DATA REPORT Rev. 1 | Rev. 1
GEOTECHNICAL EXPLORATION AND TESTING

VIRGINIA ELECTRIC AND POWER COMPANY | Rev. 1
NORTH ANNA NUCLEAR POWER STATION
MINERAL, LOUISA COUNTY, VIRGINIA

September 28, 2007 | Rev. 1

VOLUME 2

APPENDICES C and D

Prepared For:

Virginia Electric and Power Company | Rev. 1
Richmond, Virginia

Prepared By:

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

MACTEC Project No. 6468-06-1472

APPENDIX C.1

OBSERVATION WELL LOGS, DEVELOPMENT RECORDS AND SAMPLING RECORDS

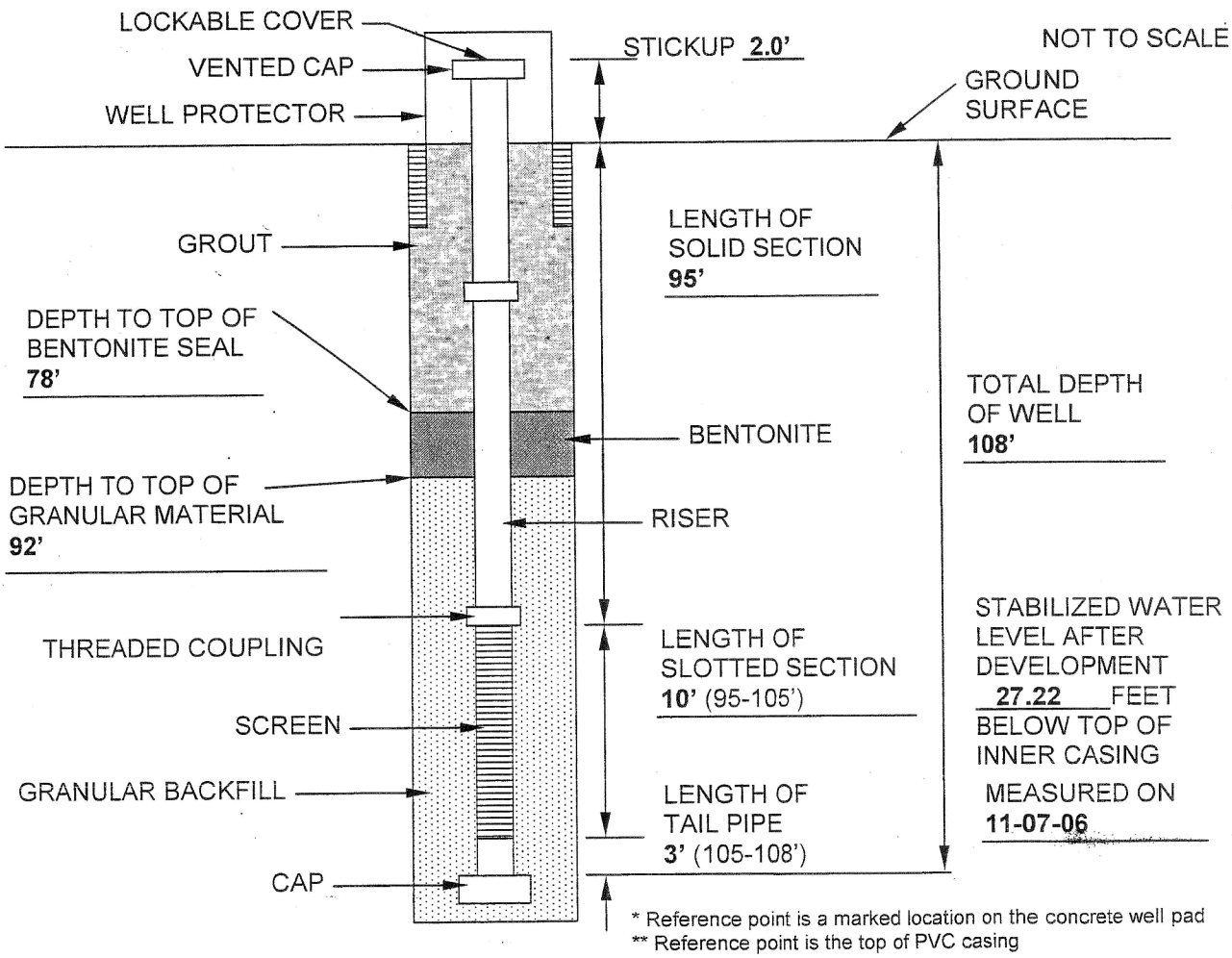
NORTH ANNA COL

DATA REPORT REV. 0
JANUARY 23, 2007

MACTEC PROJECT NO. 6468-06-1472

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-901	INSTALLATION DATE	10-31-06
LOCATION (NAD83)	N = 3,909,772.32 E = 11,685,917.49		
GROUND SURFACE ELEVATION* (NAVD88)	309.62	REFERENCE POINT ELEVATION** (NAVD88)	311.32
GRANULAR BACKFILL MATERIAL	Southern Silica #1 Sand	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Air rotary	DRILLING CONTRACTOR	Bedford
BOREHOLE DIAMETER	6"	MACTEC FIELD REPRESENTATIVE	Kim Charles-Smith
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		



* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION
MINERAL, VIRGINA
COL PROJECT
Dominion Purchase Order 7015798

