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Piezometer data and documents

Cal R. Fremling
Winona State University

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TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR
MANUFACTURER'S CERTIFICATES OF COMPLIANCE
(Read instructions on the reverse side prior to initiating this form)

DATE
31 Dec 82

NEW SUBMITTAL
 RESUBMITTAL

Section I REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)

TO: WINONA PROJECT OFFICE 70½ E. 4th ST. WINONA, MN 55987	FROM: KATHY'S KRANES 1251 HOMER RD. WINONA, MN 55987	CONTRACT NO. DACW 37-82-C-0027	TRANSMITTAL NO. 14b PREVIOUS TRANS. NO. (If any) 14a
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SPECIFICATION SEC. NO. (Cover only one section with each transmittal)	PROJECT TITLE AND LOCATION WINONA FLOOD CONTROL - REACH E-2
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ITEM NO. a.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.) b.	MFG. OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. (See instruction No. 8) c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT		VARIATION (See instruction No. 6) g.	FOR C OF E USE CODE h.
				SPEC. PARA. NO. e.	DRAWING SHEET NO. f.		
1	Piezometer Installation Report - Piez. E-1		4	20-5.1			A*
2	" " " " E-2		4	"			A
3	" " " " E-3		4	"			A
4	" " " " E-4		4	"			A
5	" " " " E-5		4	"			A
6	" " " " E-6		4	"			A
7	" " " " E-7		4	"			A
8	" " " " E-8		4	"			A

REMARKS *See Attached Comments.	<p>RECEIVED</p> <p>DEC 8 11982</p> <p>U. S. ARMY ENGINEER DISTRICT WINONA PROJECT</p>	<p>I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.</p> <p><i>Ken Breitkopf</i></p> <p>NAME AND SIGNATURE OF CONTRACTOR</p>
------------------------------------	--	--

Section II U.S. ARMY CORPS OF ENGINEERS ACTION (This section will be used by the approving authority only)

INCLOSURES RETURNED (List by Item No.) 1-Contractor 1-Project Engineer 1-CO-C 1-ED-GH	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY <i>Melissa Morris</i> Melissa Morris Authorized Representative of the Contracting Officer	DATE 17 Jan 83
---	---	-------------------

BRAUN™ ENGINEERING TESTING

Testing Services Since 1957

MINNESOTA: Minneapolis, Duluth, Hibbing, St. Cloud, Rochester, St. Paul

Affiliated Offices:
Williston, North Dakota
Hazen, North Dakota

Reply to:

PIEZOMETER INSTALLATION REPORT

PROJECT: DACW 37-82-C-0027			LEVEE DISTRICT: Reach E-2 Winona		
LOCATION (STA): 10+00 E		OFFSET FROM CENTER LINE: 90' left		PIEZ NO.: E-1	
PIEZ TYPE: 1 1/4" x 24" x #18 slot		DEPTH OF PIEZ: 11'		RISER PIPE DIAM: 1 1/4"	
PIEZ TIP SET IN (SOIL TYPE): (SP) Sand fine to med. gr		SOIL SAMPLE NO.:		BORING DIAM: 4"	
METHOD OF INSTALLATION: 4" casing drilled to 12'					
TYPE OF PROTECTION FOR PIEZ: 18" C.M.P.				VENT:	
GROUND ELEV: 650.8		ELEV TOP OF RISER: 651.38		ELEV PIEZ TIP: 639.9	
FILTER: Gravel		FROM ELEV: 638.9		TO ELEV: 643.9	
SEAL: Bentonite pellets		FROM ELEV: 643.9		TO ELEV: 645.9	
INSTALLED BY: Braun Engineering Test			CONTRACT NO.:		FOREMAN: Gary Rueter
DATE OF INSTALLATION: 10-11-82			DATE OF OBSERVATIONS: 10-14-82		
METHOD OF TESTING PIEZ: Fill to top of pipe and record rate of fall					
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
10:27	30 sec.	7.9'			
10:28	20 sec	7.9'			
10:30	15 sec	7.9'			
REMARKS: Groundwater @ 7.9' to top of riser pipe					
Water did not flow thru sand-bentonite fill					

WES FORM 730
MAR. 53
REVISED OCT. 53

Gary J. Rueter
INSPECTOR

APPROVED AND NOTED & TO THE BEST OF MY KNOWLEDGE THE SPECIFICATIONS
A
JAN 17 1983
U. S. ARMY ENGINEER DISTRICT ST. PAUL
By *M. Shortidge*

MINNESOTA: Minneapolis, Duluth, Hibbing, St. Cloud, Rochester, St. Paul

PIEZOMETER INSTALLATION REPORT

Affiliated Offices:
Williston, North Dakota
Hazen, North Dakota

Reply to:

PROJECT: DACW 37-82-C-0027			LEVEE DISTRICT: Reach E-2 Winona					
LOCATION (STA) 25_00 E		OFFSET FROM CENTER LINE: 175' Left		PIEZ NO.: E-2				
PIEZ TYPE: 1 1/4 x 24" X #18 Slot		DEPTH OF PIEZ: 16'		RISER PIPE DIAM: 1 1/4"				
PIEZ TIP SET IN (SOIL TYPE) (SP) Sand, fine to med. gr		SOIL SAMPLE NO.: 15		BORING DIAM: 4"				
METHOD OF INSTALLATION: 4" casing drilled 17'								
TYPE OF PROTECTION FOR PIEZ: 18" C.M.P.			VENT:					
GROUND ELEV: 654.3		ELEV TOP OF RISER: 654.41		ELEV PIEZ TIP: 637.9				
FILTER: Gravel		FROM ELEV: 636.9		TO ELEV: 641.9				
SEAL: Bentonite Pellets		FROM ELEV: 641.9		TO ELEV: 643.9				
INSTALLED BY: Braun Engineering Test.		CONTRACT NO.:		FOREMAN: Gary Rueter				
DATE OF INSTALLATION: 10-12-82			DATE OF OBSERVATIONS: 10-14-82					
METHOD OF TESTING PIEZ: Fill water to top of pipe and record rate of fall								
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
10:47	30 sec.	14.6						
10:49	30 sec	14.6						
10:50	30 sec.	14.6						
REMARKS: Groundwater @ 14.6'								
Water did not flow thru sand - Bentonite mix								

WES FORM 790
MAR. 53
REVISED OCT. 53

Gary J. Rueter
INSPECTOR

APPROVED SUBJECT TO CORRECTIONS
NOTED & TO THE PROVISIONS OF
THE SPECIFICATIONS
A
JAN 17 1983
U. S. ARMY ENGINEER - DISTRICT ST. PAUL
By *M. Shortridge*

MINNESOTA: Minneapolis, Duluth, Hibbing, St. Cloud, Rochester, St. Paul

Affiliated Offices:
Williston, North Dakota
Hazen, North Dakota

Reply to:

PIEZOMETER INSTALLATION REPORT

PROJECT: DACW 37-82-C-0027			LEVEE DISTRICT: Reach F-2 Winona					
LOCATION (STA): 25+00 E		OFFSET FROM CENTER LINE: 235' left		PIEZ NO.: E-3				
PIEZ TYPE: 1½" x 24" x #18 slot		DEPTH OF PIEZ: 14½'		RISER PIPE DIAM: 1¼"				
PIEZ TIP SET IN (SOIL TYPE): (SP) Sand fine to med. gr		SOIL SAMPLE NO.: 26		BORING DIAM: 4"				
METHOD OF INSTALLATION: 4" casing drilled to 15½'								
TYPE OF PROTECTION FOR PIEZ: 18" C.M.P.				VENT:				
GROUND ELEV: 652.4		ELEV TOP OF RISER: 652.78		ELEV PIEZ TIP: 637.8				
FILTER: Gravel		FROM ELEV: 636.8		TO ELEV: 641.8				
SEAL: Bentonite Pellets		FROM ELEV: 641.8		TO ELEV: 643.8				
INSTALLED BY: Braun Engineering			CONTRACT NO.:		FOREMAN: Gary Rueter			
DATE OF INSTALLATION: 10-12-82			DATE OF OBSERVATIONS: 10-14-82					
METHOD OF TESTING PIEZ: Fill water to top of pipe and record rate of fall								
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
10:53	30 sec	10.7'						
10:54	20 sec	10.6'						
REMARKS: Groundwater @ 10.7'								
Water did not flow thru sand-bentonite fill								

WES FORM 72B
MAR. 53
REVISED OCT. 83

Gary J. Rueter
INSPECTOR

APPROVED SUBJECT TO CORRECTIONS
NOTED & TO THE PROVISIONS OF
THE SPECIFICATIONS

4'
JAN 17 1983

U. S. ARMY ENGINEER - DISTRICT ST. PAUL

By *M. Shothudse*



Testing Services Since 1957

MINNESOTA: Minneapolis, Duluth, Hibbing, St. Cloud, Rochester

PIEZOMETER INSTALLATION REPORT

Affiliated Offices:
Williston, North Dakota
Hazen, North Dakota

Reply to:

PROJECT: DACW 37-82-C-0027		LEVEE DISTRICT: Reach E-2 Winona						
LOCATION (STA): 25+00 E	OFFSET FROM CENTER LINE: 295' left	PIEZ NO.: E-4						
PIEZ TYPE: 1 1/4" x 24" x #18 slot	DEPTH OF PIEZ: 12'	RISER PIPE DIAM: 1 1/4"						
PIEZ TIP SET IN (SOIL TYPE): (SP) Sand fine to med. gr	SOIL SAMPLE NO.: 22	BORING DIAM: 4"						
METHOD OF INSTALLATION: 4" casing drilled to 13"								
TYPE OF PROTECTION FOR PIEZ: 18" C.M.P.		VENT:						
GROUND ELEV: 651.6	ELEV TOP OF RISER: 652.01	ELEV PIEZ TIP: 639.5						
FILTER: Gravel	FROM ELEV: 638.5	TO ELEV: 643.5						
SEAL: Bentonite pellets	FROM ELEV: 643.5	TO ELEV: 645.5						
INSTALLED BY: Braun Engineering Test	CONTRACT NO.:	FOREMAN: Gary Rueter						
DATE OF INSTALLATION: 10-12-82	DATE OF OBSERVATIONS: 10-14-82							
METHOD OF TESTING PIEZ: Fill water to top of pipe and record rate of fall								
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
10:58	20 sec	6.4'						
10:59	15 sec	6.3'						
REMARKS: Groundwater @ 6.4'								
Water did not flow thru sand-bentonite fill								

