

ES202

In-Class Exercise: Introduction to Hydrogeology of the Monmouth-Independence Area

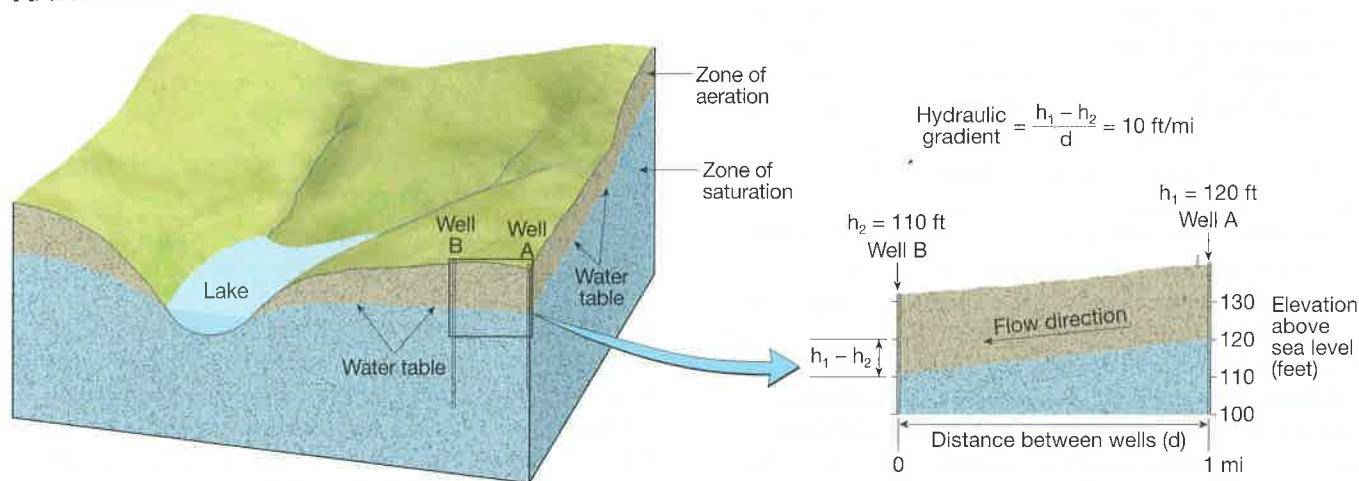
Attached is a portion of the 7.5-minute Monmouth Quadrangle, showing the Monmouth-Independence “metropolitan” area. The hand-marked points are well locations showing water level elevations from 1972. The second figure is a cross-section showing the generalized geology of the Willamette Valley from Corvallis, westward to Lebanon. While this cross-section is south of Monmouth, the general geologic relations are also present in the Monmouth-Independence area. For purposes of comparison, the Monmouth-Independence area is located approximately in the same valley position as the point labeled “Corvallis DH13-88 well”. The Willamette river is located on the profile immediately adjacent to the well (about 2 mm to the east, in profile units).

Based on examination of the generalized geology at the west edge of the profile and using the Monmouth-Independence groundwater map. Conduct the following tasks / answer the following questions.

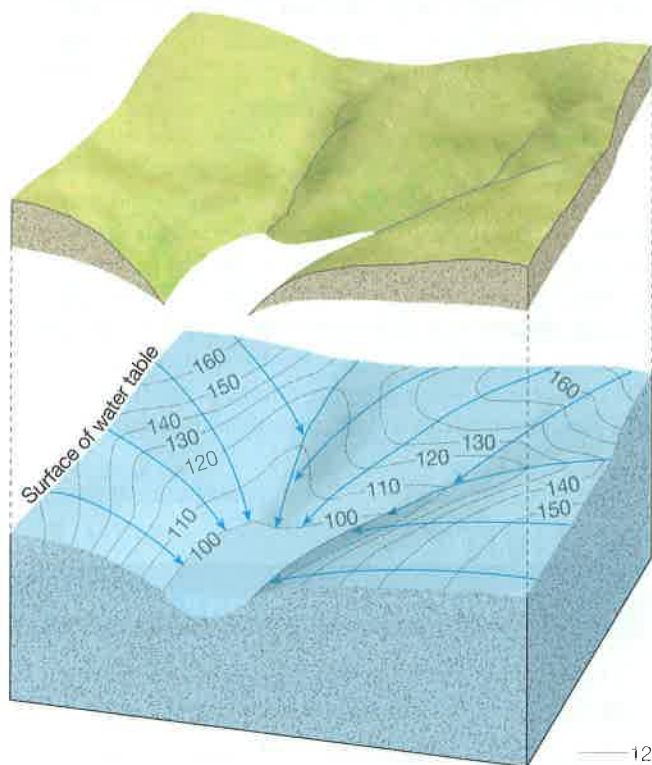
1. What types of Earth materials occupy the subsurface environment in the Monmouth-Ind. Area? Bedrock? Alluvium? Or ?
2. What type of aquifer conditions do you predict in the Monmouth area? Confined or unconfined?
3. Are the water level elevations in the wells on the base map likely depicting a water table or potentiometric surface under artesian conditions?
4. What is the local “basement” bedrock that underlies the valley material in the Monmouth area?
5. On the basemap with groundwater elevations, use a 5 ft contour interval and draw a groundwater contour map.
6. Which direction is regional groundwater flow in the Monmouth area?
7. How does the elevation of the Willamette River compare with groundwater levels in the area?
8. Do you think the Willamette River is gaining or losing in this reach?
9. Locate the two wells labeled with values of “132” and “136” on the west side of the river, across from Independence. Do you think groundwater flow on this portion of the map parallels that of the west side of the river?
10. Discuss the relationship between hydraulic gradients in the groundwater system, and the presence/position of the Willamette River in the Monmouth-Independence area.

