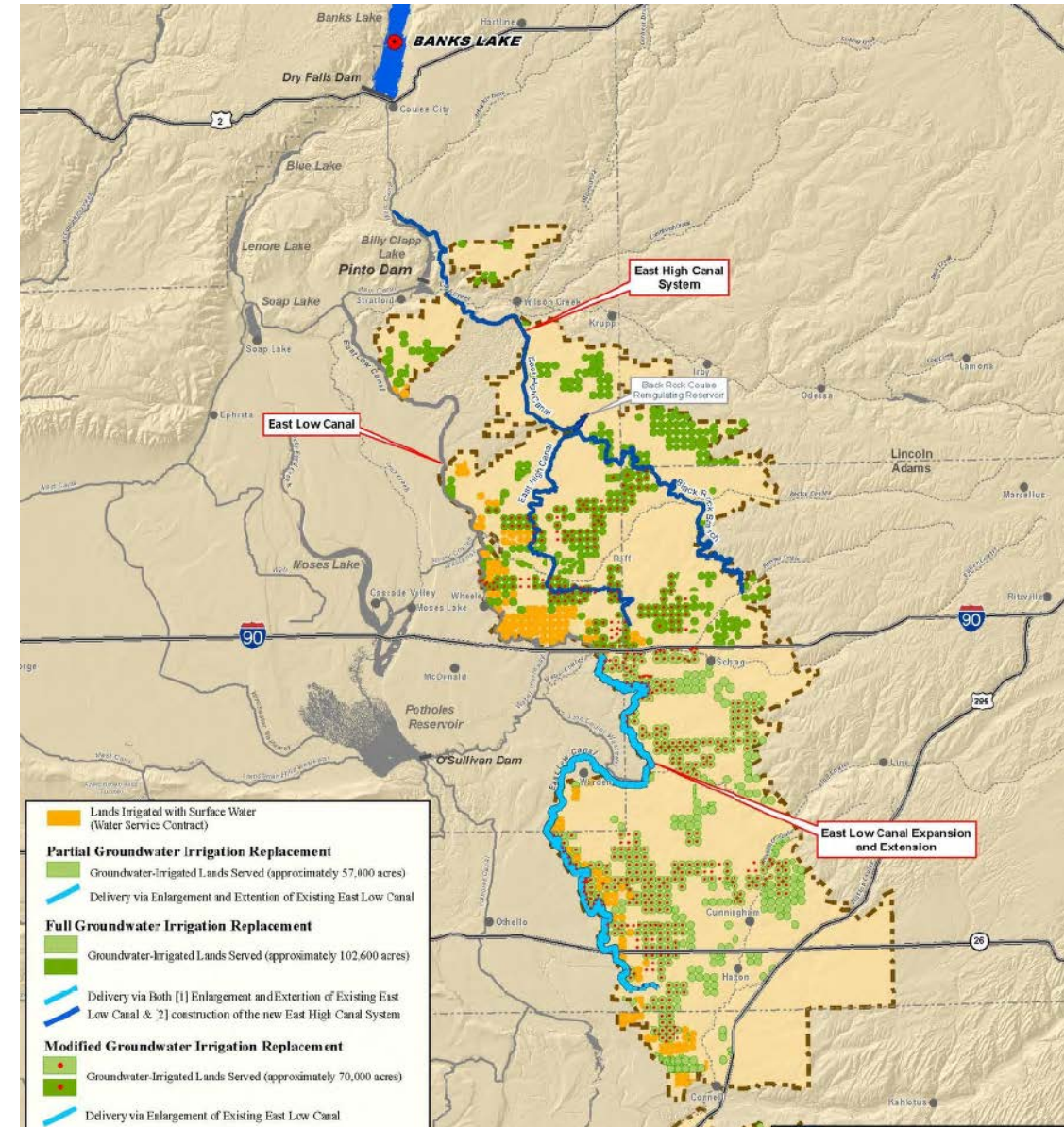
## A1: Odessa Groundwater Replacement Program (OGWRP)

### ▲ Benefits:

- Reduce groundwater pumping for irrigation of up to 80,000 acres
- Planned and permitted, partially funded
- Construction is in process

### ▲ Challenges:

- Limited to Odessa Subarea Special Study Area (western Odessa subarea)
- Requires multiple pump stations