WES FORM 730
MAR. 53
REVISED OCT. 53

Gary J. Rueter
INSPECTOR

APPROVED SUBJECT TO CORRECTIONS NOTED & TO THE PROVISIONS OF THE SPECIFICATIONS
A
JAN 17 1983
U. S. ARMY ENGINEER - DISTRICT ST. PAUL
By *M. Shortridge*

BRAUN

Testing Services Since 1957

PIEZOMETER INSTALLATION REPORT ENGINEERING TESTING

MINNESOTA: Minneapolis, Duluth, Hibbing, St. Cloud, Rochester, St. Paul

Affiliated Offices:
Williston, North Dakota
Hazen, North Dakota

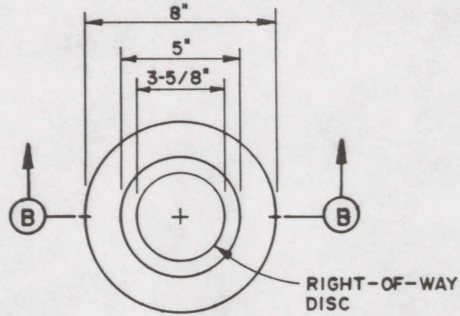
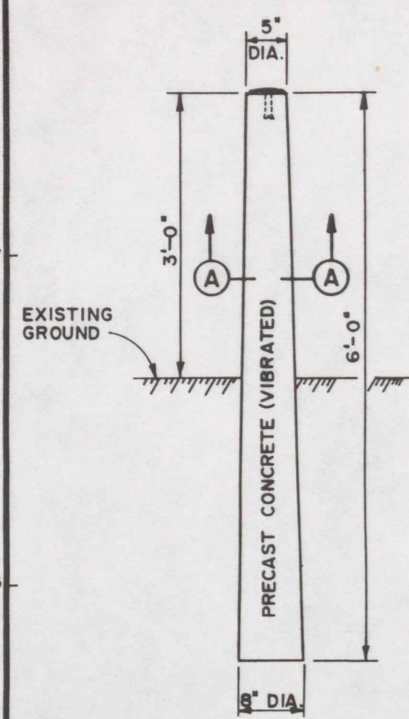
Reply to:

PROJECT: DACW 37-82-C-0027			LEVEL: Reach E-2			DISTRICT: Winona		
LOCATION (STA): 21+00 E		OFFSET FROM CENTER LINE: 88' left		PIEZ NO.: E-5				
PIEZ TYPE: 1 1/4" x 24" x #18 slot			DEPTH OF PIEZ: 10 1/2'		RISER PIPE DIAM: 1 1/4"			
PIEZ TIP SET IN (SOIL TYPE): (SP) Sand fine to med. gr			SOIL SAMPLE NO.: 17		BORING DIAM: 4"			
METHOD OF INSTALLATION: 4" casing drilled to 11 1/2"								
TYPE OF PROTECTION FOR PIEZ: 18" C.M.P.						VENT:		
GROUND ELEV: 649.4		ELEV TOP OF RISER: 649.78		ELEV PIEZ TIP: 638.8				
FILTER: Gravel		FROM ELEV: 637.8		TO ELEV: 642.8				
SEAL: Bentonite pellets		FROM ELEV: 642.8		TO ELEV: 644.8				
INSTALLED BY: Braun Engineering Test			CONTRACT NO.:		FOREMAN: Gary Rueter			
DATE OF INSTALLATION: 10-12-82				DATE OF OBSERVATIONS: 10-14-82				
METHOD OF TESTING PIEZ: Fill to top of pipe and record rate of fall								
TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
REMARKS: Natural groundwater @ 5.5' to top of riser pipe.								
Poured ten gallons H ₂ O into piezometer, rant out as fast as we could pour it in. Water did not flow thru sand-bentonite fill								

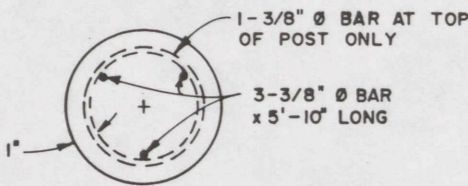
Gary J. Rueter
INSPECTOR

APPROVED SUBJECT TO REVISIONS NOTED & TO THE PROVISIONS OF THE SPECIFICATIONS
 A
 JAN 17 1983
 U. S. ARMY ENGINEER - DISTRICT ST. PAUL
 By *M. Hordidge*

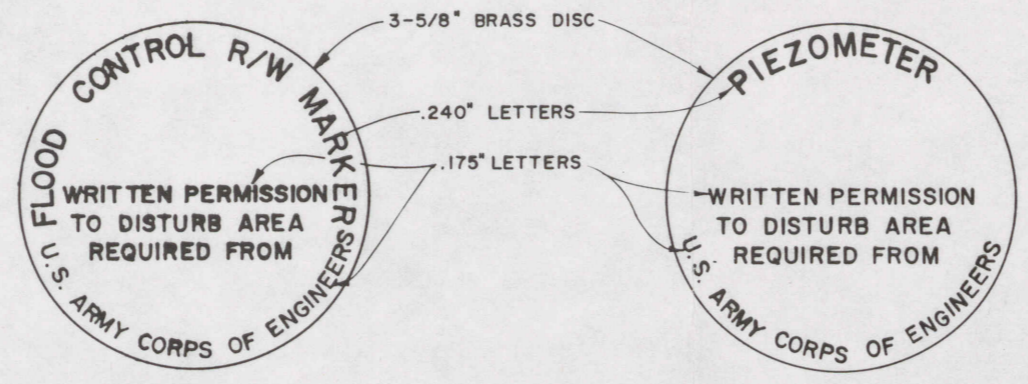
WES FORM 790
MAR. 53
REVISED OCT. 83



TOP VIEW
SCALE: 3" = 1'-0"
TOTAL WEIGHT = 226 LBS.



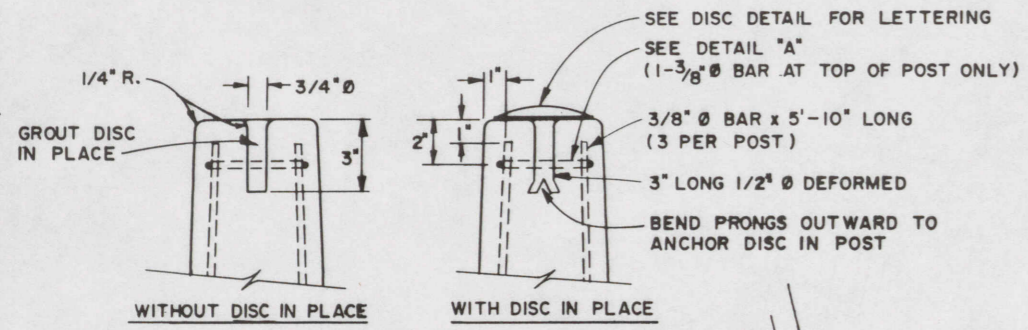
ELEVATION OF POST
SCALE: 1" = 1'-0"



