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.

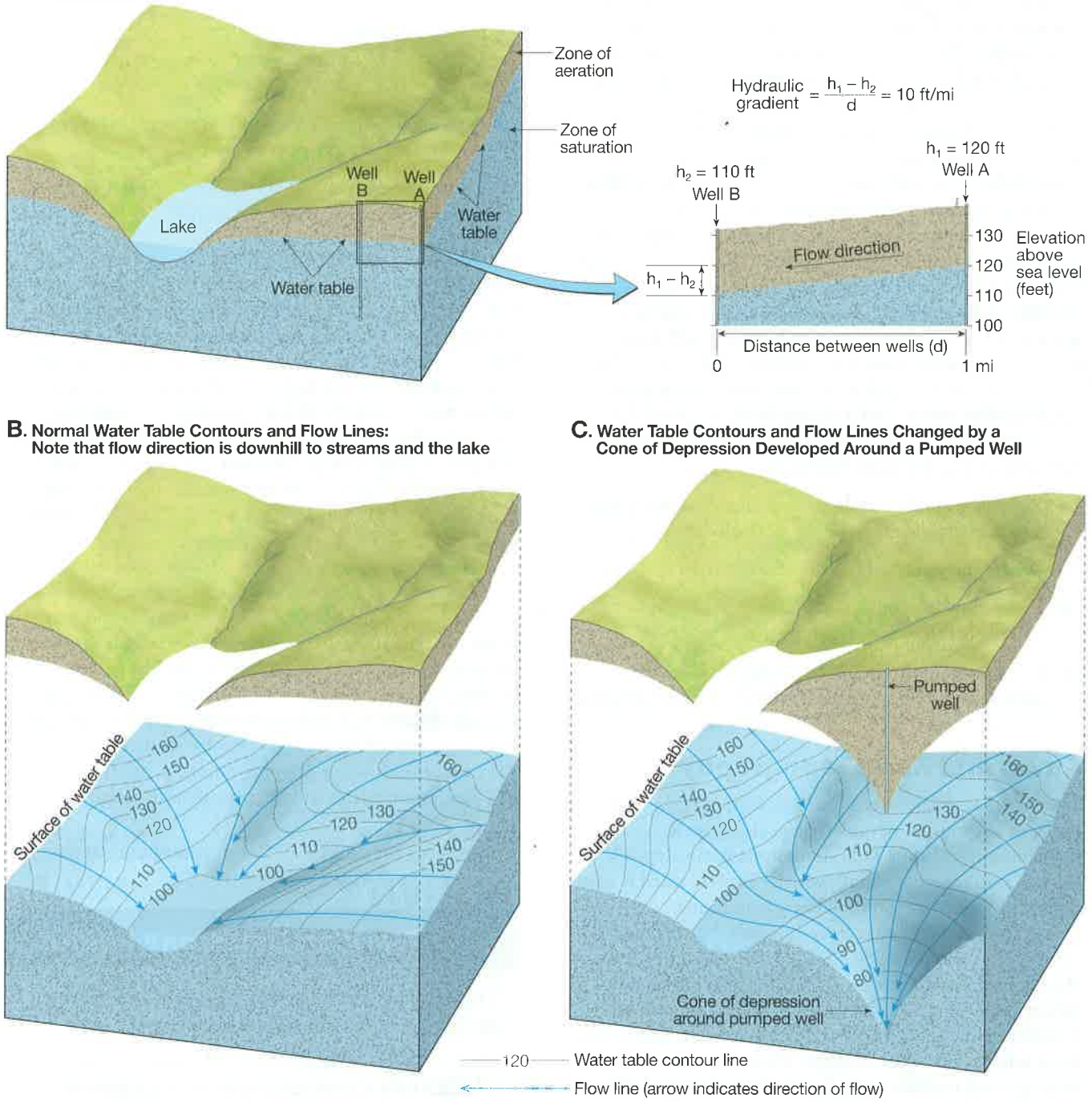
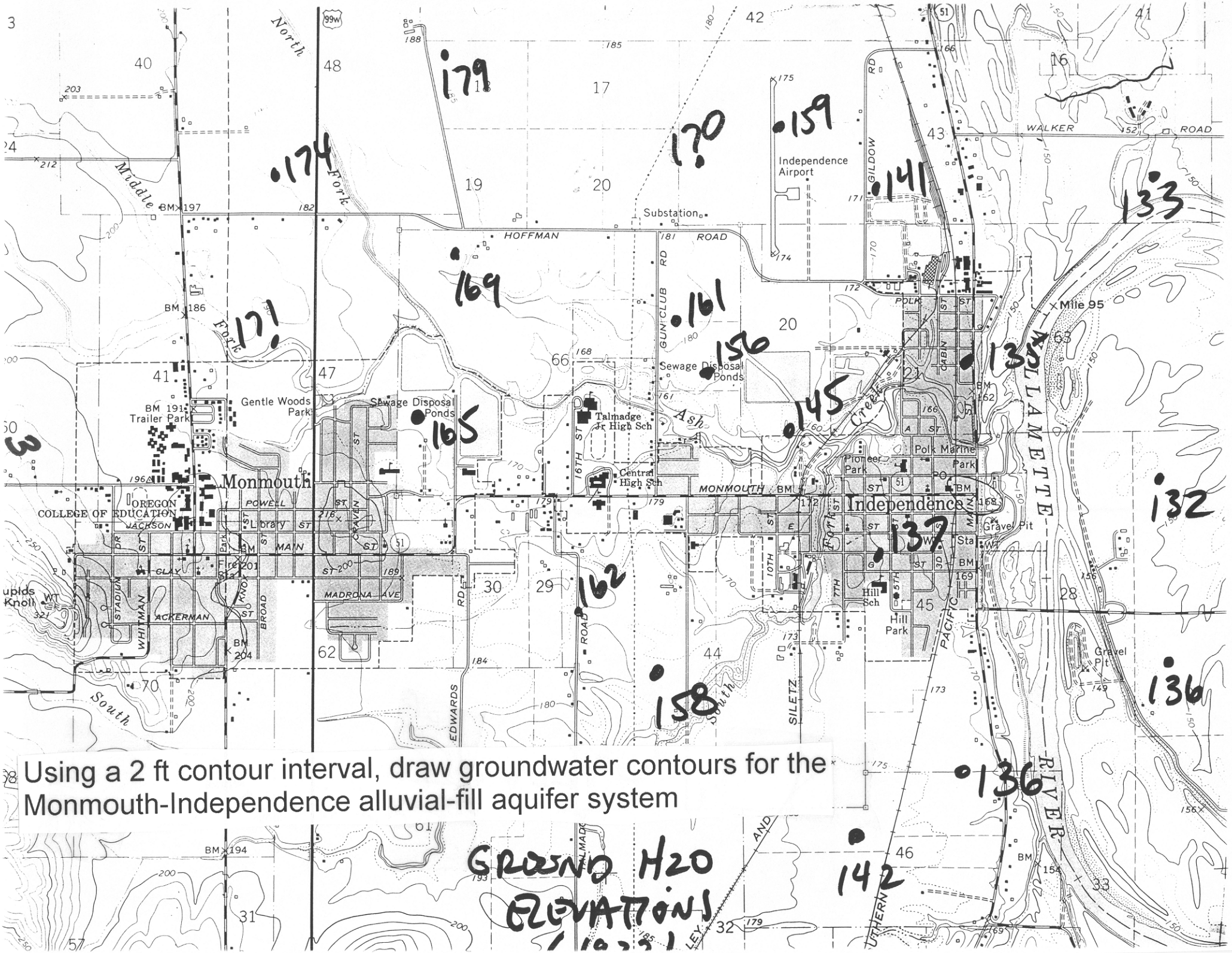