MACTEC

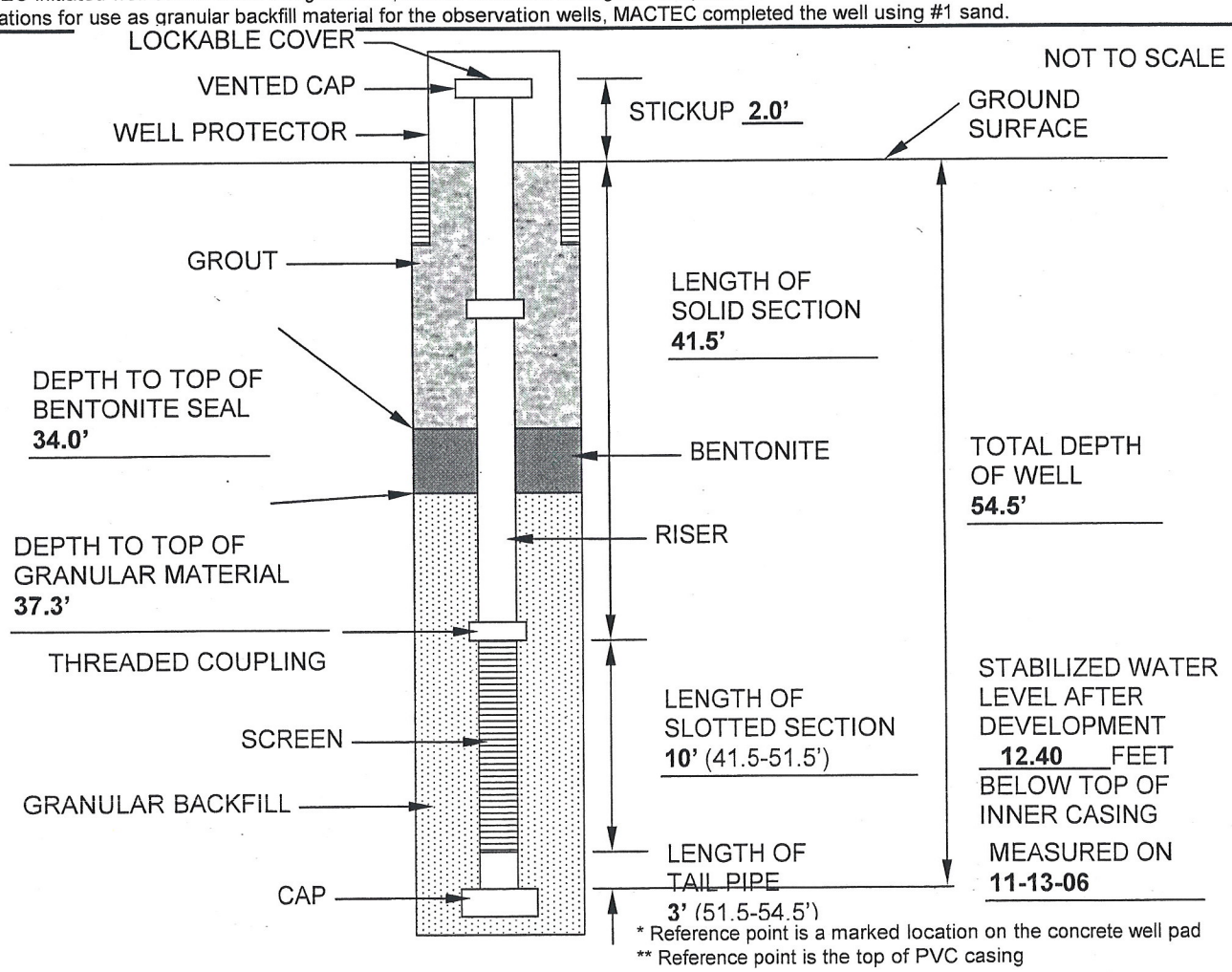
MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

OBSERVATION WELL INSTALLATION RECORD
JAZ 1-19-07

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-945	INSTALLATION DATE	11-07-06
LOCATION (NAD83)	N = 3,910,136.49 E = 11,683,793.31		
GROUND SURFACE ELEVATION* (NAVD88)	281.56	REFERENCE POINT ELEVATION** (NAVD88)	283.08
GRANULAR BACKFILL MATERIAL	Southern Silica #1 & #3 Sand*	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Hollow-stem auger 4.25" I.D.	DRILLING CONTRACTOR	MACTEC
BOREHOLE DIAMETER	Approximately 8"	MACTEC FIELD REPRESENTATIVE	Kim Charles-Smith
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		

* MACTEC initiated well construction using #3 sand, but did not have enough to complete the well. Because both #1 and #3 sands met technical specifications for use as granular backfill material for the observation wells, MACTEC completed the well using #1 sand.