R/W MARKER DISC
SCALE: FULL SIZE

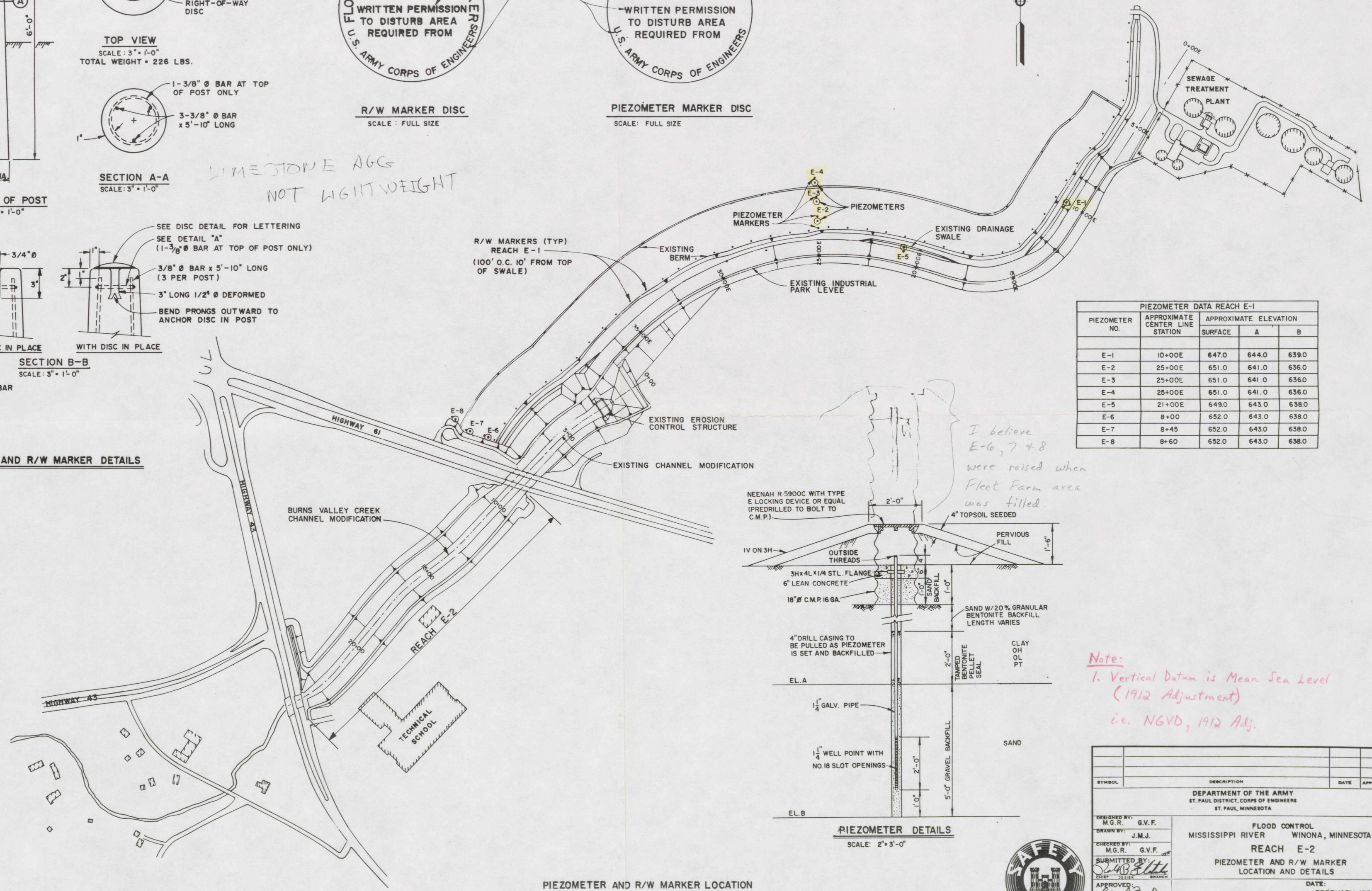
PIEZOMETER MARKER DISC
SCALE: FULL SIZE

LIMESTONE AGG
NOT LIGHTWEIGHT



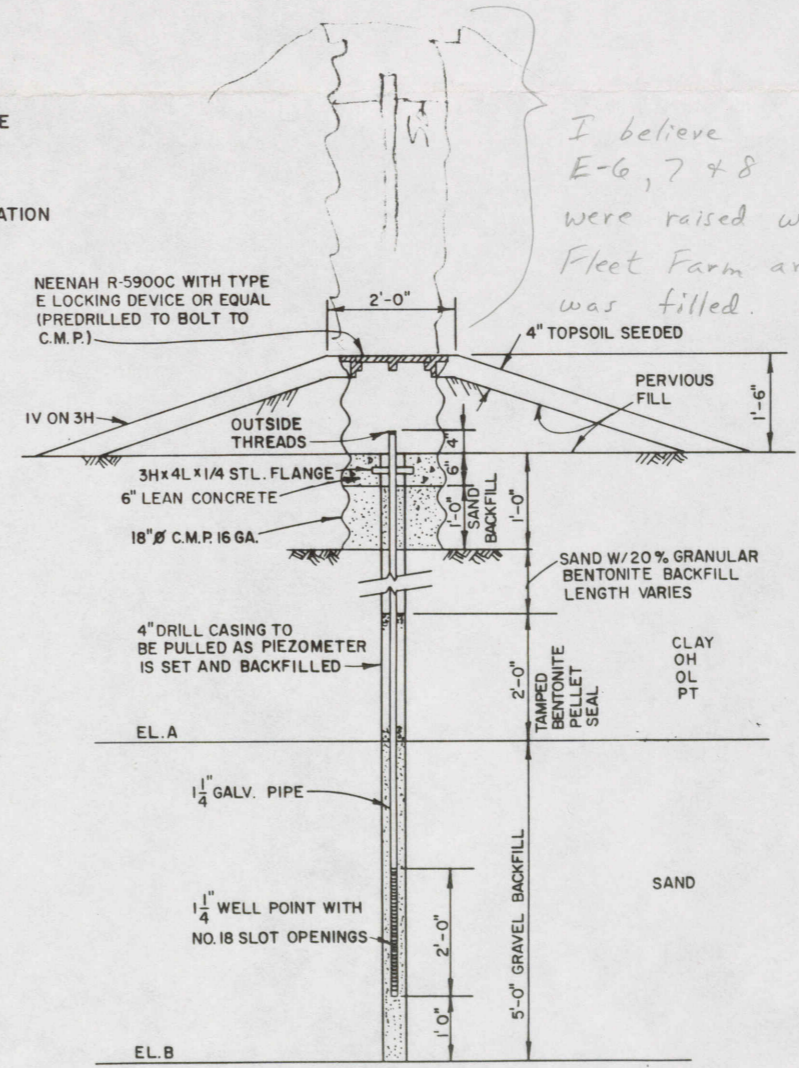
DETAIL "A"
NO SCALE

PIEZOMETER AND R/W MARKER DETAILS



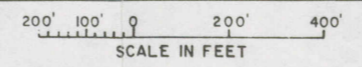
PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION	APPROXIMATE ELEVATION		
		SURFACE	A	B
E-1	10+00E	647.0	644.0	639.0
E-2	25+00E	651.0	641.0	636.0
E-3	25+00E	651.0	641.0	636.0
E-4	25+00E	651.0	641.0	636.0
E-5	21+00E	649.0	643.0	638.0
E-6	8+00	652.0	643.0	638.0
E-7	8+45	652.0	643.0	638.0
E-8	8+60	652.0	643.0	638.0

I believe E-6, 7 + 8 were raised when Fleet Farm area was filled.



Note:
1. Vertical Datum is Mean Sea Level (1912 Adjustment)
i.e. NGVD, 1912 Adj.

PIEZOMETER AND R/W MARKER LOCATION



SYMBOL	DESCRIPTION	DATE	APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: M.G.R.	G.V.F.	FLOOD CONTROL MISSISSIPPI RIVER WINONA, MINNESOTA REACH E-2 PIEZOMETER AND R/W MARKER LOCATION AND DETAILS	
DRAWN BY: J.M.J.			
CHECKED BY: M.G.R.	G.V.F.		
SUBMITTED BY: <i>[Signature]</i>		DATE: FEBRUARY 1982	
APPROVED: <i>[Signature]</i> CHIEF ENGINEER, DIVISION			
SCALE: AS SHOWN		SPEC. NO. DACW 37-82-B-0013	
DRAWING NUMBER M-L6-64/127		SHEET 13 OF 14	

Table . Piezometer data from Riverbend Industrial Park, in relation to river level. All data are from U.S. Army Corps of Engineers. Piezometer locations are shown in figure . Elevations are feet above mean sea level, 1929 adjustment.

Date	E-1 *650.6	E-2 *653.9	E-3 *652.3	E-4 *650.9	E-5 *648.0	Pool 5A Tailwaters
5/26/83	646.9	647.7	647.6	647.6	647.3	649.0
9/7/83	644.8	645.5	645.7	644.8	645.7	645.2
10/14/83	645.6	646.1	646.0	646.1	645.9	646.4
11/21/83	646.4	647.0	646.8	646.8	646.5	646.1
3/16/84	647.0	647.2	647.0	647.3	647.0	648.4
5/4/84	647.5	648.2	648.1	648.0	648.0	652.0
6/25/84	648.0	—	—	—	—	646.5
11/14/84	646.5	646.9	646.7	647.0	647.0	647.1
5/3/90	646.6	647.0	646.9	647.0	645.8	647.1
5/3/90	646.5	649.8	647.0	644.2	645.8	647.1
5/21/90	646.5	646.1	646.1	646.9	645.7	647.5
7/5/90	646.5	647.2	646.9	646.9	645.9	647.6

* Soil surface.

~~* Soil surface~~

Jeanne -

Please type this table on disk. I'll need it on July 16. I'll be gone until then. If you have questions about the table, ask Neal. Thanks!

Cal

Piezometer E-1

5A tailwaters
Kelley Willis
612-220-
0619

Date	* Water Table	* Ground Surface	* Pool 5A Tailwaters
May 26, 1983	646.9	650.6	49.47 649.0
Sept. 7, 1983	644.8		45.20 645.2
Oct. 14, 1983	645.6		46.39 646.4
Nov. 21, 1983	646.4		46.61 646.1
Mar. 16, 1984	647.0		48.89 648.4
May 4, 1984	647.5		52.42 652.0
June 25, 1984	648.0		47.03 646.5
Nov. 14, 1984	646.5		47.58 647.1
May 3, 1990	646.6		47.60 647.1
May 11, 1990	646.5		47.65 647.1
May 21, 1990	646.5		48.03 647.5
July 5, 1990	646.5		48.11 647.6

Piezometer E-2

May 26, 1983	647.7	653.9
Sept. 7, 1983	645.5	
Oct. 14, 1983	646.1	
Nov. 21, 1983	647.0	
Mar. 16, 1984	647.2	
May 4, 1984	648.2	
Nov. 14, 1984	646.9	
May 3, 1990	647.0	
May 11, 1990	649.8	
May 21, 1990	646.1	
July 5, 1990	647.2	

* MSL (1929 adjustment)

Piezometer E-3

May 26, 1983	647.6	652.3
Sept. 7, 1983	645.7	
Oct. 14, 1983	646.0	
Nov. 21, 1983	646.8	
Mar. 16, 1984	647.0	
May 4, 1984	648.1	
Nov. 14, 1984	646.7	
May 3, 1990 •	646.9	
May 11, 1990	647.0	
May 21, 1990	646.1	
July 5, 1990	646.9	

187

53

Piezometer E-4

May 26, 1983	647.6	650.9
Sept. 7, 1983	644.8	
Oct. 14, 1983	646.1	
Nov. 21, 1983	646.8	
Mar. 16, 1984	647.3	
May 4, 1984	648.0	
Nov. 14, 1984	647.0	
May 3, 1990	647.0	
May 11, 1990	644.2	
May 21, 1990	646.9	
July 5, 1990	646.9	

6

Piezometer E-5

May 26, 1983	647.3	648.0
Sept. 7, 1983	645.7	
Oct. 14, 1983	645.9	
Nov. 21, 1983	646.5	
Mar. 16, 1984	647.0	
May 4, 1984	648.0	
Nov. 14, 1984	647.0	
May 3, 1990	645.8	
May 11, 1990	645.8	
May 21, 1990	645.7	
July 5, 1990	645.9	

Date

ROUTING AND TRANSMITTAL SLIP

6-29-90

TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
1. Cal Fremling, Winona State		
2.		
3.		
4.		
5.		