FIGURE 12.1 Water movement through an unconfined aquifer. A. Rainwater seeps into the *zone of aeration* (unsaturated zone, vadose zone), where void spaces are filled with air and water. Below it is the *zone of saturation*, where all void spaces are filled with water. Its upper surface is the water 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

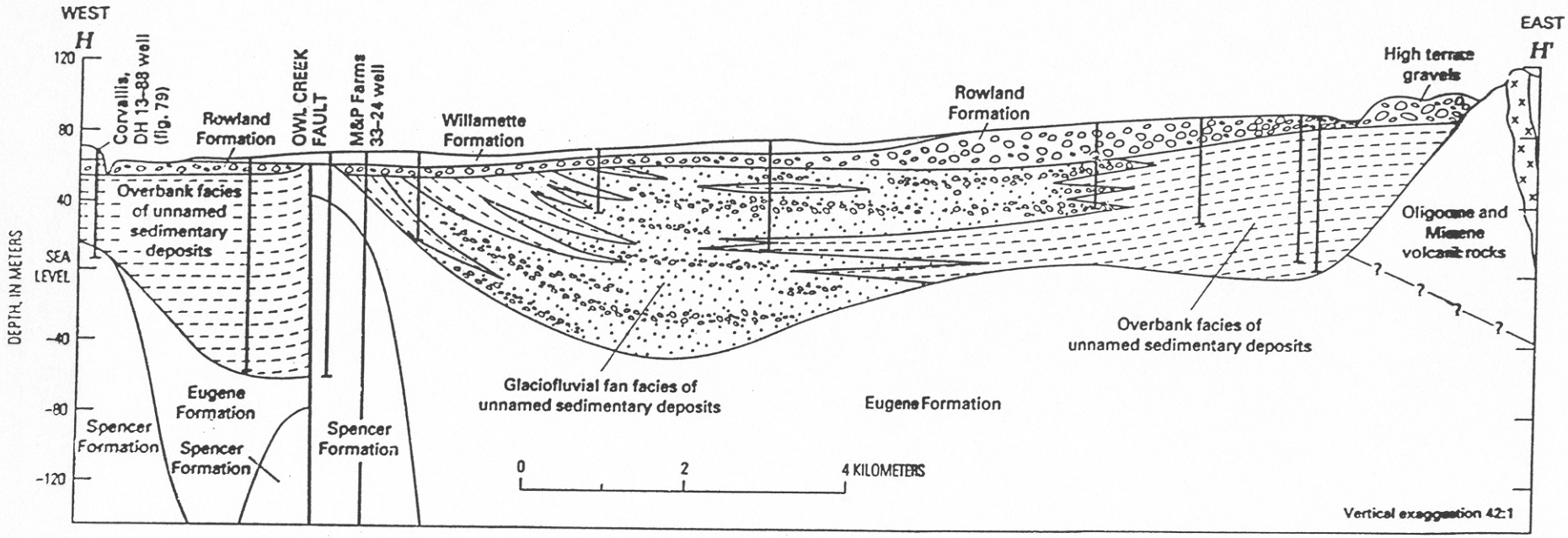


Figure 82. Structural cross section between Corvallis and Lebanon, Oreg., showing channel and overbank facies of unnamed fluvial sedimentary deposits, high-terrace gravels, late Pleistocene outwash deposits of the Rowland Formation, and catastrophic flood deposits of the Willamette Formation. Data are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

POLK 52047

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 indentified 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