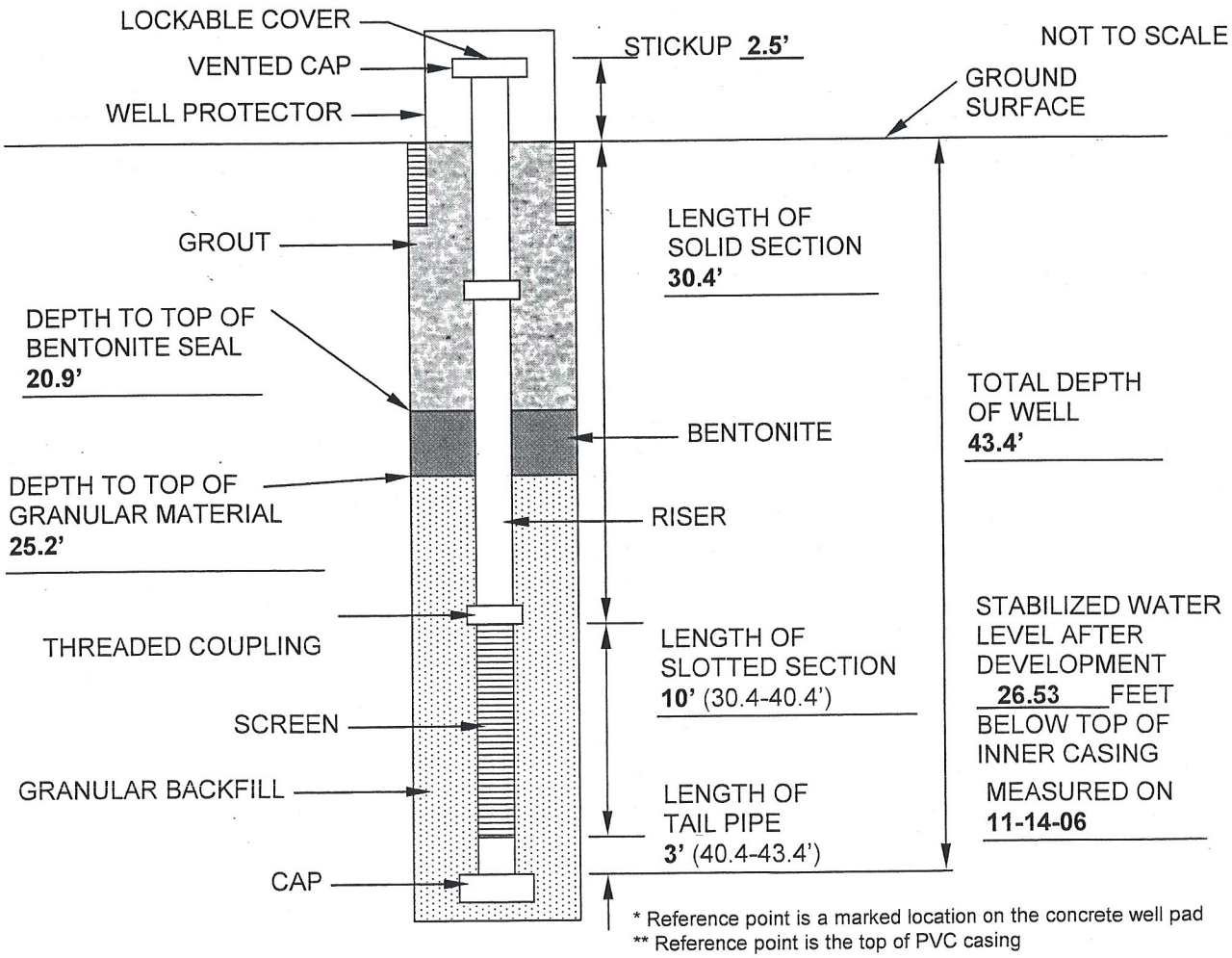


* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION MINERAL, VIRGINA COL PROJECT Dominion Purchase Order 7015798	MACTEC MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604	OBSERVATION WELL INSTALLATION RECORD 1-18-07

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-946	INSTALLATION DATE	11-13-06
LOCATION (NAD83)	N = 3,908,787.97 E = 11,683,822.73		
GROUND SURFACE ELEVATION* (NAVD88)	334.04	REFERENCE POINT ELEVATION** (NAVD88)	335.58
GRANULAR BACKFILL MATERIAL	Southern Silica #3 Sand	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Hollow-stem auger 4.25" I.D.	DRILLING CONTRACTOR	MACTEC
BOREHOLE DIAMETER	Approximately 8"	MACTEC FIELD REPRESENTATIVE	Joe Wallen
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		



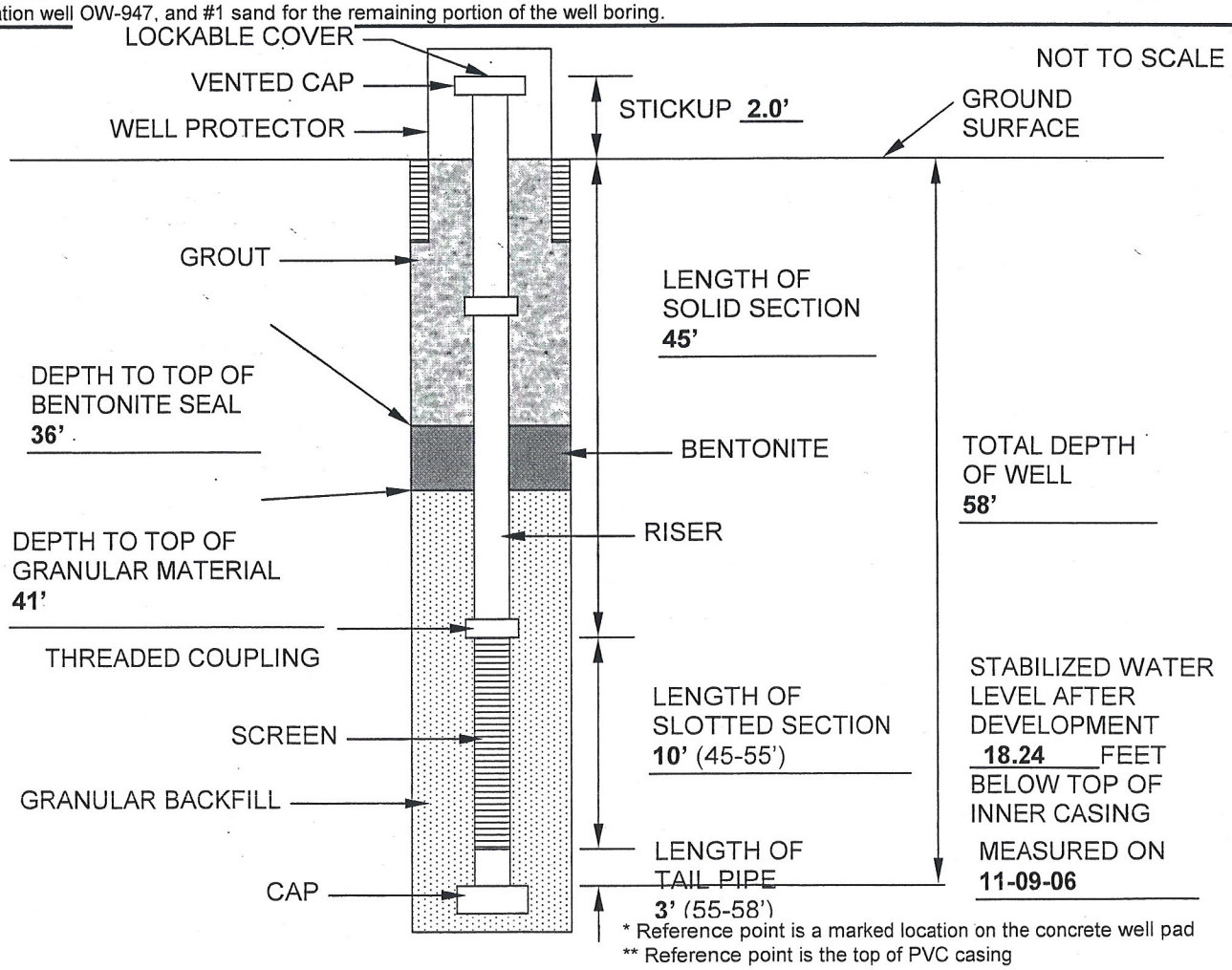
* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION MINERAL, VIRGINA COL PROJECT Dominion Purchase Order 7015798	MACTEC MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604	OBSERVATION WELL INSTALLATION RECORD 1-18-07