Action	File	Note and Return
Approval	For Clearance	Per Conversation
As Requested	For Correction	Prepare Reply
Circulate	For Your Information	See Me
Comment	Investigate	Signature
Coordination	Justify	

REMARKS

Cal,

Attached are copies of the piezometer info that could be helpful to you.

Please note that the vertical datum used by the Corps at Winona is

Mean Sea Level, 1912 Adjustment.

MSL 1929 = MSL 1912 - 0.49 ft.

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
Al Kean Geotechnical Design Section	Phone No.

5041-102

GPO : 1987 O - 196-409

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

SUMMARY REPORT OF ALL READINGS
FOR OBSERVATION WELL(W), OR PIEZOMETER(P) W13

PROJECT CODE - WIN WINONA LEVEES

DATE - 27 JUN 90

DATE INSTALLED - 11 OCT 1982
LOCATION-STATION; 1000E
OFFSET; 90L

DATE OF CONST. COMPLETION - 0 19 0
BORING REFERENCE NUMBER- E1
CURRENT INSTRUMENT STATUS - ACTIVE

ELEVATION, TOP OF RISER= 651.38 (*top of 1 1/4" pipe*)
ELEVATION, TIP OF RISER= 639.90
ELEVATIONS OF THE READING ZONE

TOP MIDPOINT BOTTOM
0.00 0.00 0.00

READING DATE DAY MONTH YR	MILITARY TIME	ELEV-TOP OF RISER	ELEV-WATER SURFACE	POOL ELEV	TAILWATER ELEVATION	EMBK. ELEV.	FIELD MESSAGE
(1) 26 MAY 83	0000	651.38	647.38	646.9	647.64	0.00	10-NO MESSAGE
(2) 7 SEP 83	0000	651.38	645.31	644.8	645.50	0.00	10-NO MESSAGE
(3) 14 OCT 83	0000	651.38	646.13	645.6	0.00	0.00	10-NO MESSAGE
(4) 21 NOV 83	0000	651.38	646.88	646.4	0.00	0.00	10-NO MESSAGE
(5) 16 MAR 84	0000	651.38	647.46	646.9	647.0	0.00	10-NO MESSAGE
(6) 4 MAY 84	0000	651.38	648.05	647.5	0.00	0.00	10-NO MESSAGE
(7) 25 JUN 84	0000	651.38	648.46	648.0	0.00	0.00	10-NO MESSAGE
(8) 14 NOV 84	0000	651.38	646.96	646.5	0.00	0.00	10-NO MESSAGE

END OF REPORT FOR READINGS ON W13

↑
1912

↑
1929

SUMMARY REPORT OF ALL READINGS
FOR OBSERVATION WELL(W), OR PIEZOMETER(P) W15

PROJECT CODE - WIN WINONA LEVEES

DATE - 27 JUN 90

DATE INSTALLED - 12 OCT 1982
LOCATION-STATION; 2500E
OFFSET; 175L

DATE OF CONST. COMPLETION - 0 19 0
BORING REFERENCE NUMBER- E2
CURRENT INSTRUMENT STATUS - ACTIVE

ELEVATION, TOP OF RISER= 654.41
ELEVATION, TIP OF RISER= 637.90
ELEVATIONS OF THE READING ZONE

TOP MIDPOINT BOTTOM
0.00 0.00 0.00

READING DATE DAY MONTH YR	MILITARY TIME	ELEV-TOP OF RISER	ELEV-WATER SURFACE	POOL ELEV	TAILWATER ELEVATION	EMBK. ELEV.	FIELD MESSAGE
(1) 26 MAY 83	0000	654.41	648.20 <i>647.7</i>	647.64	0.00	0.00	10-NO MESSAGE
(2) 7 SEP 83	0000	654.41	645.96 <i>645.5</i>	645.50	0.00	0.00	10-NO MESSAGE
(3) 14 OCT 83	0000	654.41	646.58 <i>646.1</i>	0.00	0.00	0.00	10-NO MESSAGE
(4) 21 NOV 83	0000	654.41	647.49 <i>647.0</i>	0.00	0.00	0.00	10-NO MESSAGE
(5) 16 MAR 84	0000	654.41	647.70 <i>647.2</i>	0.00	0.00	0.00	10-NO MESSAGE
(6) 4 MAY 84	0000	654.41	648.68 <i>648.2</i>	0.00	0.00	0.00	10-NO MESSAGE
(7) 25 JUN 84	0000	654.41	0.00	0.00	0.00	0.00	4-UNDERWATER
(8) 14 NOV 84	0000	654.41	647.41 <i>646.9</i>	0.00	0.00	0.00	10-NO MESSAGE

END OF REPORT FOR READINGS ON W15

SUMMARY REPORT OF ALL READINGS
FOR OBSERVATION WELL(W), OR PIEZOMETER(P) W16

PROJECT CODE - WIN WINONA LEVEES

DATE - 27 JUN 90

DATE INSTALLED - 12 OCT 1982
LOCATION-STATION; 2500E
OFFSET; 235L

DATE OF CONST. COMPLETION - 0 19 0
BORING REFERENCE NUMBER- E3
CURRENT INSTRUMENT STATUS - ACTIVE

ELEVATION, TOP OF RISER= 652.78

ELEVATION, TIP OF RISER= 637.80

ELEVATIONS OF THE READING ZONE

TOP MIDPOINT BOTTOM
0.00 0.00 0.00

	READING DATE	MILITARY	ELEV-TOP	ELEV-WATER	POOL	TAILWATER	EMBK.	FIELD
	DAY MONTH YR	TIME	OF RISER	SURFACE	ELEV	ELEVATION	ELEV.	MESSAGE
(1)	26 MAY 83	0000	652.78	648.11	647.6	647.64	0.00	10-NO MESSAGE
(2)	7 SEP 83	0000	652.78	645.70	645.7	645.50	0.00	10-NO MESSAGE
(3)	14 OCT 83	0000	652.78	646.45	646.0	0.00	0.00	10-NO MESSAGE
(4)	21 NOV 83	0000	652.78	647.28	646.8	0.00	0.00	10-NO MESSAGE
(5)	16 MAR 84	0000	652.78	647.53	647.0	0.00	0.00	10-NO MESSAGE
(6)	4 MAY 84	0000	652.78	648.58	648.1	0.00	0.00	10-NO MESSAGE
(7)	25 JUN 84	0000	652.78	0.00	0.00	0.00	0.00	4-UNDERWATER
(8)	14 NOV 84	0000	652.78	647.16	646.7	0.00	0.00	10-NO MESSAGE

END OF REPORT FOR READINGS ON W16

SUMMARY REPORT OF ALL READINGS
FOR OBSERVATION WELL(W), OR PIEZOMETER(P) W17

PROJECT CODE - WIN WINONA LEVEES

DATE - 27 JUN 90

DATE INSTALLED - 12 OCT 1982
LOCATION-STATION; 2500E
OFFSET; 295L

DATE OF CONST. COMPLETION - 0 19 0
BORING REFERENCE NUMBER- E4
CURRENT INSTRUMENT STATUS - ACTIVE

ELEVATION, TOP OF RISER= 652.01

ELEVATION, TIP OF RISER= 639.50

ELEVATIONS OF THE READING ZONE

TOP MIDPOINT BOTTOM
0.00 0.00 0.00

	READING DATE	MILITARY	ELEV-TOP	ELEV-WATER	POOL	TAILWATER	EMBK.	FIELD
	DAY MONTH YR	TIME	OF RISER	SURFACE	ELEV	ELEVATION	ELEV.	MESSAGE
(1)	26 MAY 83	0000	652.01	648.13	647.64	0.00	0.00	10-NO MESSAGE
(2)	7 SEP 83	0000	652.01	645.30	645.50	0.00	0.00	10-NO MESSAGE
(3)	14 OCT 83	0000	652.01	646.59	0.00	0.00	0.00	10-NO MESSAGE
(4)	21 NOV 83	0000	652.01	647.26	0.00	0.00	0.00	10-NO MESSAGE
(5)	16 MAR 84	0000	652.01	647.80	0.00	0.00	0.00	10-NO MESSAGE
(6)	4 MAY 84	0000	652.01	648.46	0.00	0.00	0.00	10-NO MESSAGE
(7)	25 JUN 84	0000	652.01	0.00	0.00	0.00	0.00	4-UNDERWATER
(8)	14 NOV 84	0000	652.01	647.51	0.00	0.00	0.00	10-NO MESSAGE

END OF REPORT FOR READINGS ON W17

SUMMARY REPORT OF ALL READINGS
FOR OBSERVATION WELL (W), OR PIEZOMETER (P) W14

PROJECT CODE - WIN WINONA LEVEES

DATE - 27 JUN 90

DATE INSTALLED - 12 OCT 1982
LOCATION-STATION; 2100E
OFFSET; 88L

DATE OF CONST. COMPLETION - 0 19 0
BORING REFERENCE NUMBER- E5
CURRENT INSTRUMENT STATUS - ACTIVE

ELEVATION, TOP OF RISER= 649.78
ELEVATION, TIP OF RISER= 638.80
ELEVATIONS OF THE READING ZONE

TOP MIDPOINT BOTTOM
0.00 0.00 0.00

READING DATE DAY MONTH YR	MILITARY TIME	ELEV-TOP OF RISER	ELEV-WATER SURFACE	POOL ELEV	TAILWATER ELEVATION	EMBK. ELEV.	FIELD MESSAGE
(1) 26 MAY 83	0000	649.78	647.78	647.84	0.00	0.00	10-NO MESSAGE
(2) 7 SEP 83	0000	649.78	645.70	645.50	0.00	0.00	10-NO MESSAGE
(3) 14 OCT 83	0000	649.78	646.36	0.00	0.00	0.00	10-NO MESSAGE
(4) 21 NOV 83	0000	649.78	646.95	0.00	0.00	0.00	10-NO MESSAGE
(5) 16 MAR 84	0000	649.78	647.53	0.00	0.00	0.00	10-NO MESSAGE
(6) 4 MAY 84	0000	649.78	648.53	0.00	0.00	0.00	10-NO MESSAGE
(7) 25 JUN 84	0000	649.78	0.00	0.00	0.00	0.00	4-UNDERWATER
(8) 14 NOV 84	0000	649.78	647.45	0.00	0.00	0.00	10-NO MESSAGE