# // Alternatives for CBSWC Consideration – Project Alternatives

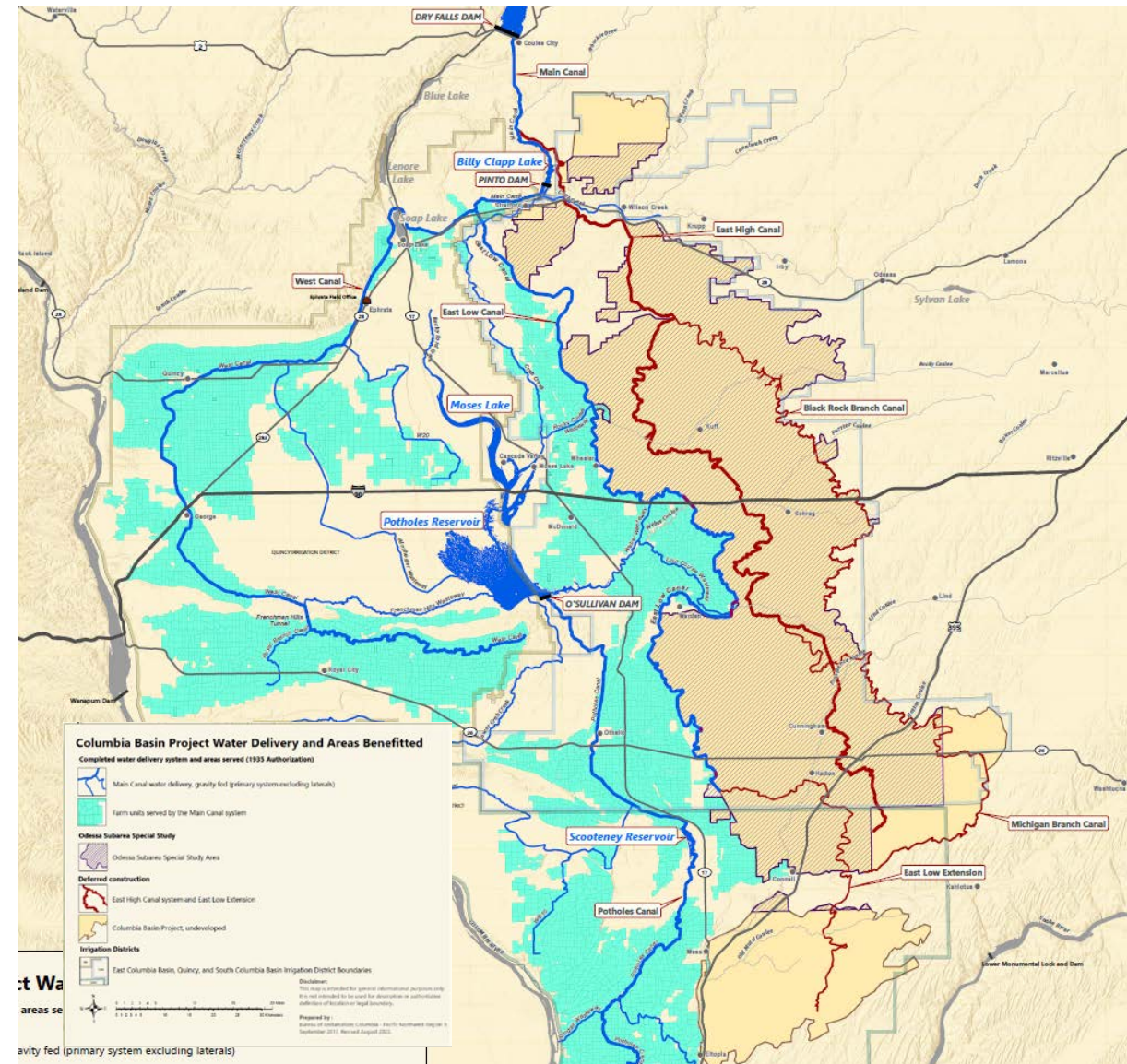
## A2: Full Columbia Basin Project Completion

### ▲ Benefits :

- Reduce groundwater pumping for irrigation of 100,000 acres
- Potential for serving irrigation and communities further east, compared to OGWRP
- Fewer pump stations, than gravity

### ▲ Challenges :

- High Cost
- Needs permitting (secondary use water rights, EIS, etc.)
- Long timeframe for completion





# // Alternatives for CBSWC Consideration – Project Alternatives

## A3: Water Conservation (widespread)

### ▲ Benefits :

- Can stretch existing supplies
- Can be implemented now

### ▲ Challenges :

- Public perception/ unpopular
- No current regional mechanism for coordinated conservation



# // Alternatives for CBSWC Consideration – Project Alternatives

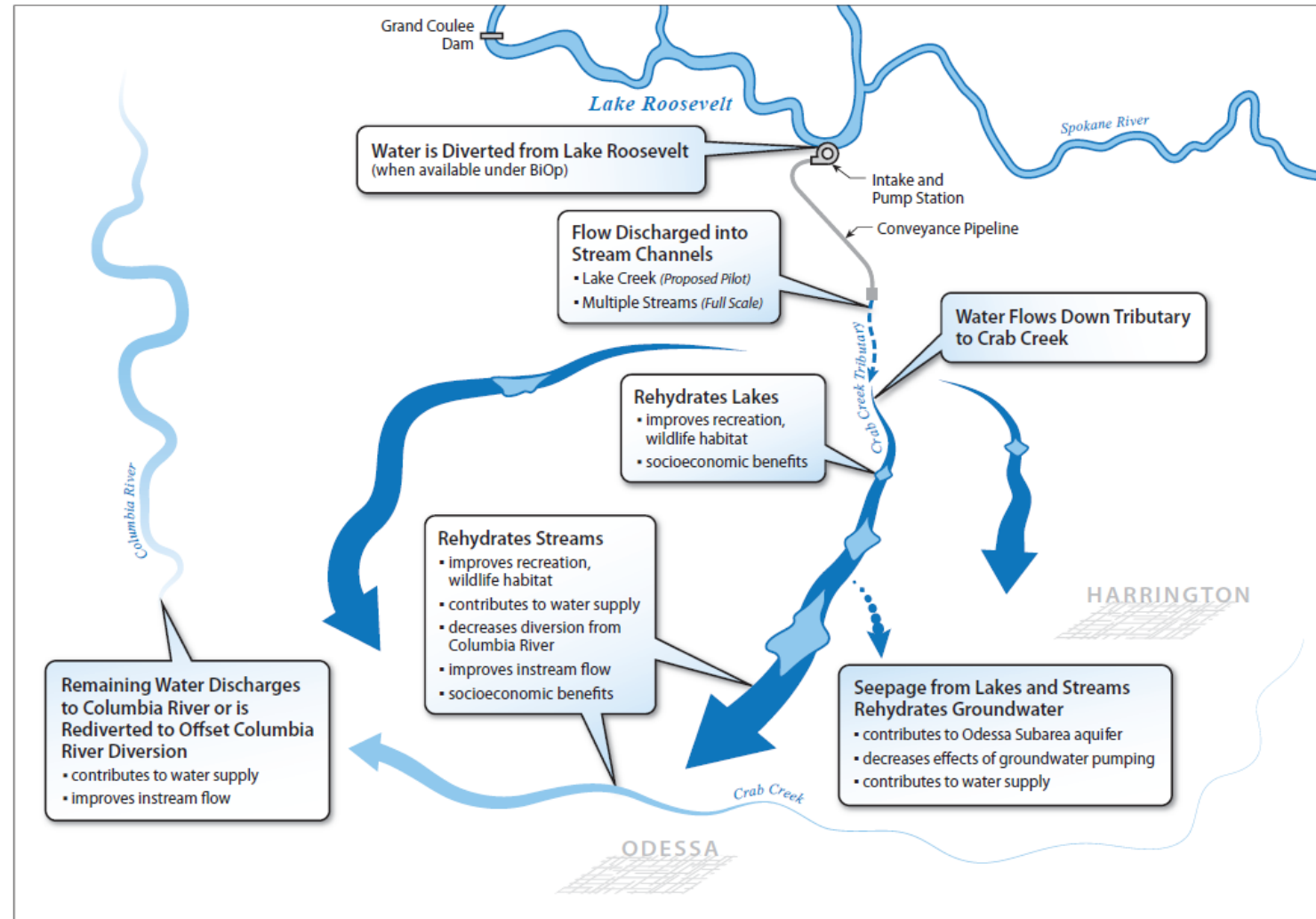
## A4: Aquifer Recharge by Passive Rehydration