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-947	INSTALLATION DATE	11-06-06
LOCATION (NAD83)	N = 3,909,579.58 E = 11,686,371.84		
GROUND SURFACE ELEVATION* (NAVD88)	313.30	REFERENCE POINT ELEVATION** (NAVD88)	315.08
GRANULAR BACKFILL MATERIAL	Southern Silica #1 & #3 Sand*	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Hollow-stem auger 4.25" I.D.	DRILLING CONTRACTOR	MACTEC
BOREHOLE DIAMETER	Approximately 8"	MACTEC FIELD REPRESENTATIVE	Kim Charles-Smith
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		

* Both #1 and #3 sand met the technical specifications for use as granular backfill material. MACTEC used #3 sand to backfill the sump portion of observation well OW-947, and #1 sand for the remaining portion of the well boring.



* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION
MINERAL, VIRGINA
COL PROJECT
Dominion Purchase Order 7015798

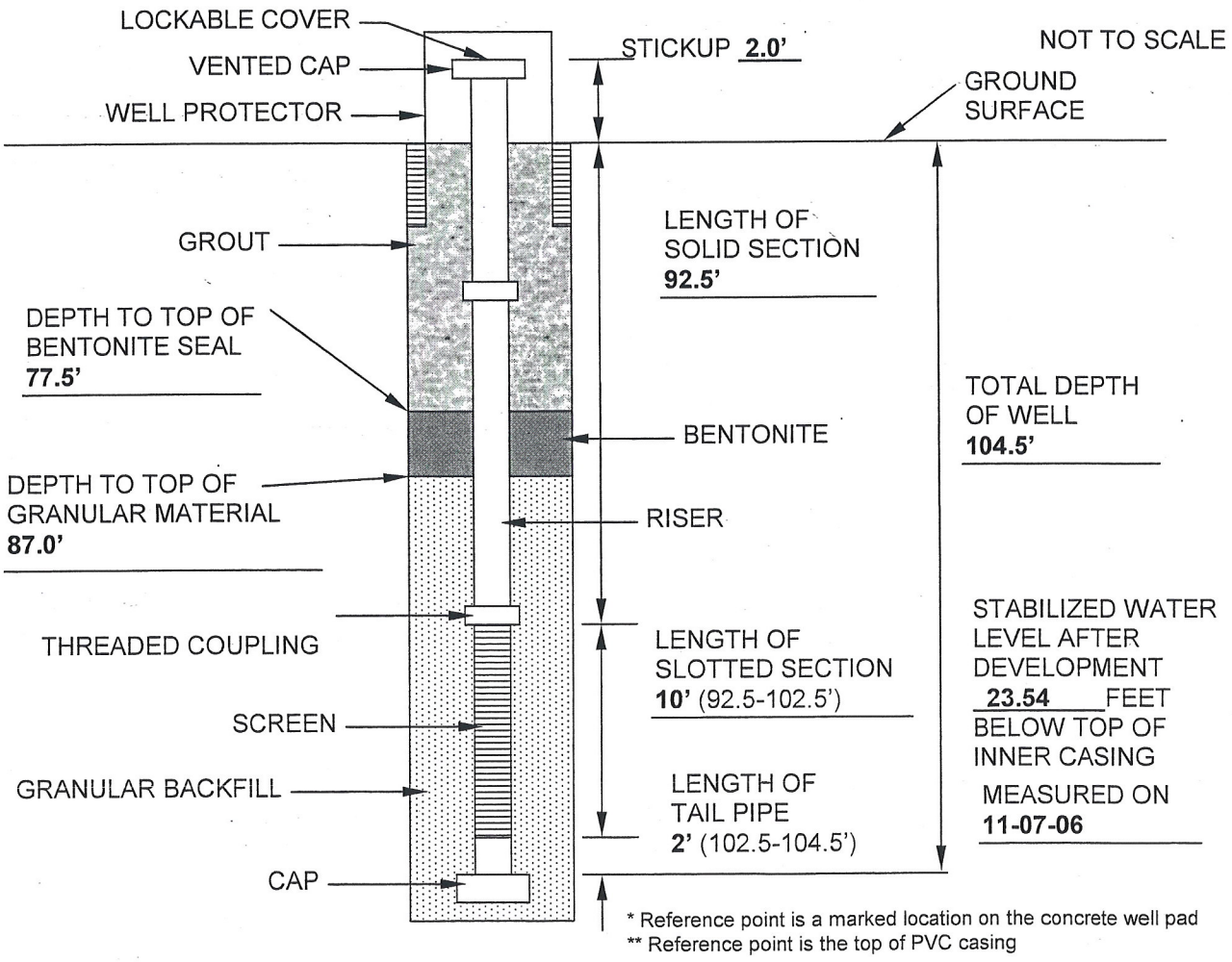
MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

OBSERVATION WELL INSTALLATION RECORD

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-949	INSTALLATION DATE	10-30-06
LOCATION (NAD83)	N = 3,909,025.20 E = 11,685,153.35		
GROUND SURFACE ELEVATION* (NAVD88)	335.67	REFERENCE POINT ELEVATION** (NAVD88)	336.91
GRANULAR BACKFILL MATERIAL	Southern Silica #1 Sand	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Air rotary	DRILLING CONTRACTOR	Bedford
BOREHOLE DIAMETER	6"	MACTEC FIELD REPRESENTATIVE	Mike Lear
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		