Water Table Contours and Flow Lines

A. Groundwater Zones and the Water Table



B. Normal Water Table Contours and Flow Lines: Note that flow direction is downhill to streams and the lake



C. Water Table Contours and Flow Lines Changed by a Cone of Depression Developed Around a Pumped Well

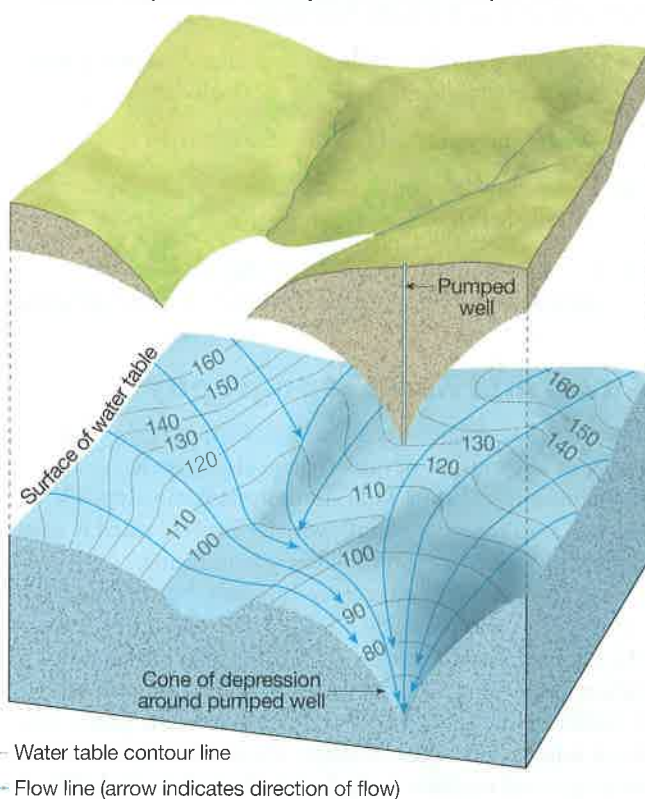
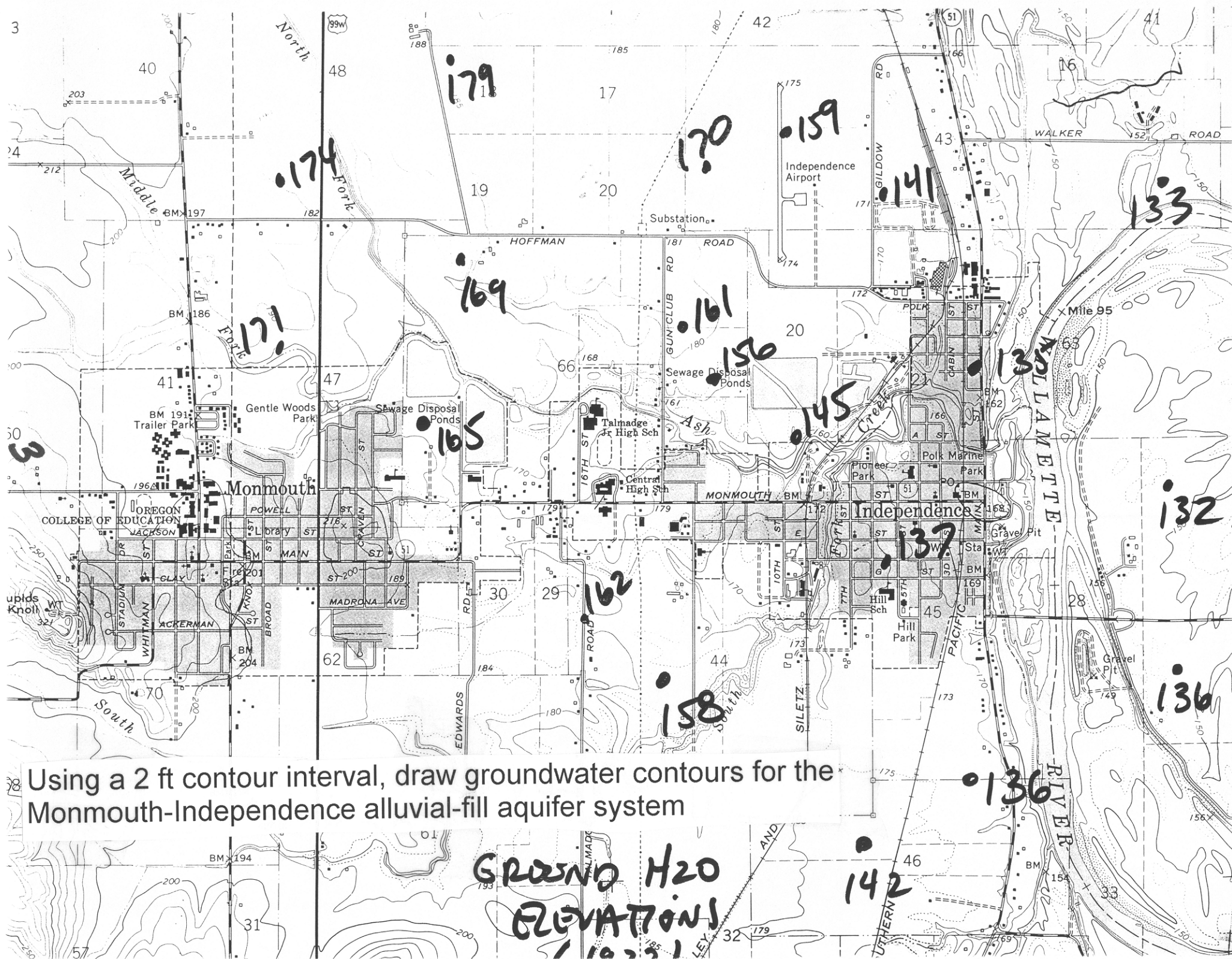