### ▲ Benefits :

- Replenish aquifer over time
- Allow use of existing muni wells/pumps (when aquifer is recharged)
- Minimal water quality treatment

### ▲ Challenges :

- Long timeframe
- Not fully efficient (could be a benefit)
- Undefined source
- Studied preliminarily but needs additional study



From: LCCD/GSI/HDR/WNR 2011 – Prefeasibility Assessment Report

Lincoln County Passive Rehydration Project  
Conceptual Schematic Diagram





# // Alternatives for CBSWC Consideration – Project Alternatives

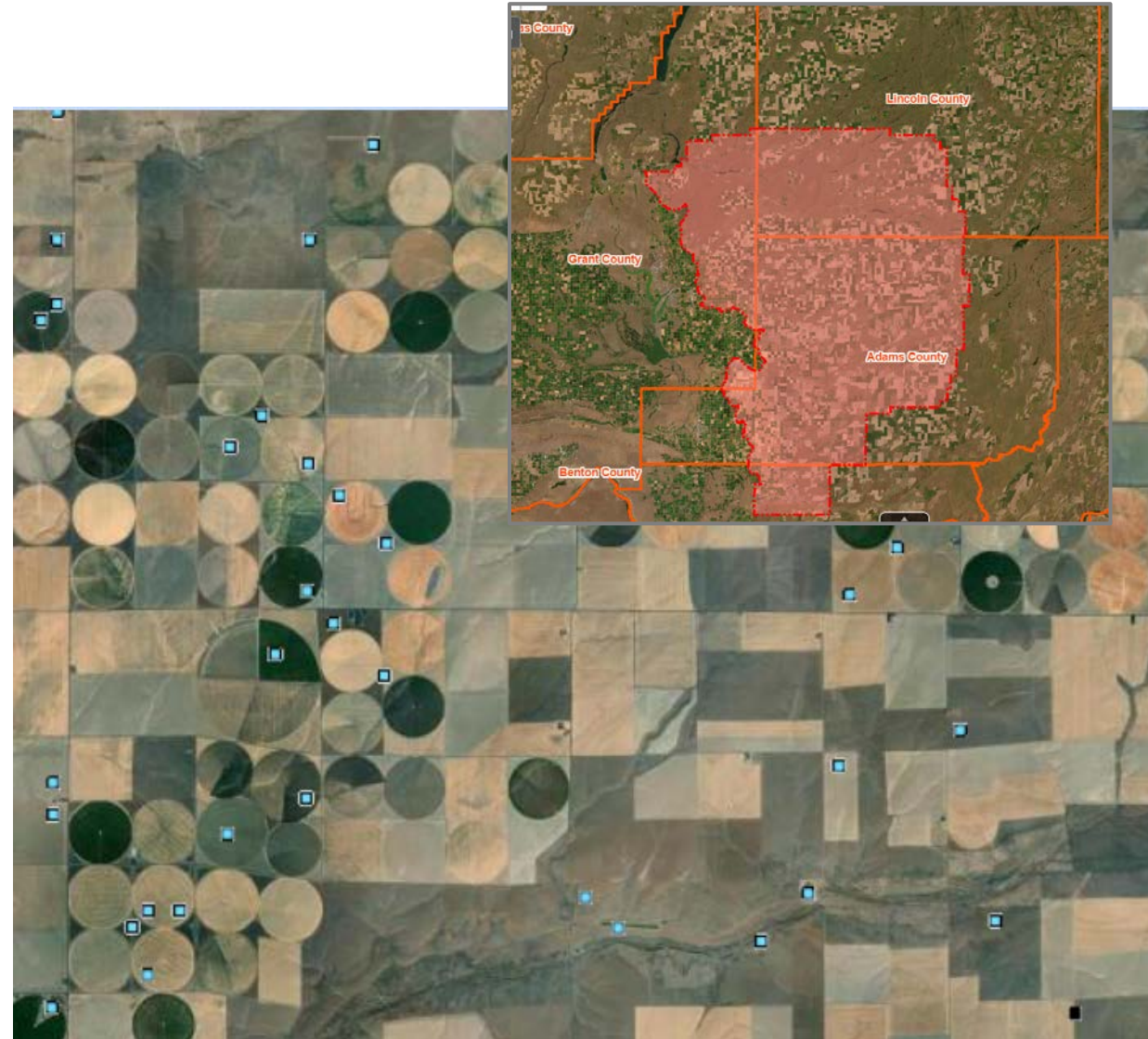
## A5: Aquifer Recharge by Deep Well Injection Network