END OF REPORT FOR READINGS ON W14

R/W MARKER DISC

SCALE: FULL SIZE

PIEZOMETER MARKER DISC

SCALE: FULL SIZE

May 3, 1990

Bottom of well
 E1 646.26 ft above sea level

E2 638.05 ft

E3 639.24 ft

E4 639.37 ft

E5 637.9 ft

R/W MARKERS (TYP)
 REACH E-1
 (100' O.C. 10' FROM TOP
 OF SWALE)



INDUSTRIAL PARK LEVEE

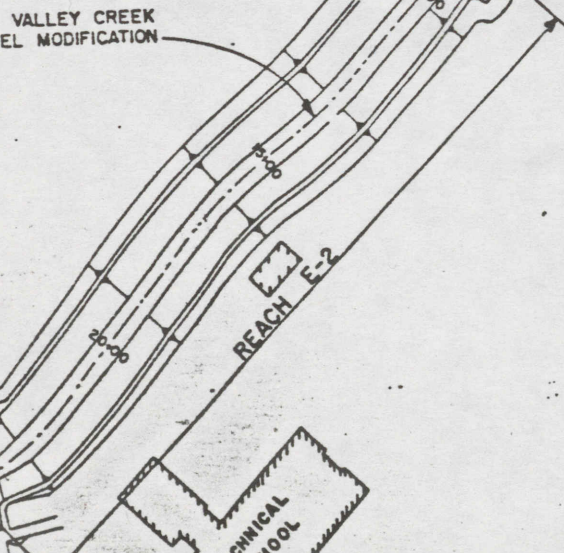
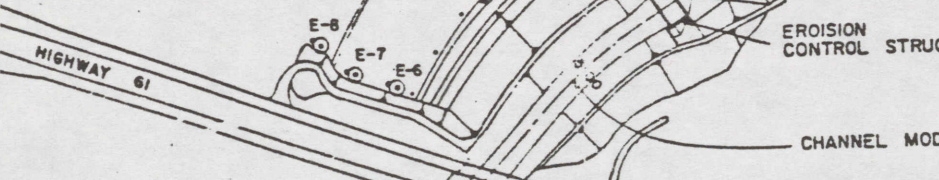
Depth to Water

E1	<u>5.05 ft</u>
E2	<u>8.11 ft</u>
E3	<u>6.82 ft</u>
E4	<u>5.44 ft</u>
E5	<u>3.58 ft</u>

water surface above sea level

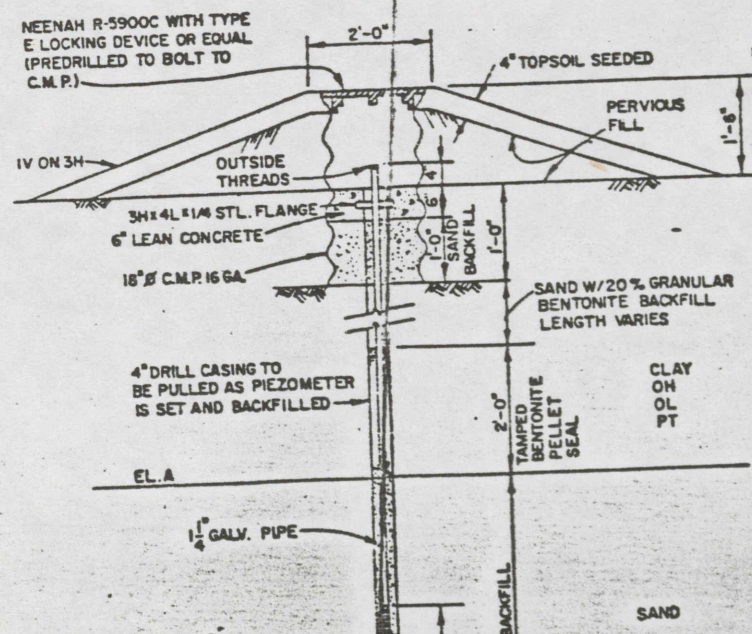
E1	<u>646.59 ft</u>
E2	<u>646.97 ft</u>
E3	<u>646.92 ft</u>
E4	<u>646.96 ft</u>
E5	<u>645.77 ft</u>

PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION
E-1	10+00E
E-2	25+00E
E-3	25+00E
E-4	25+00E
E-5	21+00E
E-6	8+00
E-7	8+45
E-8	8+60



Elev. to top of CMP Lid.

E1	<u>651.64</u>
E2	<u>655.08</u>
E3	<u>653.74</u>
E4	<u>652.40</u>
E5	<u>649.35</u>

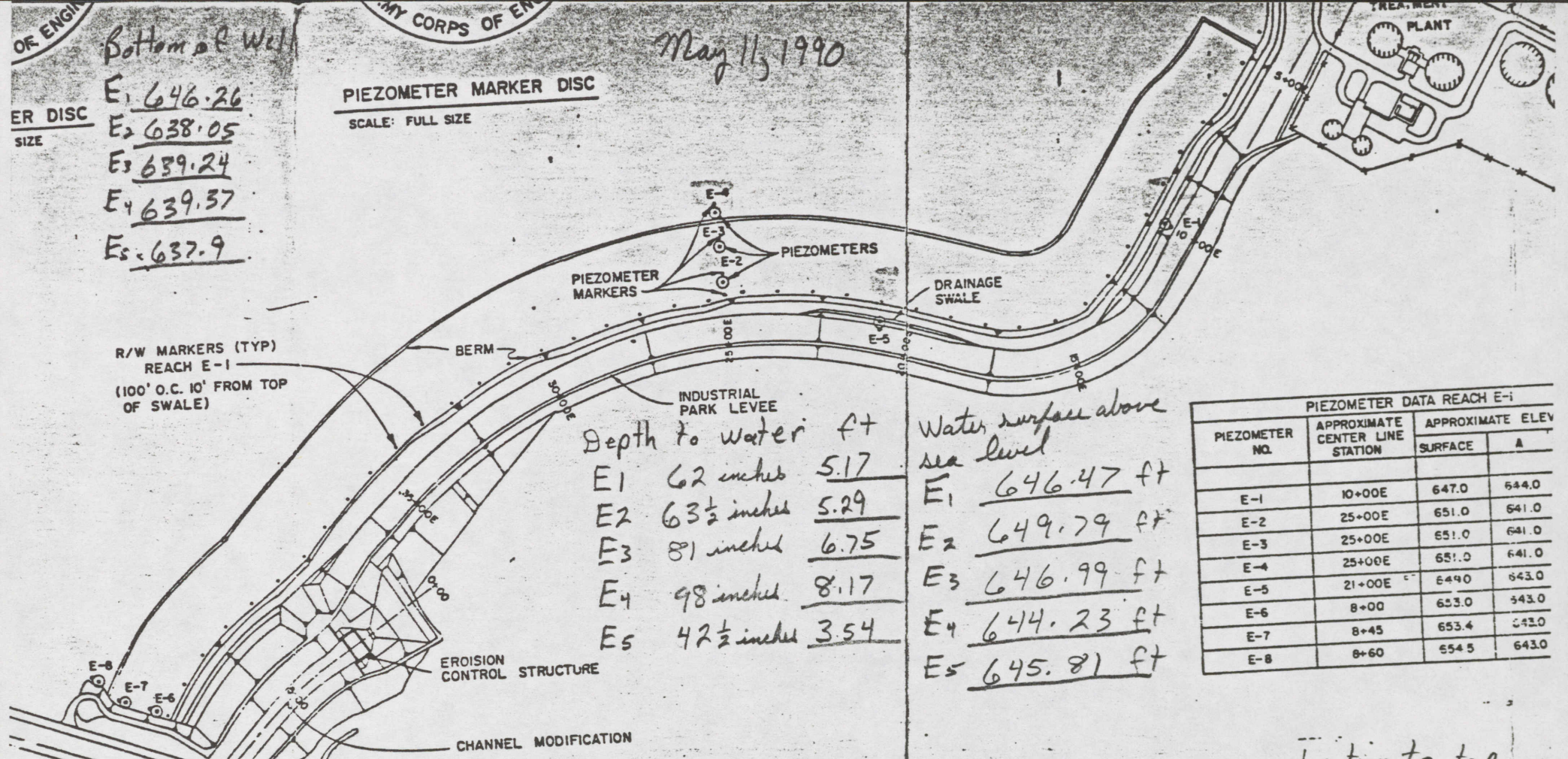


Data generated w/ piezometer water level indicator as checked by Rich Youngblom from PACE Labs.