FIGURE 12.1 Water movement through an unconfined aquifer. A. Rainwater seeps into the *zone of aeration* (unsaturated zone, vadose zone), where void spaces are filled with air and water. Below it is the *zone of saturation*, where all void spaces are filled with water. Its upper surface is the water table. Water in the saturated zone is called groundwater, which always flows down the hydraulic gradient in unconfined aquifers. B. A water table surface is rarely level. Contour lines (contours) are used to map its topography and identify flow lines—paths traveled by droplets of water from the points where they enter the water table to the points where they enter a lake or stream. Flow lines with arrows run perpendicular to contour lines, converge or diverge, but never cross. C. A pumped well is being used to withdraw water faster than it can be replenished, causing development of a cone of depression in the water table and a change in the groundwater flow lines.

continuously being replenished (recharged) upslope, and it takes time for the water to flow through the ground, the water table is normally not level. It is normally higher uphill, where water flows into the ground, and lower downhill, where water seeps out of the ground at a lake or

springs. The slope of the water table surface is called the **hydraulic gradient** (FIGURE 12.1A)—the difference in elevation between two points on the water table (observed in wells or surfaces of lakes and ponds) divided by the distance between those points.



Using a 2 ft contour interval, draw groundwater contours for the Monmouth-Independence alluvial-fill aquifer system

GROUND H₂O
ELEVATIONS



Figure 82. Structural cross section between Corvallis and Lebanon, Oreg., showing channel and overbank facies of unnamed fluvial sedimentary deposits, high-terrace gravels, late Pleistocene outwash deposits of the Rowland Formation, and catastrophic flood deposits of the Willamette Formation. Data are from water wells, engineering bore holes, and petroleum-exploration wells.