### ▲ Benefits :

- Replenish aquifer over time
- Allow use of existing muni wells/pumps (when aquifer is recharged)
- Shorter timeframe (compared to passive rehydration)

### ▲ Challenges :

- Not fully efficient (could be a benefit)
- Undefined source
- Needs feasibility study
- Significant water quality treatment
- Permitting not defined



From: Ecology Online Well Log Viewer



# // Alternatives for CBSWC Consideration – Project Alternatives

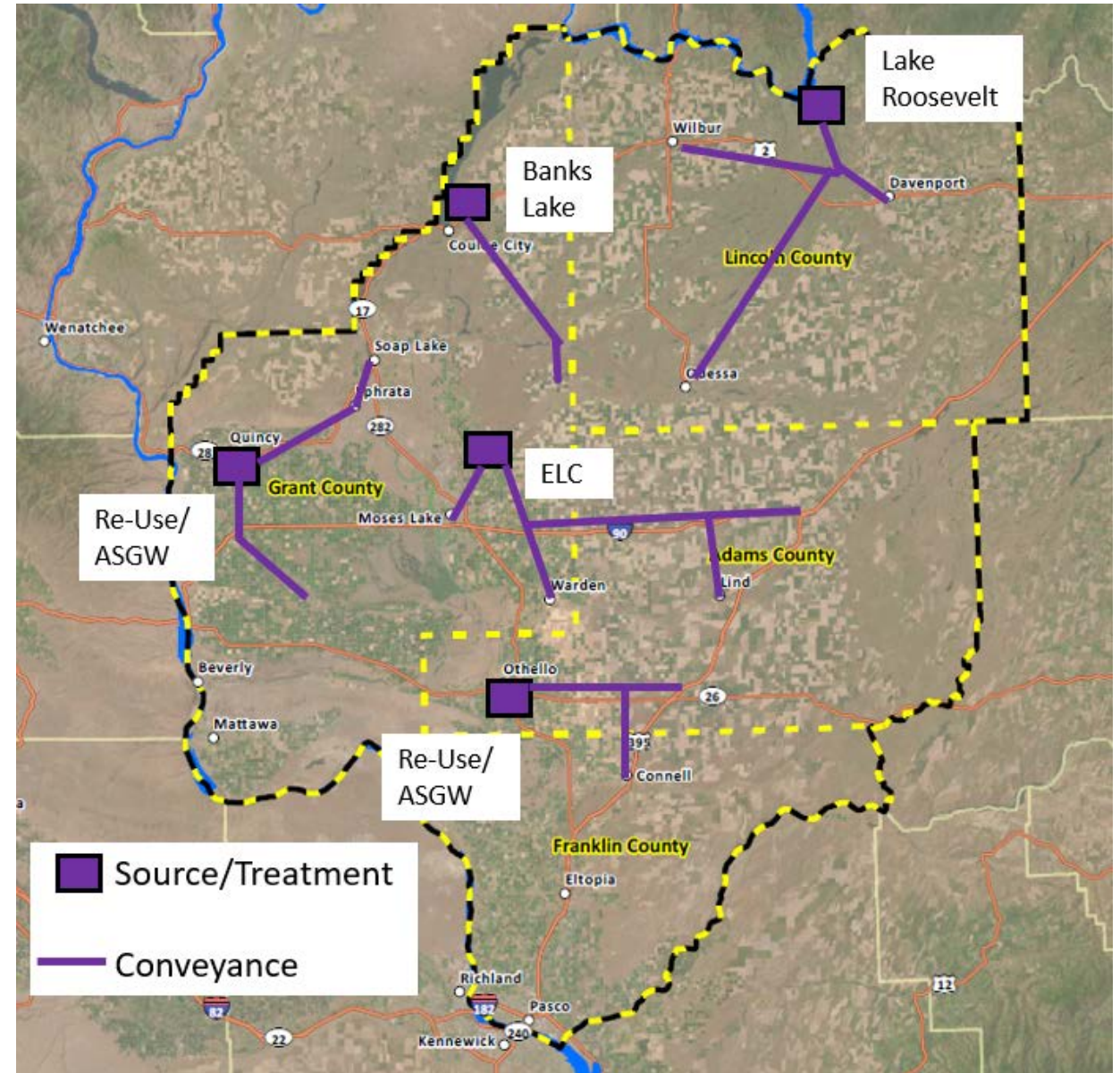
## A6: New Source Treatment and Regional Distribution

### ▲ Benefits :

- ~100% efficiency (piped direct)
- Some defined sources
- Technical and permitting pathways are known

### ▲ Challenges :

- Cost for new infrastructure
- Challenge serving eastern communities
- Needs feasibility study