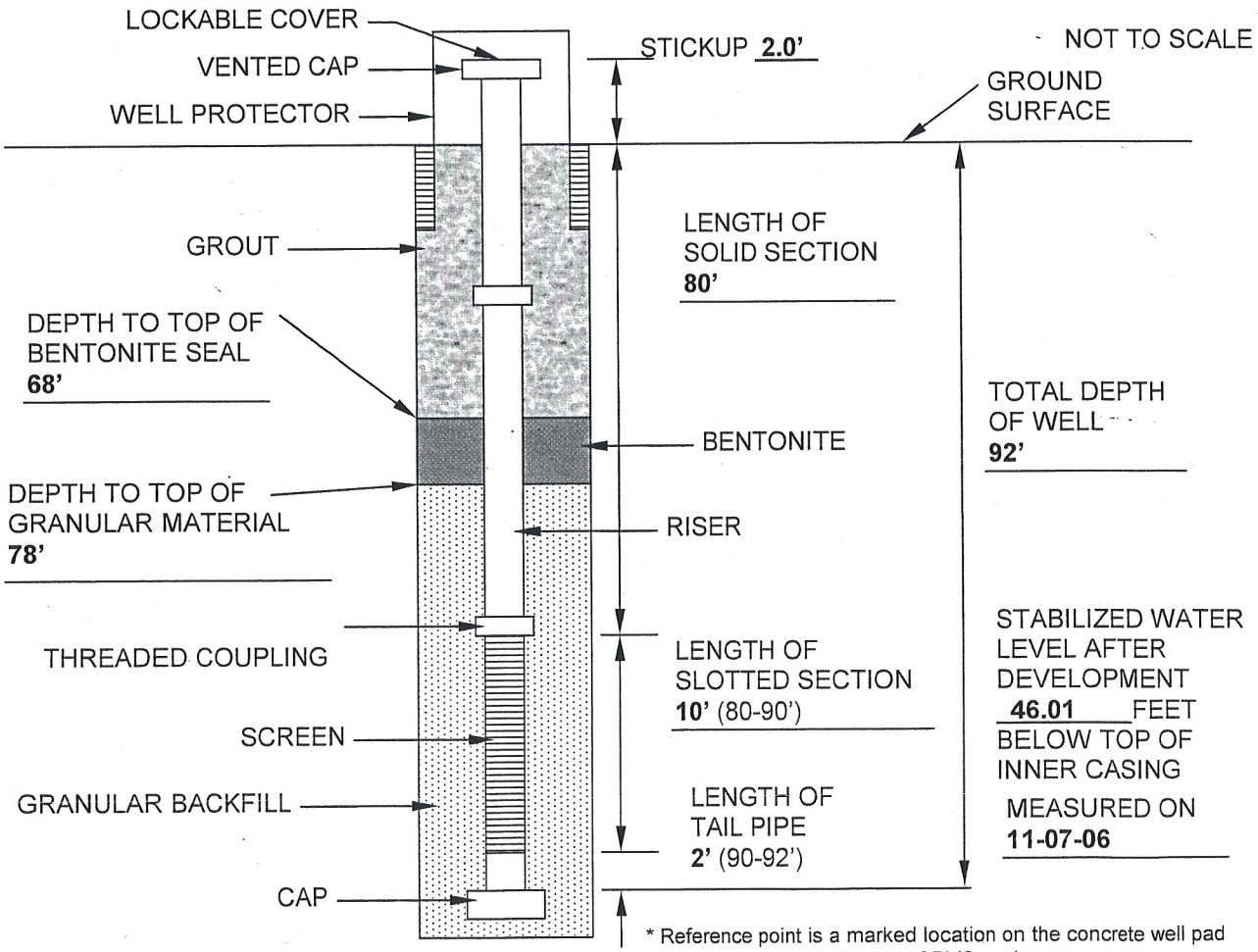


* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION MINERAL, VIRGINA COL PROJECT Dominion Purchase Order 7015798	MACTEC MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604	OBSERVATION WELL INSTALLATION RECORD JAZ 1-12-07

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-950	INSTALLATION DATE	10-31-06
LOCATION (NAD83)	N = 3,910,842.18 E = 11,686,285.15		
GROUND SURFACE ELEVATION* (NAVD88)	282.98	REFERENCE POINT ELEVATION** (NAVD88)	284.49
GRANULAR BACKFILL MATERIAL	Southern Silica #1 Sand	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Air rotary	DRILLING CONTRACTOR	Bedford
BOREHOLE DIAMETER	6"	MACTEC FIELD REPRESENTATIVE	Kim Charles-Smith
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		