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
 (as required by OAR 690-240-035)

(1) **OWNER/PROJECT:** Hole Number **B-2**
 Name **WESTERN OREGON UNIVERSITY**
 Address **345 MONMOUTH AVE**
 City **MONMOUTH** State **OREGON** Zip **97361**

(2) **TYPE OF WORK**
☒ New ☐ Deepening ☐ Alteration (repair/recondition) ☒ Abandonment

(3) **CONSTRUCTION:**
☐ Rotary Air ☐ Hand Auger ☐ Hollow Stem Auger
☒ Rotary Mud ☐ Cable Tool ☐ Push Probe ☐ Other

(4) **TYPE OF HOLE:**
☒ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) **USE OF HOLE: GEOTECHNICAL**

(6) **BORE HOLE CONSTRUCTION:**

Special Construction approval ☐ Yes ☒ No Depth of Completed Hole **60** ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
5	0	60	BENT GROUT	60	30	30 GAL
			BENT CHIPS	30	0	6 SKS

Backfill placed from _____ ft. to _____ ft. Material _____
 Filter Pack placed from _____ ft. to _____ ft. Size of pack _____

(7) **CASING/SCREEN:**

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐
Slot size								

(8) **WELL TEST:**

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
 Permeability _____ Yield _____ GPM _____
 Conductivity _____ PH _____
 Temperature of water **55** °F Depth artesian flow found _____ ft.
 Was water analysis done? ☐ Yes ☒ No
 By whom? _____
 Depth of strata analyzed. From _____ ft. to _____ ft.
 Remarks: _____

(9) **LOCATION OF HOLE by legal description:**

County **POLK** Latitude _____ Longitude _____
 Township **8** S Range **5** W WM.
 Section **25** NE 1/4 NE 1/4
 Tax Lot **1800** Lot _____ Block _____ Subdivision _____
 Street Address of Well (or nearest address) **SAME**

Map with location identified must be attached

(10) **STATIC WATER LEVEL:**

10 ft. below land surface. Date **9/15/04**
 Artesian pressure _____ lb. per square inch. Date _____

(11) **SUBSURFACE LOG:**

Ground Elevation _____

Material Description	From	To	SWL
BROWN SILT	0	10	10
BROWN CLAY	10	35	
GREY GRAVELLY SAND	35	50	
GREY CLAY	50	60	

Date Started **9/15/04**

Date Completed **9/15/04**

(12) **ABANDONMENT LOG:**

Material Description	From	To	Sacks or Pounds
BENT GROUT	60	30	30 GAL
BENT CHIPS	30	0	6 SKS

Date started **9/15/04**

Date Completed **9/15/04**

Professional Certification

(to be signed by a licensed water supply or monitoring well constructor, or registered geologist or civil engineer).

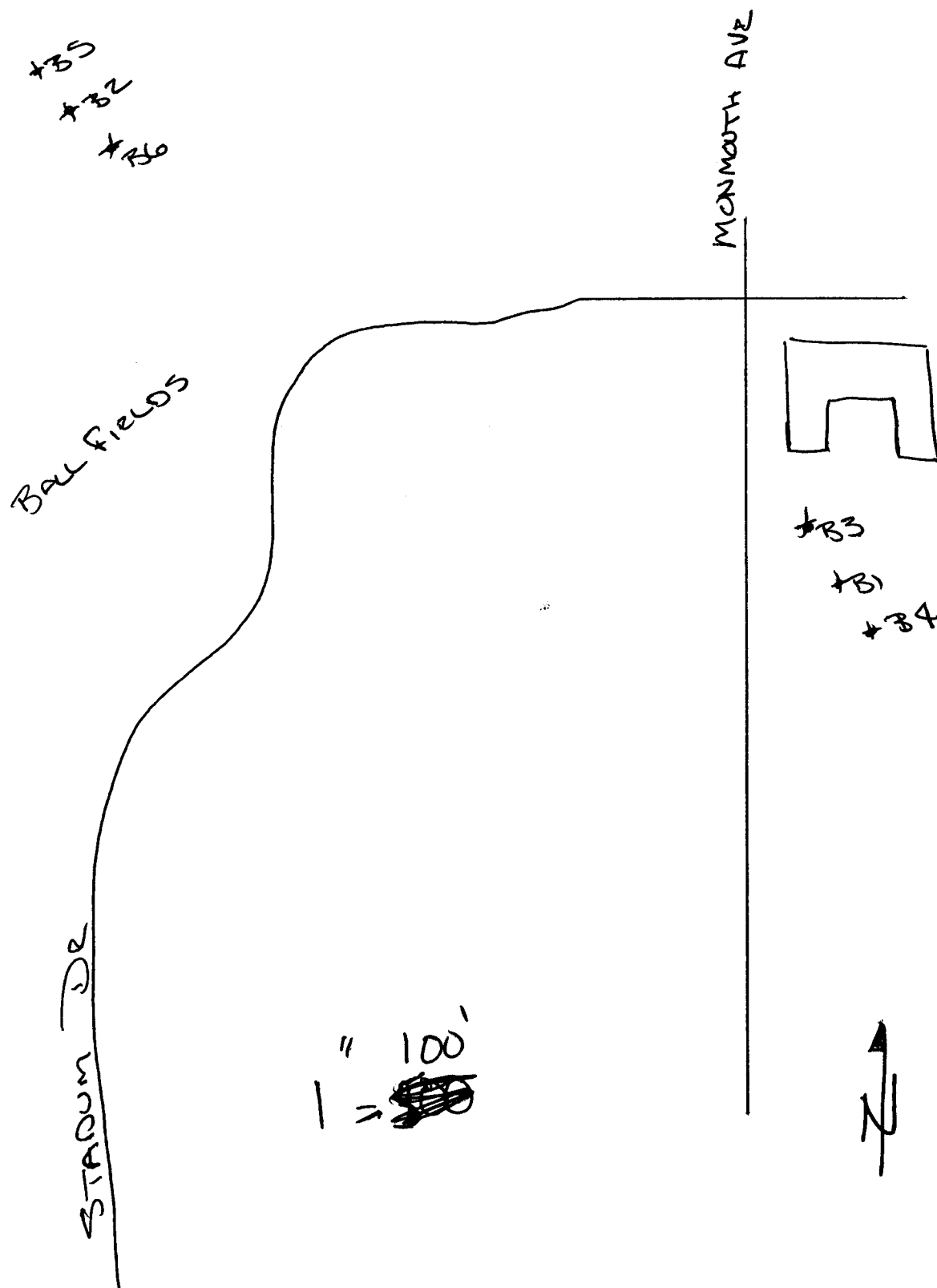
I accept responsibility for the construction, alteration, or abandonment work performed on during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License or Registration Number **10459**