# // Alternatives for CBSWC Consideration – Tool Alternatives

## Tool Alternatives:

- ▲ B1: Groundwater Level Monitoring
- ▲ B2: Numerical Groundwater Modeling



# // Alternatives for CBSWC Consideration – Tool Alternatives

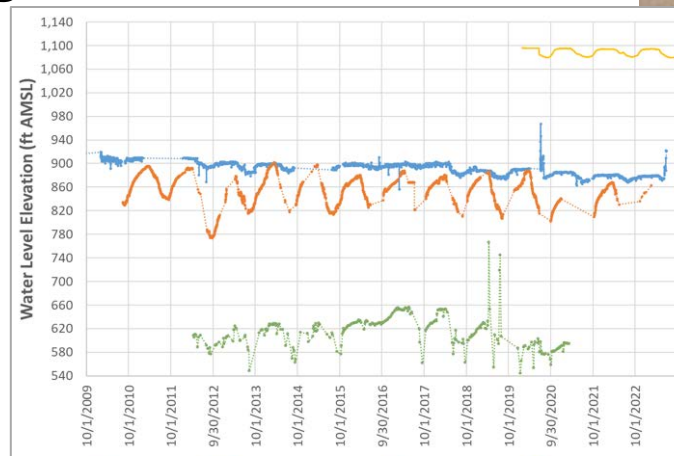
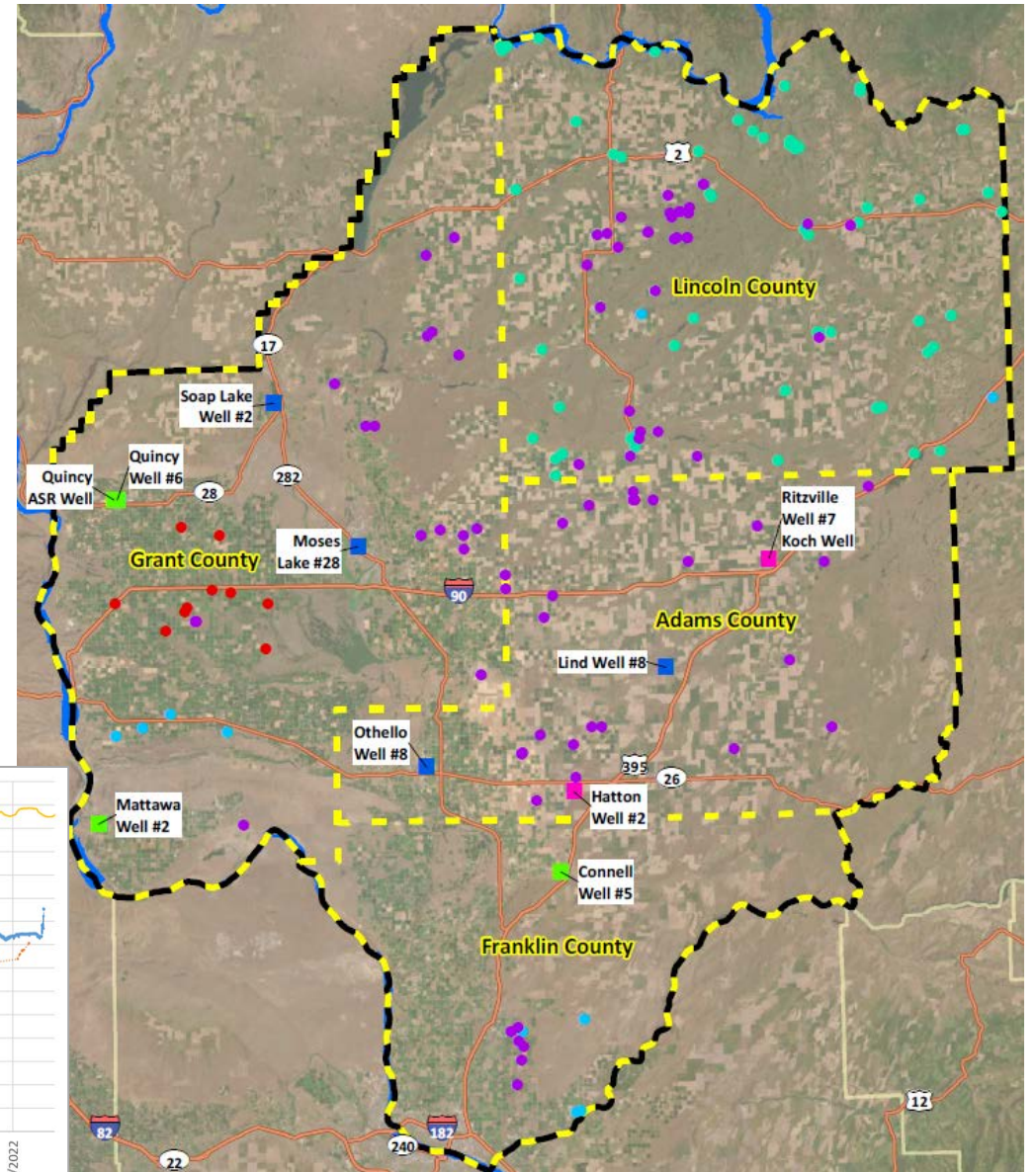
## B1: Groundwater Level Monitoring

### ▲ Benefits :

- Low Cost
- Direct measurements of current groundwater supplies and trends
- Helps focus resources