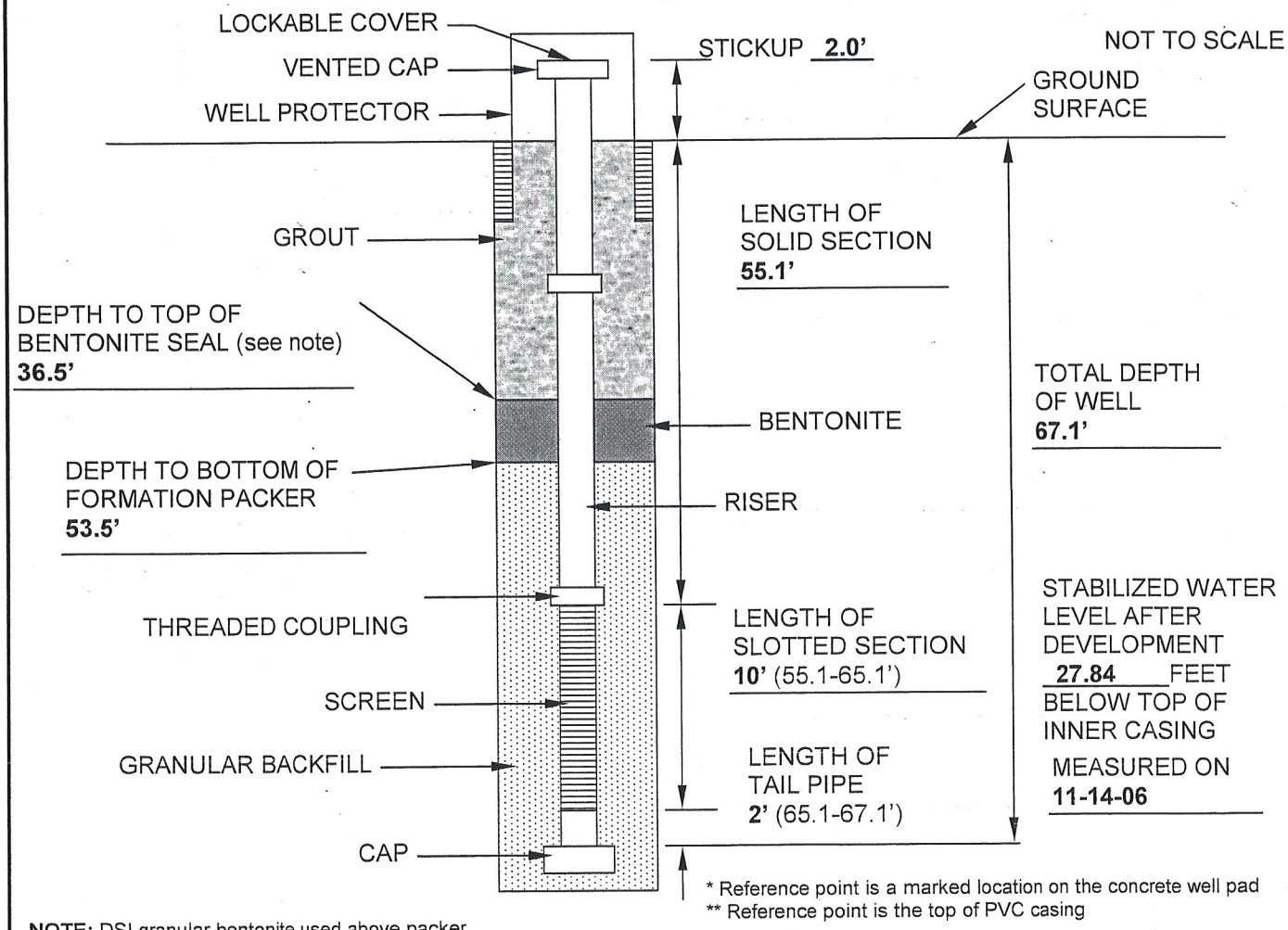


* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NORTH ANNA POWER STATION MINERAL, VIRGINA COL PROJECT Dominion Purchase Order 7015798	MACTEC MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604	OBSERVATION WELL INSTALLATION RECORD 1-18-07

OBSERVATION WELL INSTALLATION RECORD

JOB NAME	NORTH ANNA COL	JOB NUMBER	6468-06-1472
WELL NUMBER	OW-951	INSTALLATION DATE	11-10-06
LOCATION (NAD83)	N = 3,910,521.44 E = 11,686,786.01		
GROUND SURFACE ELEVATION* (NAVD88)	249.69	REFERENCE POINT ELEVATION** (NAVD88)	250.68
GRANULAR BACKFILL MATERIAL	Southern Silica #3 Sand	SLOT SIZE	.010
SCREEN MATERIAL	PVC Schd. 40-Standard	SCREEN DIAMETER	2 in.
RISER MATERIAL	PVC Schd. 40-Standard	RISER DIAMETER	2 in.
DRILLING TECHNIQUE	Hollow-stem auger 4.25" I.D.	DRILLING CONTRACTOR	MACTEC
BOREHOLE DIAMETER	Approximately 8"	MACTEC FIELD REPRESENTATIVE	Kim Charles-Smith
LOCK BRAND	Master	SIZE/MODEL	N/A
KEY CODE/COMBINATION	#3206		



* Reference point is a marked location on the concrete well pad
** Reference point is the top of PVC casing

NOTE: DSI granular bentonite used above packer

NORTH ANNA POWER STATION MINERAL, VIRGINA COL PROJECT Dominion Purchase Order 7015798	MACTEC MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604	OBSERVATION WELL INSTALLATION RECORD JAA 1-18-07

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-901

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-02-06 TIME (MILITARY) 1100

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Partly cloudy to sunny

TOTAL WELL DEPTH (TWD) 108' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2' FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 27.37' FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER [X] OTHER: Grundfos pump

TOTAL VOLUME OF WATER REMOVED Approx. 41.0 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC [X] S.S. [ ] TEFLON [ ] OTHER NA

SCREENED INTERVAL (FROM ID PLATE) 95'-105' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES [X] NO [ ] COMMENTS

LOCKING CAP YES [X] NO [ ]

PROTECTIVE POST/ABUTMENT YES [ ] NO [X]

NONPOTABLE LABEL YES [ ] NO [ ]

ID PLATE YES [ ] NO [ ]

WELL INTEGRITY SATISFACTORY YES [X] NO [ ]

WELL YIELD LOW [X] MODERATE [ ] HIGH [ ] COMMENTS See note

GROUNDWATER PARAMETERS

VOLUME (GAL.)	1 Volume	2nd volume	3rd volume See note			
pH (S.U.)	6.99	6.62	6.38			
SP. COND. (µMHOS/CM)	143.4	132.4	121.5			
WATER TEMP. (°C)	13.7	15.0	12.5			
TURBIDITY* (NTU)	4.22	42.2	32.9			

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

note: 3rd well volume pumped on 11-03-06 0819 hrs.
– Turbidity increased after 1st well volume was removed. KCJ 01-15-07

KCJ 11-03-06

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-945

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-09-06 TIME (MILITARY) 1102

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Sunny ~70°F

TOTAL WELL DEPTH (TWD) 54.5' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2' FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 12.43' FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER ☐ OTHER: Grundfos pump

TOTAL VOLUME OF WATER REMOVED Approx. 85 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC ☒ S.S. ☐ TEFLON ☐ OTHER

SCREENED INTERVAL (FROM ID PLATE) 41.5' - 51.5' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES ☐ NO ☐ COMMENTS

LOCKING CAP YES ☒ NO ☐

PROTECTIVE POST/ABUTMENT YES ☐ NO ☐

NONPOTABLE LABEL YES ☐ NO ☐

ID PLATE YES ☐ NO ☐

WELL INTEGRITY SATISFACTORY YES ☒ NO ☐

WELL YIELD LOW ☐ MODERATE ☐ HIGH ☒ COMMENTS Pumped @ Approx. 2.5 gpm

GROUNDWATER PARAMETERS

VOLUME (GAL.)	14 gal	21 gal	35 gal	50 gal	70 gal	85 gal.
pH (S.U.)	6.60	6.78	6.61	6.34	6.00	6.00
SP. COND. (µMHOS/CM)	47.5	32.1	27.6	22.1	20.8	19.3
WATER TEMP. (°C)	20.1	18.3	17.7	17.1	17.0	17.1
TURBIDITY* (NTU)	>1000	>1000	402	71.5	50.3	31.0