Bottom of Well
 ER DISC
 SIZE
 E₁ 646.26
 E₂ 638.05
 E₃ 639.24
 E₄ 639.37
 E₅ 637.9

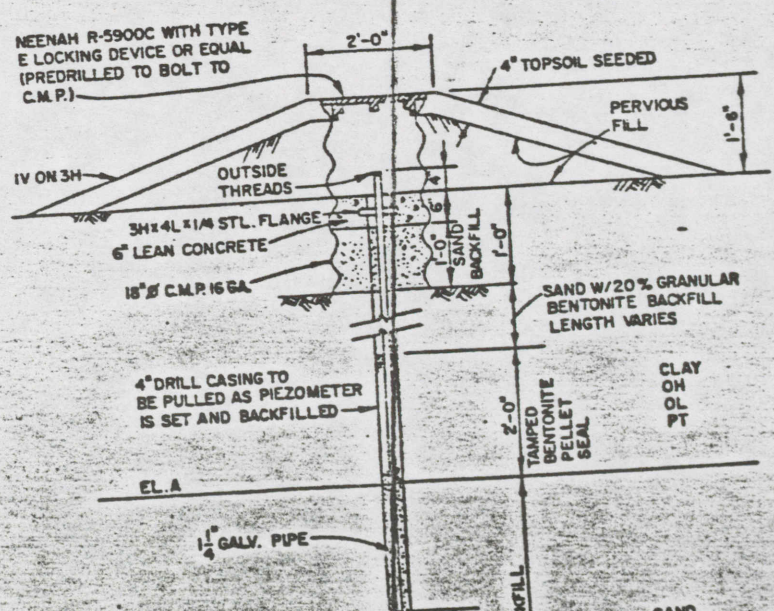
PIEZOMETER MARKER DISC
 SCALE: FULL SIZE

May 11, 1990



Depth to water ft	Water surface above sea level
E1 62 inches 5.17	E1 646.47 ft
E2 63 1/2 inches 5.29	E2 649.79 ft
E3 81 inches 6.75	E3 646.99 ft
E4 98 inches 8.17	E4 644.23 ft
E5 42 1/2 inches 3.54	E5 645.81 ft

PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION	APPROXIMATE ELEVATION	
		SURFACE	A
E-1	10+00E	647.0	644.0
E-2	25+00E	651.0	641.0
E-3	25+00E	651.0	641.0
E-4	25+00E	651.0	641.0
E-5	21+00E	649.0	643.0
E-6	8+00	653.0	643.0
E-7	8+45	653.4	643.0
E-8	8+60	654.5	643.0



elevation to top of C.M.P. 16 GA

E₁ 651.64
 E₂ 655.08
 E₃ 653.74
 E₄ 652.40
 E₅ 649.35

WA CR7 ID

Ecological measurements of a dredge spoil disposal area prior to filling.

By Bruce Ebnet

May 23, 1990

style?
size of trees?
significance of various species?
ecological succession?
wetland species?
? ?
?

Bruce, you need to do extensive reorganization to proper format and you need to discuss the vegetation observed directly in relation to past uses and current water levels to build a case for the project.

Field work A
Map B
Paper C—

Final grade B

I would like to take this opportunity to thank the following people for their time and efforts in contributing to this research: Dr. Calvin Fremling, (Professor of Biology, Winona State University), Dr. Neal Mundahl, (Assistant professor of Biology, Winona State University), Dr. Phillip Whitford, (Assistant Professor of Biology, Winona State University), and Dr. Carol Jefferson, (Professor of Biology, Winona State University). I would also like to thank John Brancich, fellow student, for expert assistance in running the transects.

*Genus & species
of deer etc*

Introduction

In looking towards future growth and placement of industries into an area that impacts the population and ecological settings the least, certain areas of land are more desirable to a municipality than others. The purpose of this document is to describe the area in question and provide information on the plant and animal species that might be displaced as a result of the filling. Also discussed will be the benefits obtained by the removal of the dredge spoil from Lake Winona, as pertains to the plant and animal life in that area.

The area in question lies in an area alongside the Mississippi River on the eastern end of Winona, Minnesota. ^{Fig 1.} It is bounded by Shives Road to the east, a temporary dike to the north and a permanent dike on the west side on which is placed a bike path.

Area background:

The Mississippi River has, for the last 500,000 years, been eroding and depositing soft sedimentary rock materials in a valley formed as a result of glaciation further to the north. The past 20,000 years has been a period of erosional processes in which the floor of the valley in the Winona area has been widened and the river allowed to meander from side to side due to the small elevation change. Severe soil erosion from a drainage basin adjacent to the area in the early 1800's caused the river to move to the middle of the valley and left the sand bar on the south side of the valley stable enough to build a settlement on. In 1851, the first settlement was started and the population rapidly swelled to 20,000. As the population increased more land was needed for the industries that moved in to take advantage of the ease of transportation offered by the nearby river

- Citation of Source as following.

and railroads. During the flood of 1965, the study area was inundated with water. Also in 1967 and 1969 the area, being lower than the surrounding area, was flooded. A permanent dike, authorized by the 1958 Flood Control Act, was completed in 1967 during Stage I. Stage II was authorized under Section 201 of the Flood Control Act of 1965. As part of the Stage II dike project, a pumping station was placed at the end of County Ditch # 4, which drains Lake Winona. This allows the water level of the lake to be controlled enough to prevent flooding of the surrounding basements by seepage. This pumping also has the effect of drawing down the water table level of the study area which is called Riverbend. *reference?*

During the spring of 1974, the Riverbend area was cleared of trees to provide an area for the fill dredged from a proposed 24 barge fleeting area on the adjacent river. The logs were sold and the slash burned during that summer. The necessary permits could not be obtained for this project and also the Environmental Protection Agency was opposed to building a fleeting area in that location. The area was allowed to grow back in trees and grasses. In 1985, the permitting processes were started in an effort to fill the now dry area of Riverbend with dredge spoil from the lake to create needed space for industrial applications. After many meetings with Dept. of Natural Resources, United States Fish and Wildlife Service, United States Army Corps of Engineers and Lake Winona Committee, the area was again considered a fill site. *reference?*

What kind of grasses

Needs a Methods section to describe how you mapped the vegetation, ie
Transect sampling with ~~as~~ spacing, on orientation - Define density, dominance criteria used to assign species, and references

Data

On March 23, 1990, The area was surveyed and the following information was noted. *how?*

In the ditches left by the city for sewer line placement there was noted old beaver sign, such as caved in banks and half rotted trees that had been cut down many years before. Tree stands in the area suggest a history of usage by hunters. New and old rusted appliances and metal show use as a household refuse dump, albeit unlawful. Bird species consist of cardinals, blackbirds, and *woodcock + many others* sparrows. The area was completely dry with the exception of the ditches and a cattail area behind Fleet Farms wood storage lot. Tree species noted were boxelder (Acer negundo L.), silver maple (Acer saccharinum L.), cottonwood (Populus deltoides) and willow (Salix interior). *multiple stems* *mulberry*

March 30, a fence was noted grown into a tree which means somebody used the area for livestock pasture. Cottontail rabbits were noted using the willow areas and the water in the cattail area was 1 to 3.0 feet deep.

April 6, geese were spotted using the small lake on the southeast side of the bike path but no usage of the study area was noted. Some of the dead trees were being used for nest holes by woodpeckers, and in the short raised road bed were several holes thought to be fox dens.

April 12, 7 deer were spotted in the grassy mowed area adjacent to the cattail area but when approached ran into the thicker woods on the other side of the bike path. With the advent of warmer weather the area has received usage by migrating birds but none seem to be permanent. Except for the cattails, there seems to be a shortage of food for them. *what birds eat cattails?*

April 19, the ice is gone from the ditch and fresh beaver sign denotes usage. Sap is running in the trees and the ground has thawed sufficiently

species?

April 24, a 5 inch rain from the previous 2 days has flooded most of the study area with 2 inches to 4 feet deep. Ducks were spotted and the cattail area was alive with sounds of the western chorus frog. The weather has been warm enough to hatch insects and there is heavy bird usage. The 5 piezometers checked show the water table to be low, suggesting there are clays and silts slowing the infiltration rates.

April 26, weather is slightly cooler and the insects have slowed in their hatch, but there seems to be more rabbits using the willow areas.

May 3, a technician from P.A.C.E. labs checked the 5 piezometers to determine the water table level.

May 11, discussion with the manager of the sewage treatment plant provides information on the pumping station. The piezometers were checked again to access the weekly changes.

May 21, 1990 piezometers checked for the 4th and final time.

0.48 ft difference between 1912 & 1929 (1912 is 0.48ft higher)

Al Kean - USACE
612-220-0655
has data for 1933 & 1984
isnt sure if his data are or if his readings from top of CMP or the 3 pipes.

Elev. of water ft above mean sea level

Water Table

Piezometers	Bottom of well	Elev. CMP TOP	May 3	May 11	May 21	Ground level
E1	646.26	651.64	646.59	646.47	646.51	650.6
E2	638.05	655.28	646.97	649.79	647.08	653.9
E3	639.24	653.74	646.92	646.99	646.11	652.3
E4	639.37	652.40	646.96	644.23	646.90	650.9
E5	637.90	649.35	645.77	645.81	645.72	648.0

This data shows the area is filled with silts and clays which retard

1929 datum

water infiltration and lateral movement. The area had rain on May 9th and the area around E2 holds the water in a perched condition. The only water noted at ground level is the water in the sewage line ditch and the small cattail area. Seepage from the Fleet Farm lot keeps a small amount of water in place. Usage of the study area by the local population seems to be very slight with the exception of people using the area for walking their dog.

Discussion:

Benefits of the dredging program would be loss of curly leafed pondweed (Potamogeton crispus), which is a source of eutrophy in the lake. This is because of the weed's inability to germinate at lower light levels found at greater depths. Increased water volume of the lake will improve the oxygen holding capacity, and allow removal of the thick layer of organic material from the bottom, which causes a high BOD load.

Due to the excessive growth of the pondweed limiting the effectiveness of predators and the small amount of oxygen available for insect development, there are millions of stunted bluegills, perch and bullheads which have no chance of achieving a size suitable for fishing, which is one of the major uses of the lake. The dredging would provide deeper areas for game fish to go and with the weed only on the shallower edges, allow those game fish a better chance to capture their food.

Some of the dredging in the total proposal would renew the marsh area found on the south side of the lake and provide areas for education and

Lake dredging needs to be mentioned in the introduction of lake improvement before it is discussed here

irrelevant

environmental interpretation for the residents of Winona. These areas are being studied to determine the best vegetation types for the species of wildlife desired.

The benefits of filling in Riverbend involve a very real monetary increase in value of the property to industry. It would allow the industries to stay in one place to reduce the pollution within residential and business sections and will preserve the more environmentally sensitive and aesthetically pleasing areas from degradation.