### ▲ Challenges :

- Long-term funding sources





# // Alternatives for CBSWC Consideration – Tool Alternatives

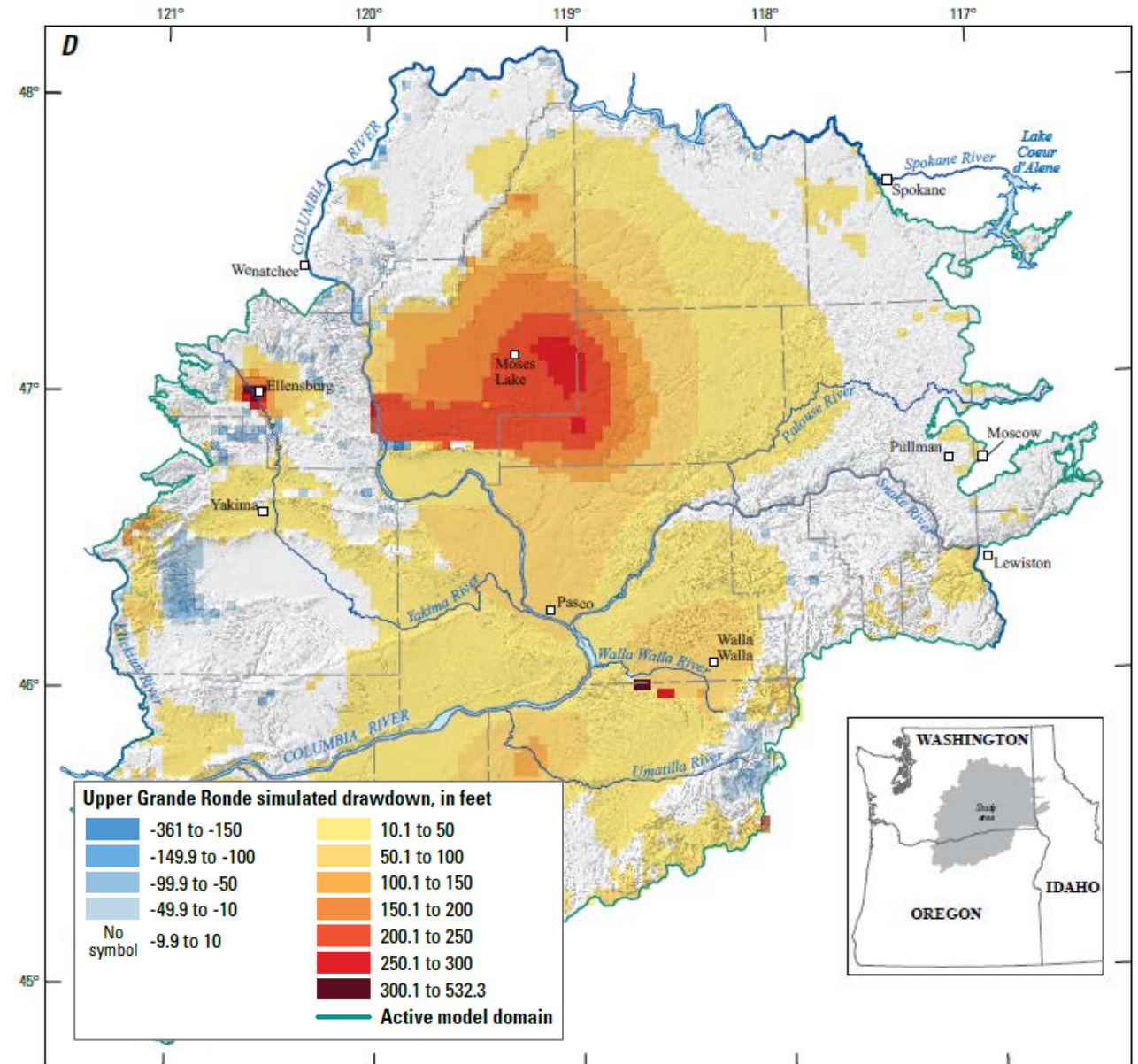
## B2: Groundwater Modeling

### ▲ Benefits :

- Future projections of changing conditions
- Existing models of project area

### ▲ Challenges :

- Cost
- Uncertainties



# // Alternatives for CBSWC Consideration – Planning Alternatives

## Planning Alternatives:

- ▲ C1: Coordinated Water System Planning
- ▲ C2: Groundwater Management Planning
- ▲ C3: Integrated Planning and Project Implementation
- ▲ C4: US Bureau of Reclamation Basin Study