RECEIVED
SEP 27 2004
WATER RESOURCES DEPT
SALEM, OREGON

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 ____ Date **9/23/04**

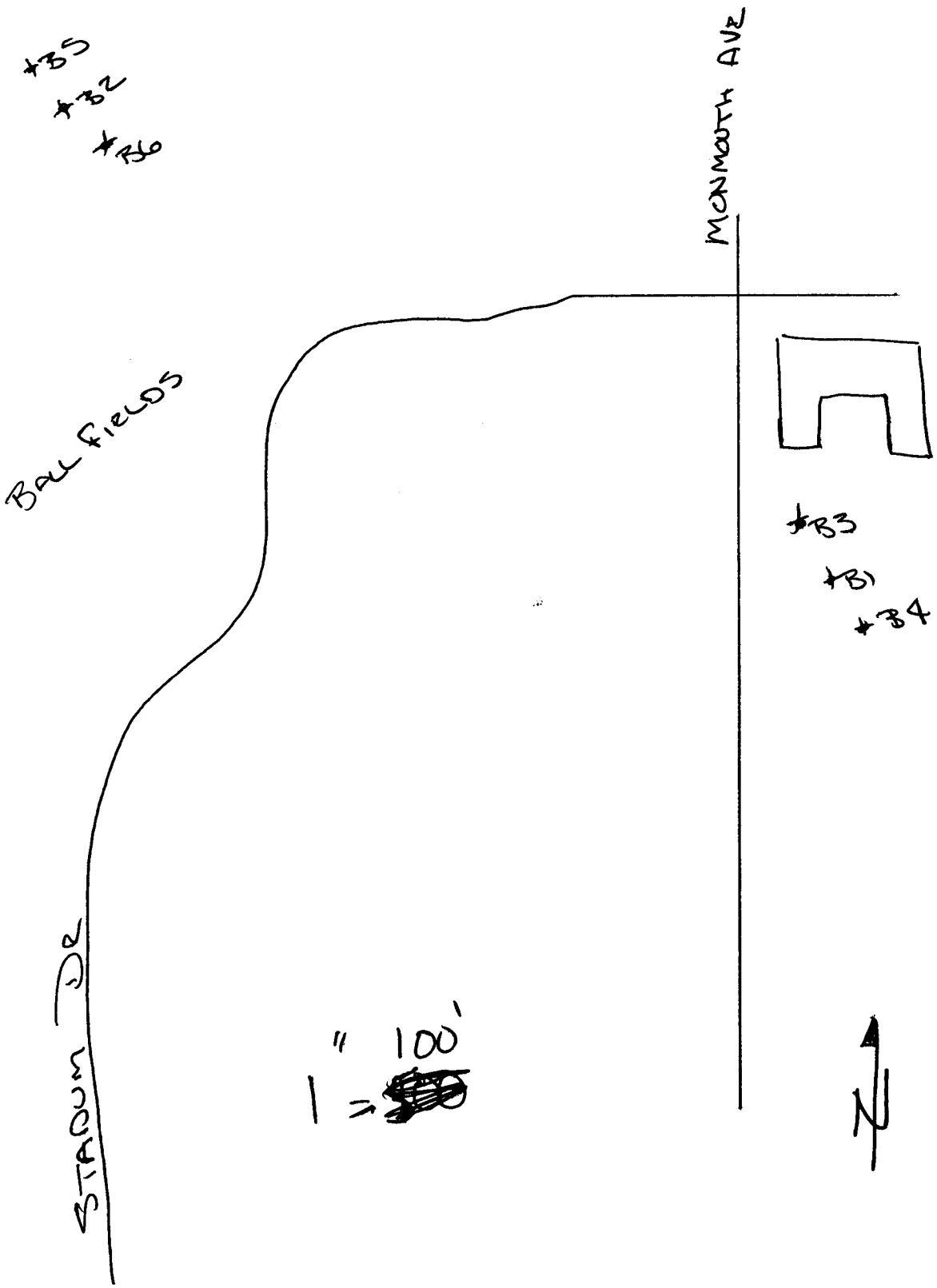
WARREN MCCANN

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

POLK 52047



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.

248 Polk

RECEIVED
MAR 24 1975
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON (Please type or print) (Do not write above this line)

State Well No. 8S/5W-24
State Permit No.

(1) OWNER:
Name Mr. W. C. Kester
Address 141 N. Monmouth
Monmouth, Oregon 97361

(2) TYPE OF WORK (check):
New Well XX Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable XX Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic XX Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:
Threaded ☐ Welded XX
" Diam. from ft. to ft. Gage
6" Diam. from 1 ft. above surface
" Diam. from to 44 ft. below surface

PERFORATIONS:
Perforated? ☐ Yes XX 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 X 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 level
Was a pump test made? ☐ Yes X 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.
perature 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 1½ 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 XX Yes ☐ No Plugs Size; location ft.
Did any strata contain unusable water? ☐ Yes XX No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes XX No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Polk Driller's well number
¼ ¼ 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 (Drilling Machine Operator) Date 3-20-, 1975
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

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45856-119