Signed Warren McCann Date **9/23/04**
WARREN MCCANN
 Affiliation **SUBSURFACE TECHNOLOGIES**

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER



RECEIVED

SEP 27 2004

WATER RESOURCES DEPT
SALEM, OREGON

NOTICE TO WATER WELL CONTRACTOR

The original and first copy
of this report are to be
filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date
of well completion.

WATER WELL REPORT

STATE OF OREGON

(Please type or print)

(Do not write above this line)

RECEIVED

MAR 24 1975

State Well No. 85/5W-24

STATE ENGINEER

SALEM, OREGON

State Permit No.

(1) OWNER:

Name Mr. W. C. Kester

Address 141 N. Monmouth
Monmouth, Oregon 97361

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:

Threaded ☐ Welded ☒

....." Diam. from ft. to ft. Gage
6" Diam. from 1 ft. above surface
....." Diam. from to 44 ft. below surface

PERFORATIONS:

Perforated? ☐ 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.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is
lowered below static levelWas a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

" " " "

" " " "

Bailer test 10 gal./min. with 79 ft. drawdown after 1 hrs.

Artesian flow g.p.m.

pressure of water 52 Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Concrete

Well sealed from land surface to 20 ft.

Diameter of well bore to bottom of seal 10 in.

Diameter of well bore below seal 6 in.

Number of sacks of cement used in well seal 1 1/2 sacks

Number of sacks of bentonite used in well seal -0- sacks

Brand name of bentonite -0-

Number of pounds of bentonite per 100 gallons

of water -0- lbs./100 gals.

Was a drive shoe used ☒ Yes ☐ No Plugs Size: location ft.Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Polk Driller's well number

1/4 1/4 Section 24 T. 8 R. 5 W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 58 ft.

Static level 6 ft. below land surface. Date 2-26-75

Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"

Depth drilled 100 ft. Depth of completed well 100 ft.

Formation: Describe color, texture, grain size and structure of materials;
and show thickness and nature of each stratum and aquifer penetrated,
with at least one entry for each change of formation. Report each change in
position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Top soil	0	3'	
Brown clay	3'	32'	
Blue clay	32'	38'	
Brown clay & Med. gravel	38'	40'	
Blue shale	40'	58'	
Sandstone			
(water bearing)	58'	96'	
Blue shale	96'	100'	

Work started Feb. 24, 1975 Completed Feb. 27, 1975

Date well drilling machine moved off of well Feb. 27, 1975

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision.
Materials used and information reported above are true to my
best knowledge and belief.

[Signed] Art Clinton Date 3-20-1975
(Drilling Machine Operator)

Drilling Machine Operator's License No. 34

Water Well Contractor's Certification:

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

Name ART CLINTON WELL DRILLING Co.
(Person, firm or corporation) (Type or print)

Address Rt. 1, Box 2, Independence, Oregon
97351

[Signed] Art Clinton
(Water Well Contractor)

Contractor's License No. 14 Date March 20, 1975