# // Alternatives for CBSWC Consideration – Planning Alternatives

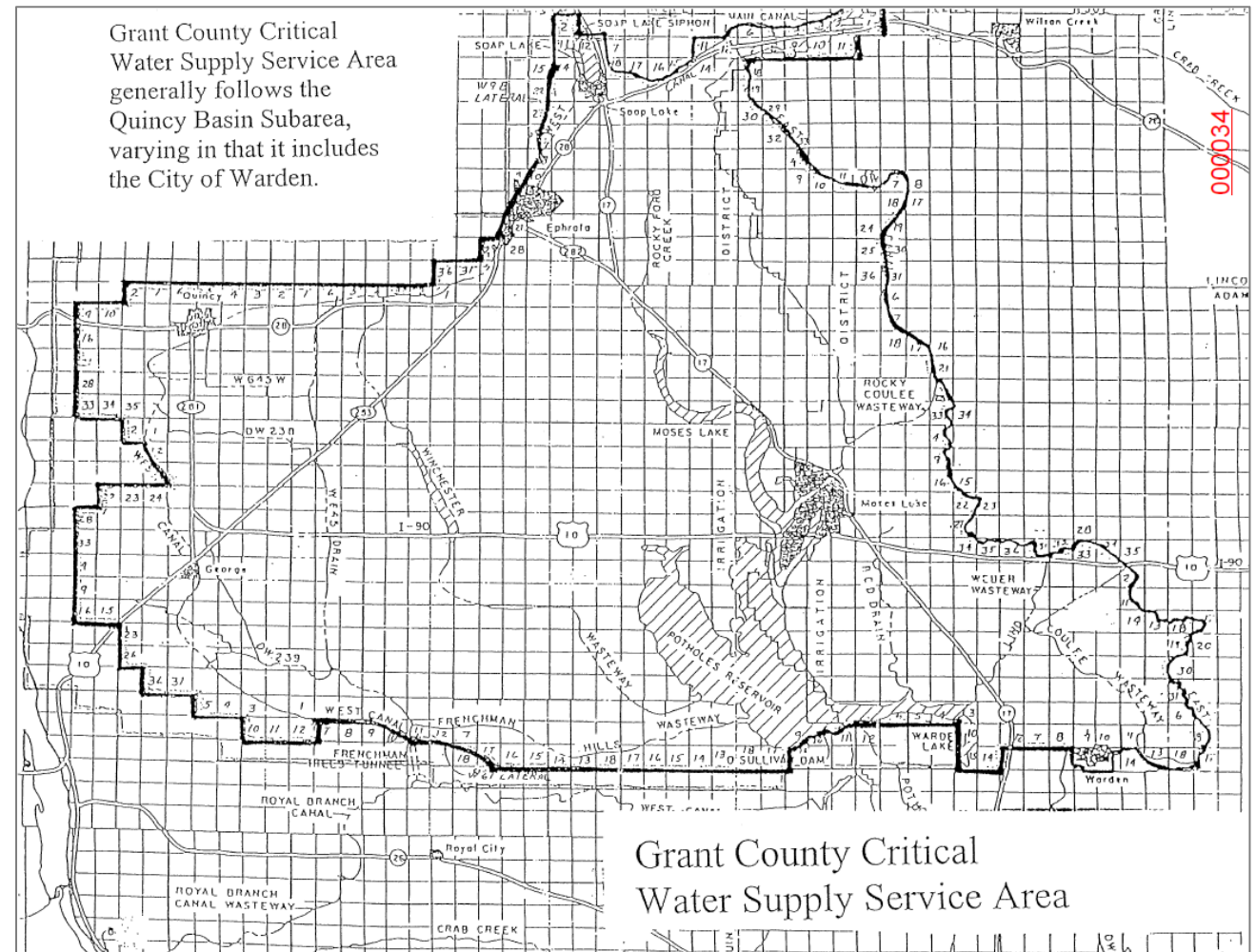
## C1: Coordinated Water System Planning

### Benefits :

- Can provide regulatory framework to limit additional groundwater withdrawals
- Opportunity for regional coordination

### Challenges :

- Not intended for project implementation (more water system focused)