The detriment to the area comes from the displacing of several species of common trees, birds, small mammals, such as beaver, woodchuck, mice, and rabbits, a few ducks, and some deer that seem to come from the area across the bike path. All of these species have coexisted with civilizations and are quite adept at relocating. The acreage at Riverbend is small compared to areas better suited to wildlife which are only a few hundred yards away. *subjective judgement*

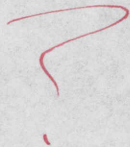
Information for the transects through the study area were generated with measured lines 400 feet apart running in a north-south direction. Compasses were used to keep the lines straight with surveyor tape marking the line. *make model* A range finder that had been calibrated was used to determine the distance if the actual length could not be measured. At each change of taxonomic species the measurement was recorded and the distance placed on a map that had been roughly generated by projecting a high altitude photo *photo date* onto a large sheet of paper. At the completion of the measurements the map was drawn at a fractional scale of 1:1200. This allows the placement of detail not generally visible on a map of greater scale. Using the Winona State geology digitizer, the map information was placed on a computer disc and taken to the U.S. Fish and Wildlife Service Environmental Management Tech Center where the map was colorized according to the similarities of

To
method

the vegetation. Due to inconsistencies between EPPL 7 and ARC INFO software, the map was produced in reverse. Therefore, a hand drawn map will be used.

Summary

Future growth dictates a need for suitable properties in placement of industries. The study area of Riverbend would provide an acceptable alternative to placement in more fragile environments. This project, in conjunction with the reshaping of the marsh areas, provides ecologically sound ideas for the restructuring of the habitats. It would also provide industrial growth space for many years.



- Brower, J.E. and Zar, J.H. 1984. Field & Laboratory Methods for General Ecology. 2nd ed. Wm. C. Brown Publishers, Dubuque, Iowa.
- Fasset, N.C. 1976. Spring Flora of Wisconsin. The University of Wisconsin Press, Madison, WI.
- Fremling, C.R. and ~~Glenn~~ ^{Henry Glenn} A.H. 1986. A Lake Winona Compendium. Winona State University Press, Winona Mn.
- Orr, R.T. 1982. Vertebrate Biology. 5th ed. Saunders College Publishing. New York.

↑
need to
be cited at
appropriate
places in paper

R/W MARKER DISC
SCALE: FULL SIZE

PIEZOMETER MARKER DISC
SCALE: FULL SIZE

May 3, 1990

Bottom of well
E₁ 646.26 ft above sea level

E₂ 638.05 ft
E₃ 639.24 ft
E₄ 639.37 ft
E₅ 637.9 ft

R/W MARKERS (TYP)
REACH E-1
(100' O.C. 10' FROM TOP OF SWALE)

PIEZOMETER MARKERS
PIEZOMETERS

DRAINAGE SWALE

INDUSTRIAL PARK LEVEE
Depth to Water
E₁ 5.05 ft
E₂ 8.11 ft
E₃ 6.82 ft
E₄ 5.44 ft
E₅ 3.58 ft

Water surface above sea level
E₁ 646.59 ft
E₂ 646.97 ft
E₃ 646.92 ft
E₄ 646.96 ft
E₅ 645.77 ft

PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION
E-1	10+00E
E-2	25+00E
E-3	25+00E
E-4	25+00E
E-5	21+00E
E-6	8+00
E-7	8+45
E-8	8+60

HIGHWAY 61

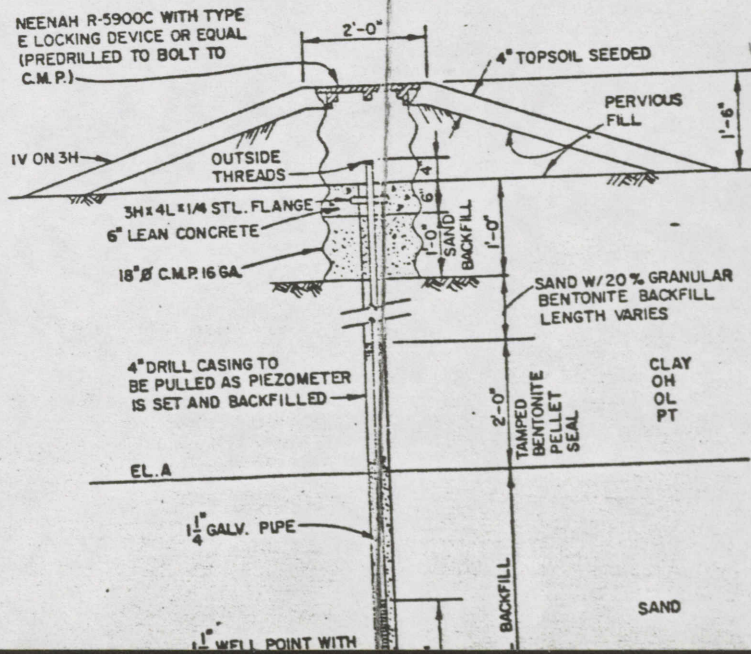
EROSION CONTROL STRUCTURE

CHANNEL MODIFICATION

VALLEY CREEK CHANNEL MODIFICATION

Elev. to top of CMP Lid.

E₁ 651.64
E₂ 655.08
E₃ 653.74
E₄ 652.40
E₅ 649.35



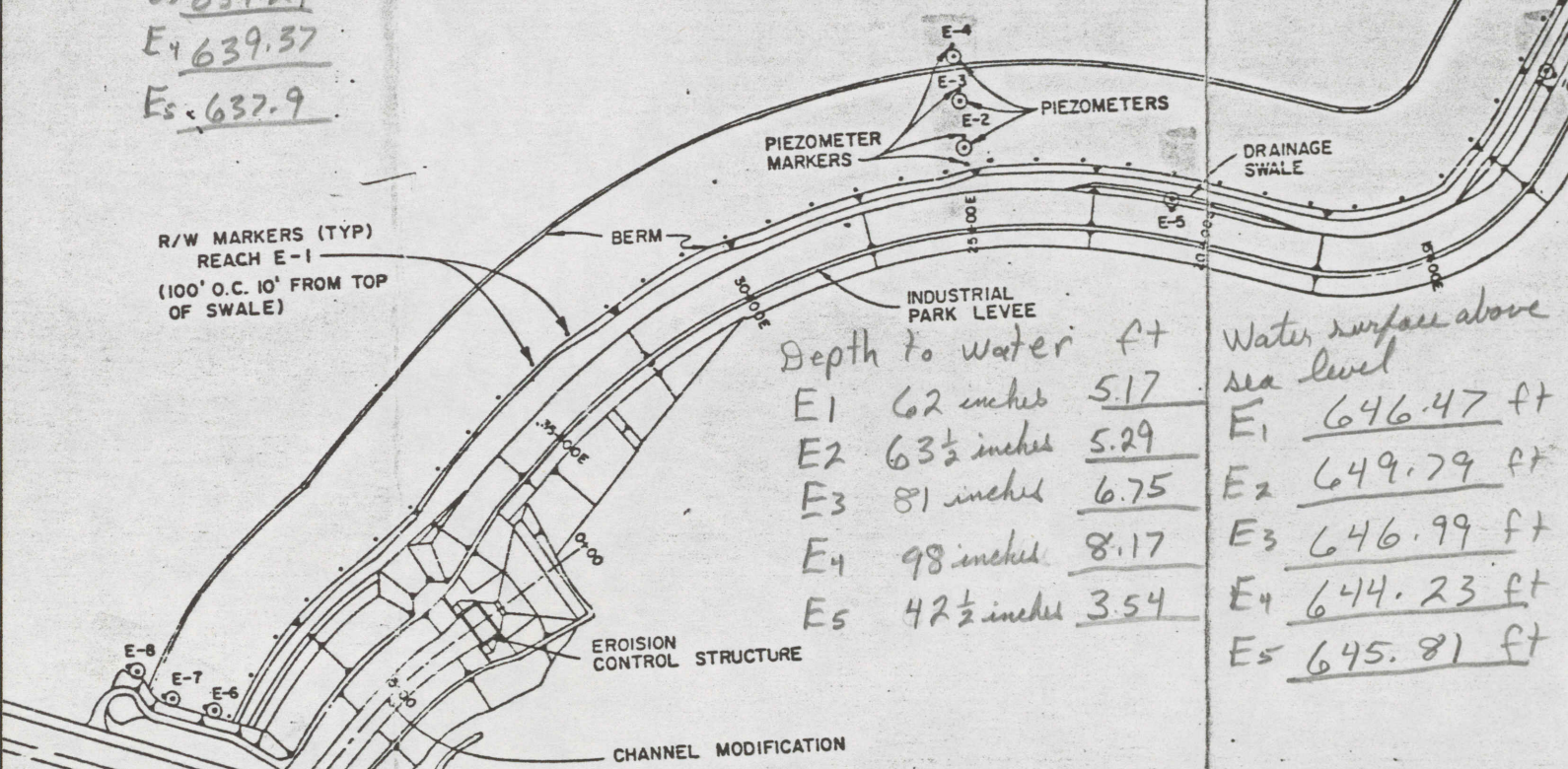
Data generated w/ piezometer water level indicator as checked by Rich Youngblom from PACE Labs.