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

NOTE: pH/Cond meter calibrated w/ 7.0 buffer #4803 Exp 01-25-07 7.0=7.0
4.0 buffer #4804 Exp 01-25-07 4.0=3.99
Turbidity 100 = 101 20 = 19.9
800 = 799 <0.1 = 0.09 See page 6 of Field Book for Lot + Exp dates

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW946

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-14-06 TIME (MILITARY) 1421

FIELD PERSONNEL Kim Charles-Smith + Mike Lear

WEATHER CONDITIONS Sunny Approx 68°F

TOTAL WELL DEPTH (TWD) 43.4 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.5 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 26.39 FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER ☐ OTHER: GrundFos pump

TOTAL VOLUME OF WATER REMOVED 30 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC ☒ S.S. ☐ TEFLON ☐ OTHER

SCREENED INTERVAL (FROM ID PLATE) 30.4-40.4 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES ☒ NO ☐ COMMENTS pumped @ Approx. 2 gpm

LOCKING CAP YES ☒ NO ☐

PROTECTIVE POST/ABUTMENT YES ☐ NO ☐

NONPOTABLE LABEL YES ☐ NO ☐ 2.84 gal = 1 Vol.

ID PLATE YES ☐ NO ☐

WELL INTEGRITY SATISFACTORY YES ☒ NO ☐

WELL YIELD LOW ☐ MODERATE ☒ HIGH ☐ COMMENTS

GROUNDWATER PARAMETERS KFJ 11-14-06

VOLUME (GAL.)	6 gal.	18 gal.	21 gal.	24 gal.	~~27 gal.~~	30 gal.
pH (S.U.)	7.27	5.68	5.96	5.91		5.25
SP. COND. (µMHOS/CM)	143.2	51.0	51.9	44.8		45.4
WATER TEMP. (°C)	17.6	16.5	16.1	15.9	KFJ 11-14-06	16.1
TURBIDITY* (NTU)	536	680	165	20.6		7.90

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

NOTE: See page 6 of Field Book for SN, etc.

pH/Cond meter calibrated 7.0 Buffer Lot # 4803 Exp 01-25-07 7.0=7.01; 4.0 Buffer Lot # 484 Exp. 01-25-07 4.0=4.02
Turbidity meter calibrated w/ 1000=999; 100=100; 20=20.1; <0.1=0.29 NTU

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-947

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-08-06 TIME (MILITARY) 1147

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Cloudy - Light Rain

TOTAL WELL DEPTH (TWD) 58.0' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 18.02 FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER ☒ OTHER: bailed + pumped w/Grundfos

TOTAL VOLUME OF WATER REMOVED 87 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC ☒ S.S. ☐ TEFLON ☐ OTHER

SCREENED INTERVAL (FROM ID PLATE) 45'-55' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES ☐ NO ☐ COMMENTS

LOCKING CAP YES ☐ NO ☐

PROTECTIVE POST/ABUTMENT YES ☐ NO ☐

NONPOTABLE LABEL YES ☐ NO ☐

ID PLATE YES ☐ NO ☐

WELL INTEGRITY SATISFACTORY YES ☒ NO ☐

WELL YIELD LOW ☐ MODERATE ☒ HIGH ☐ COMMENTS

GROUNDWATER PARAMETERS

VOLUME (GAL.)	14 gal.	21. gal	35 gal.	50. gal	80 gal	87 gal
pH (S.U.)	6.15	7.11	6.53	6.47	6.44	6.32
SP. COND. (µMHOS/CM)	81.0	75.1	~~6.47~~ 71.7 KEY 11-08-06	67.9	56.2	56.9
WATER TEMP. (°C)	15.6	15.5	16.2	16.1	15.5	15.5
TURBIDITY* (NTU)	>1000	>1000	>1000	>1000	234	142

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

NOTE: Bailed + pumped well per Work Instruction Attachment NO. 19
pH, cond meter calibrated with 7.0 buffer Lot #4803 Exp 01-25-07
7.0 read 6.99 4.0 buffer 4 Lot # 4804 Exp. 01-25-07 4.0=4.02

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-949

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-02-06 TIME (MILITARY) 1325

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Partly cloudy - Sunny

TOTAL WELL DEPTH (TWD) 105' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2' FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 23.80' FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER [X] OTHER: Grundfos pump

TOTAL VOLUME OF WATER REMOVED Approx. 150 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC [X] S.S. [ ] TEFLON [ ] OTHER

SCREENED INTERVAL (FROM ID PLATE) 105'-95' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES [X] NO [ ] COMMENTS

LOCKING CAP YES [X] NO [ ]

PROTECTIVE POST/ABUTMENT YES [ ] NO [X]

NONPOTABLE LABEL YES [ ] NO [ ]

ID PLATE YES [ ] NO [ ]

WELL INTEGRITY SATISFACTORY YES [X] NO [ ]

WELL YIELD LOW [ ] MODERATE [ ] HIGH [X] COMMENTS pumped @ ~2.5 gpm with no drawdown

GROUNDWATER PARAMETERS

VOLUME (GAL.)	5th volume	6th volume	7th volume	8th volume	9th volume	10th volume
pH (S.U.)	6.71	6.60	6.58	6.53	6.54	6.66
SP. COND. (µMHOS/CM)	92.8	92.4	91.8	92.9	90.4	96.6
WATER TEMP. (°C)	15.8	15.8	15.9	16.2	15.8	16.8
TURBIDITY* (NTU)	KK 11-02-06 240	187	129	75.2	79.3	52.9

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

Note: Removed 3 well volumes via stagger pumping, then removed 7 more volumes.