# // Alternatives for CBSWC Consideration – Planning Alternatives

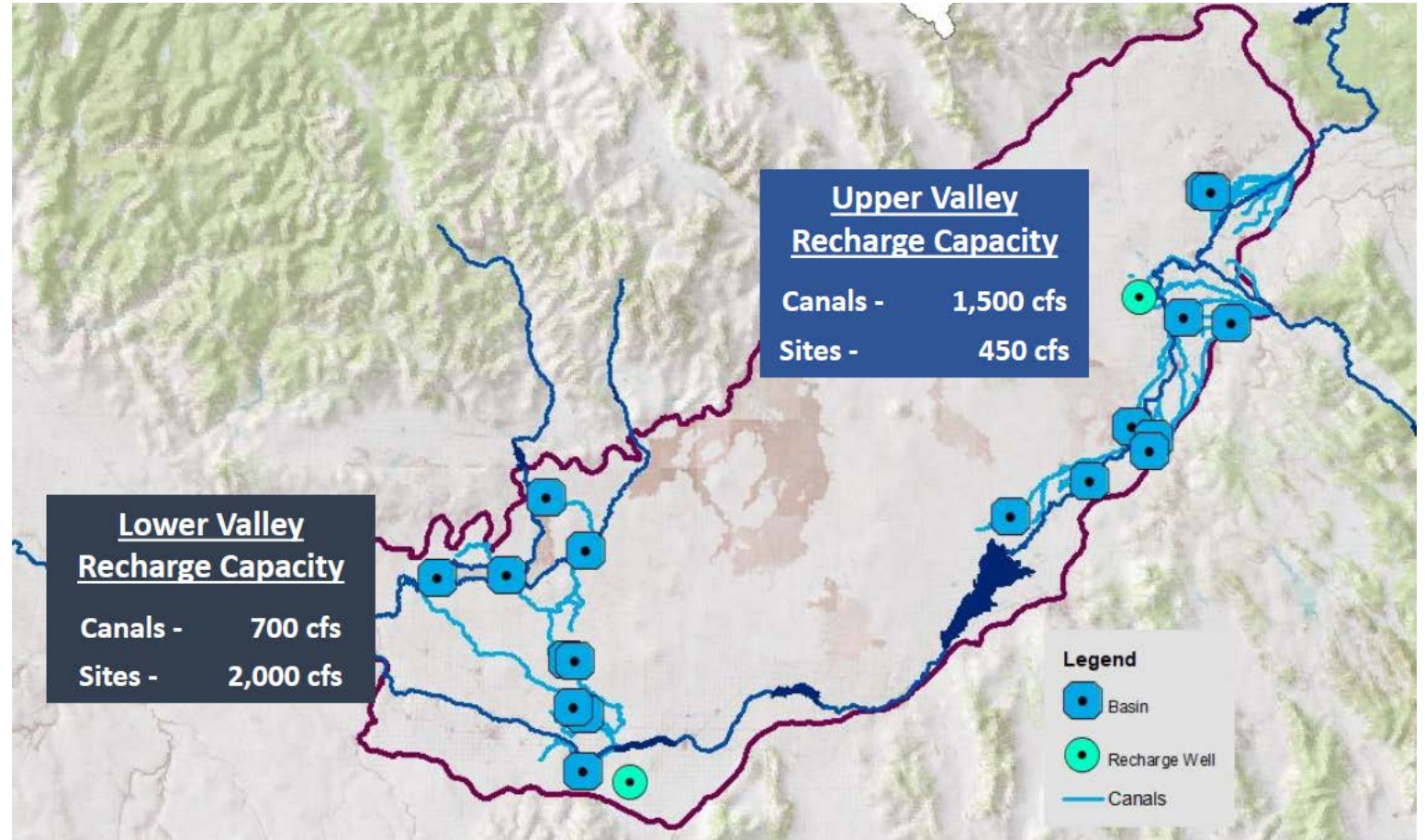
## C2: Groundwater Management Planning

### ▲ Benefits :

- Project-focused for groundwater supply maintenance/ augmentation
- Stakeholder-driven

### ▲ Challenges :

- Stakeholder participation may be limited



From: IDWR 2023





# // Alternatives for CBSWC Consideration – Planning Alternatives

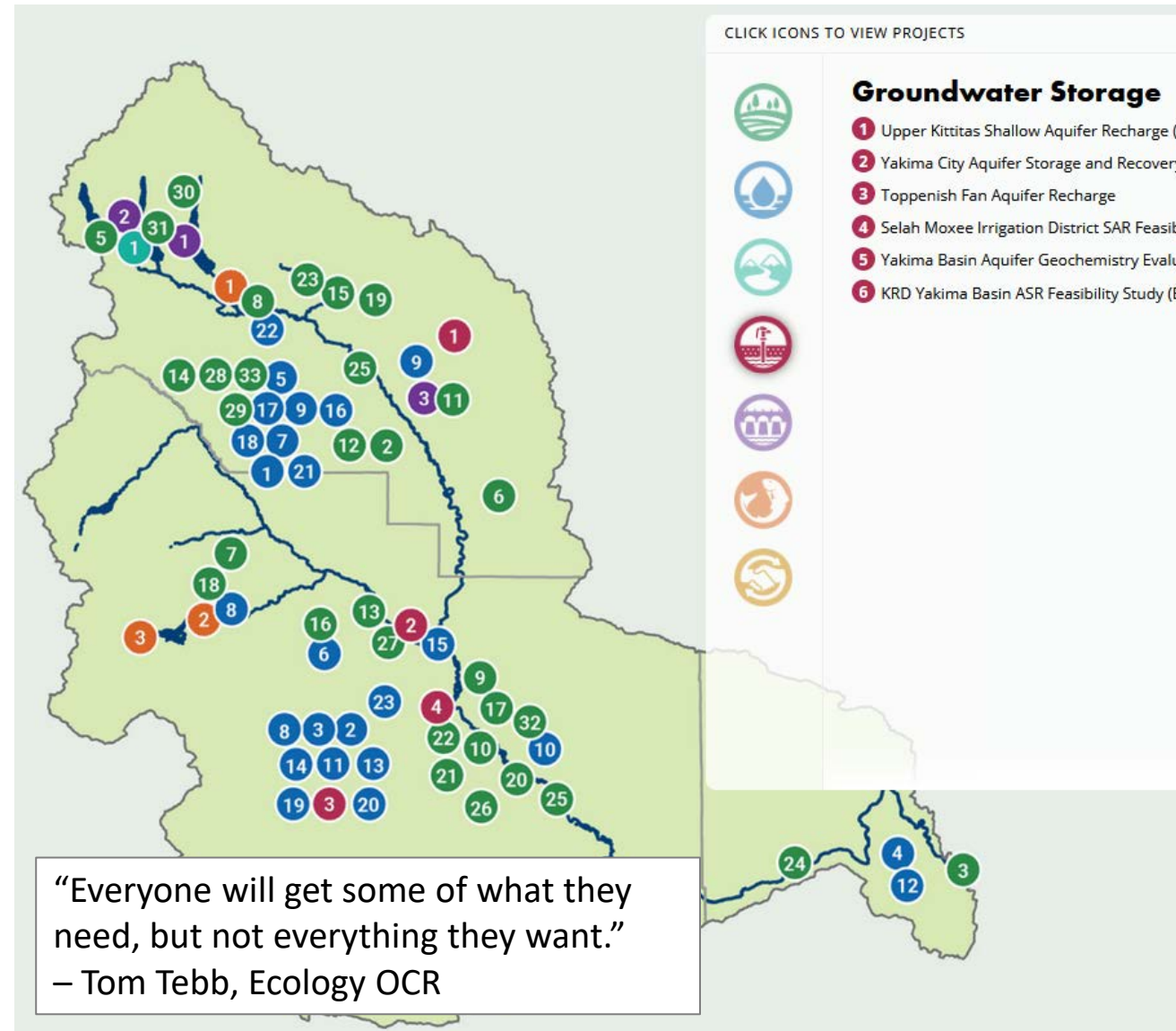
## C3: Integrated Planning and Project Implementation

### ▲ Benefits :

- Stakeholder-driven (and diverse stakeholders)
- Focused on project implementation
- Creative solutions
- Successful models exist

### ▲ Challenges :

- Legislative funding required for agency participation and facilitation
- Long timeframe



# // Alternatives for CBSWC Consideration – Planning Alternatives

## C4: USBR Basin Study

### ▲ Benefits :

- Process for finding basin-wide solutions
- Stakeholder participation

### ▲ Challenges :

- Non-federal entity 50% matching funds required
- USBR-driven – stakeholder control in outcomes is uncertain
- Focused more on planning (versus project implementation)