TECHNICAL SCHOOL

AS-BUILT

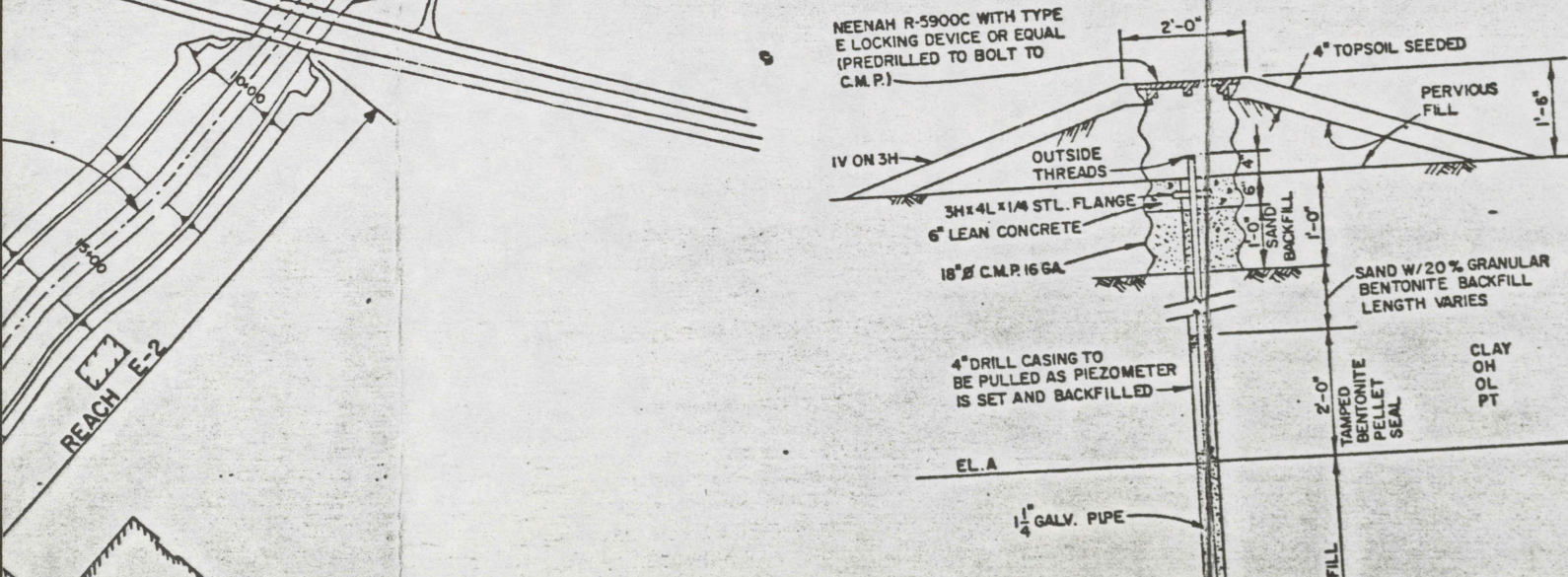
OF ENGINE
 Bottom of Well
 E₁ 646.26
 E₂ 638.05
 E₃ 639.24
 E₄ 639.37
 E₅ 637.9

ARMY CORPS OF ENGINEERS
 May 11, 1990
 PIEZOMETER MARKER DISC
 SCALE: FULL SIZE



Depth to water	ft	Water surface above sea level
E1	62 inches	5.17
E2	63 1/2 inches	5.29
E3	81 inches	6.75
E4	98 inches	8.17
E5	42 1/2 inches	3.54

PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION	APPROXIMATE ELEVATION	
		SURFACE	A
E-1	10+00E	647.0	644.0
E-2	25+00E	651.0	641.0
E-3	25+00E	651.0	641.0
E-4	25+00E	651.0	641.0
E-5	21+00E	649.0	643.0
E-6	8+00	653.0	643.0
E-7	8+45	653.4	643.0
E-8	8+60	654.5	643.0



elevation to top of CMP lid

E₁ 651.64
 E₂ 655.08
 E₃ 653.74
 E₄ 652.40
 E₅ 649.35

May 21 1990

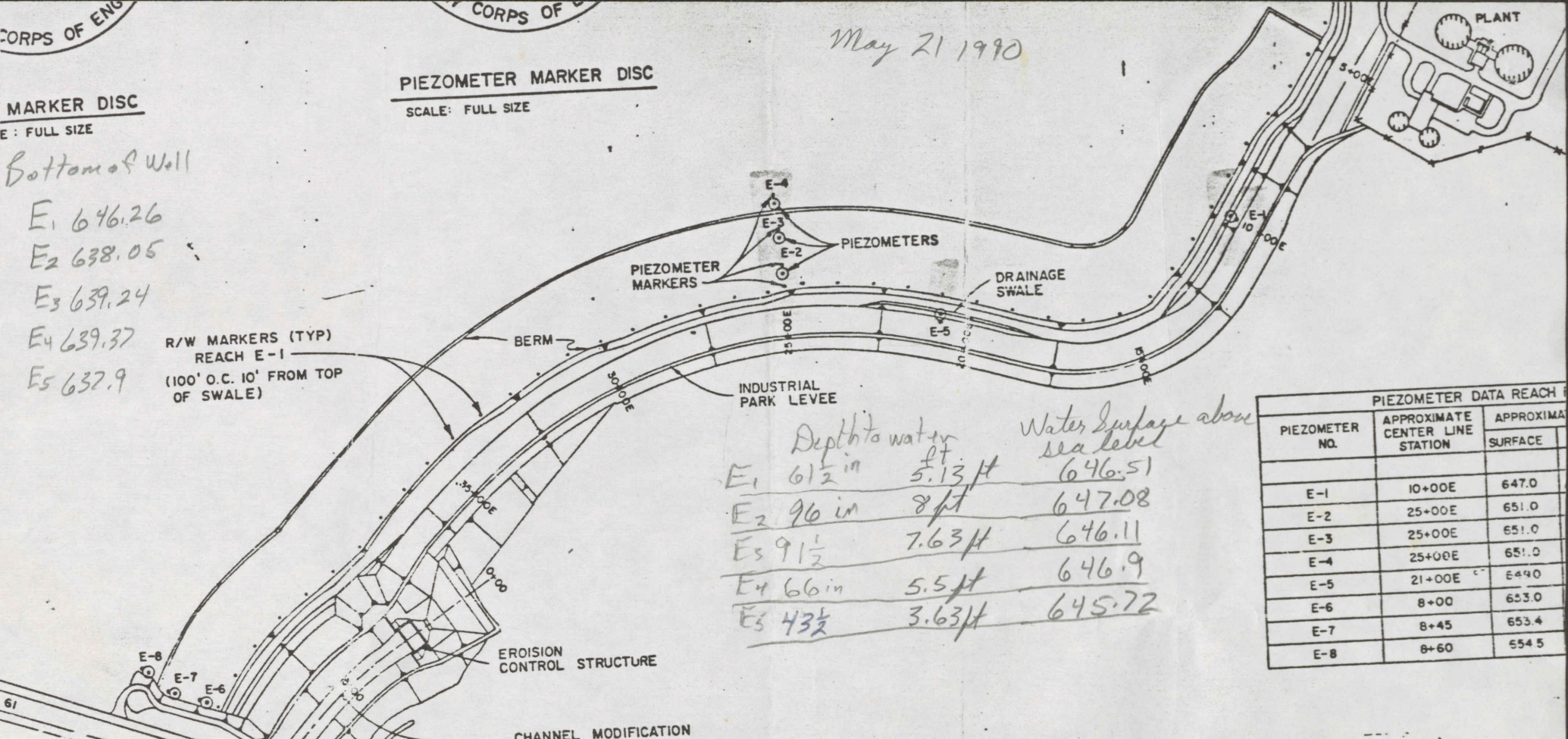
MARKER DISC
E: FULL SIZE

PIEZOMETER MARKER DISC
SCALE: FULL SIZE

Bottom of Well

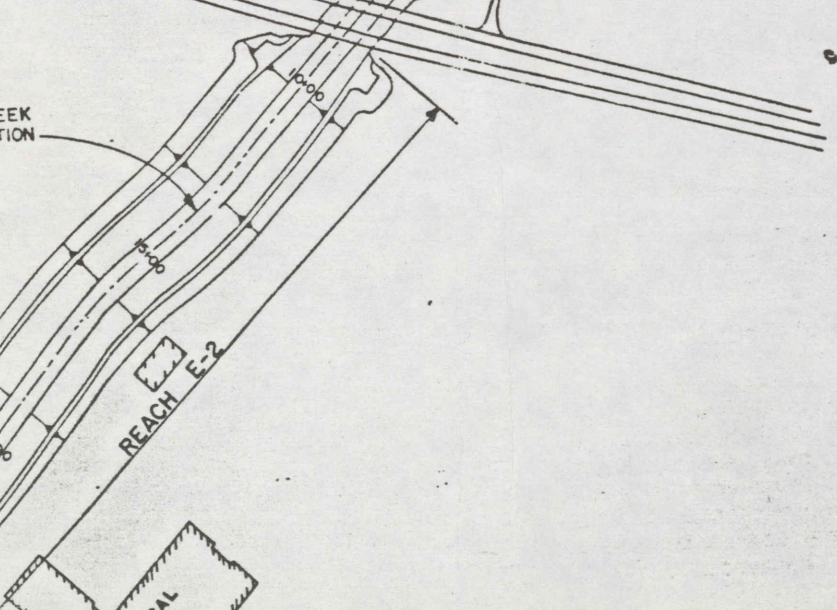
- E₁ 646.26
- E₂ 638.05
- E₃ 639.24
- E₄ 639.37
- E₅ 632.9

R/W MARKERS (TYP)
REACH E-1
(100' O.C. 10' FROM TOP
OF SWALE)



	Depth to water ft	Water Surface above sea level
E ₁	61 1/2 in 5.13 ft	646.51
E ₂	96 in 8 ft	647.08
E ₃	91 1/2 in 7.63 ft	646.11
E ₄	66 in 5.5 ft	646.9
E ₅	43 1/2 in 3.63 ft	645.72

PIEZOMETER NO.	APPROXIMATE CENTER LINE STATION	APPROXIMATE SURFACE
E-1	10+00E	647.0
E-2	25+00E	651.0
E-3	25+00E	651.0
E-4	25+00E	651.0
E-5	21+00E	649.0
E-6	8+00	653.0
E-7	8+45	653.4
E-8	8+60	654.5



- Elevation to top of CMP lid
- E₁ 651.64
 - E₂ 655.08
 - E₃ 653.74
 - E₄ 652.40
 - E₅ 649.35