KCS 11-2-06

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-950

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) 11-02-06 TIME (MILITARY) 0835

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Partly cloudy to Sunny

TOTAL WELL DEPTH (TWD) 92' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2' FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 46.07 FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER ☐ OTHER: Grundfos Pump

TOTAL VOLUME OF WATER REMOVED Approx. 23.0 GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC ☒ S.S. ☐ TEFLON ☐ OTHER

SCREENED INTERVAL (FROM ID PLATE) 80'-90' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES ☒ NO ☐ COMMENTS

LOCKING CAP YES ☒ NO ☐

PROTECTIVE POST/ABUTMENT YES ☐ NO ☒

NONPOTABLE LABEL YES ☐ NO ☐

ID PLATE YES ☐ NO ☐

WELL INTEGRITY SATISFACTORY YES ☒ NO ☐

WELL YIELD LOW ☒ MODERATE ☐ HIGH ☐ COMMENTS See note

GROUNDWATER PARAMETERS

VOLUME (GAL.)	1 volume ~8.0gal	2nd volume ~8gal.	3rd volume See note			
pH (S.U.)	6.58	7.10	7.27			
SP. COND. (µMHOS/CM)	427.2	310.6	202.4			
WATER TEMP. (°C)	13.1	15.4	9.1			
TURBIDITY* (NTU)	946	>1000	540			

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

note: 3rd well volume purged on 11-03-06 0900 hrs.

KCS 11-03-06

MACTEC

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Observation Well Development Woksheet

MACTEC JOB NUMBER **6468-06-1472** OBSERVATION WELL NUMBER OW-951

SITE NAME **North Anna Power Station**

DATE (MO/DAY/YR) ~~11-17-06~~ 11-13-06 KCJ 11-13-06 TIME (MILITARY) 0805

FIELD PERSONNEL Kim Charles-Smith

WEATHER CONDITIONS Cloudy - Mid 50'S

TOTAL WELL DEPTH (TWD) 67.1' FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 27.84' FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION DISPOSABLE BAILER ☐ OTHER: Grundfos Pump

TOTAL VOLUME OF WATER REMOVED 3 well val. GAL. CASING DIAMETER 2 IN.

CASING MATERIAL PVC ☐ S.S. ☐ TEFLON ☐ OTHER

SCREENED INTERVAL (FROM ID PLATE) (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES ☒ NO ☐ COMMENTS ~~No gar~~ KCJ 11-13-06

LOCKING CAP YES ☒ NO ☐

PROTECTIVE POST/ABUTMENT YES ☐ NO ☐

NONPOTABLE LABEL YES ☐ NO ☐

ID PLATE YES ☐ NO ☐

WELL INTEGRITY SATISFACTORY YES ☒ NO ☐

WELL YIELD LOW ☒ MODERATE ☐ HIGH ☐ COMMENTS

GROUNDWATER PARAMETERS

	11-13-06					
VOLUME (GAL.)	1 val. 6 gal.	11-14-06 6 gal.	11-15-06 7 gal.			
pH (S.U.)	7.70	7.67	6.27		KCJ 11-17-06	
SP. COND. (µMHOS/CM)	357.6	3223	1878			
WATER TEMP. (°C)	~~16.3~~ 15.6	16.3	16.5			
TURBIDITY*	>1000	172	306			

* VISUAL DETERMINATION ONLY (1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

NOTE: Well pumped Dry after each attempt and was slow to recover. KCJ 01-15-07

4

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

ACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-901

SITE NAME North Anna Coh

DATE (MO/DAY/YR) 11-16-06 TIME (MILITARY) 1330

FIELD PERSONNEL Kim Charles-Smith / Joe Wallen

WEATHER CONDITIONS light rain

PHYSICAL CONDITION OF THE WELL very good / new

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 108' FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 105'-95' SAND PACK INTERVAL (FT) 108'-92' (16')

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE FT.

DESCRIPTION OF MEASURING POINT TOC (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) NA FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 26.63' FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Slope Indicator DEVICE ID NUMBER SN: 15287

ETHOD OF WELL EVACUATION Grundfos pump

DECONTAMINATION PROCEDURE Alconox Wash / Tap Rinse

TOTAL VOLUME OF WATER REMOVED Approx 17.0 GAL. CASING DIAMETER IN. 2

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600xL INSTRUMENT ID NO. SN: 01L0629

CALIBRATION RECORD FOR INSTRUMENT In Field Book DATE 11-15-06 TIME 1330

	See note	PURGING				STABILIZED	SAMPLING
TIME (MILITARY)	Sample 1455						
PURGE RATE (gpm)	Approx .5 gpm						
VOLUME (GAL.)	17.0						
pH (S.U.)	6.26			KJ	11-16-06		
SP. COND. (mS/cm)	.150						
WATER TEMP. (°C)	15.2						
D.O. (mg/l)	2.50						
O.R.P. (mv)	-18.0						
Turbidity (NTUs)	101						
Appearance (visual)	Clear						

NOTE: well purged Dry Allowed to recover obtained Samples, no Field parameters during purgey per ASTM ~~6550~~ 6452-99 (Section 7.6.3.2)

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-901

SITE NAME North ANNA Coal

DATE (MO/DAY/YR) 11-16-06 TIME (MILITARY) 1330

FIELD PERSONNEL Kim Charles-Smith / Joe Waller

SAMPLE COLLECTION

PUMPING RATE (gpm) Approx .5 gpm due to inability to get water to wellhead @ lower rate.

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos pump w/ HDPE Tubing

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)
160.1; 300.0; 310.1	11-16-06	1455
350.1; 353.1	11-16-06	1455
	KCS 11-16-06	

NOTE: 100 ml sample given to Hach physics (Dominion RAJ) Analysis.

DESCRIPTION OF PURGE WATER MANAGEMENT purge water dumped near well on the ground - handled the same as well development purge water.

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

81.37 * 0.0218 = 1.77 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

____ * 0.0767 = ____ FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

KCS 11-17-06 ~~16~~ 13' * ~~0.0767~~ 0.1744 TJW 11/18/06 = ~~1.23~~ ~~0.99~~ 2.27 FT^3 11-17-06 TJW 11/18/06

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3

ASSUMED 30% POROSITY IN SAND PACK

1.77 + ~~1.23~~ ~~0.99~~ 0.68 KCS 11-17-06 TJW 11/18/06 * 7.48 = ~~22.44~~ ~~20.64~~ 18.3 GAL TJW 11/18/06

THREE WELL VOLUMES =

WELL VOLUME * 3 18.3 * ~~7.48~~ 3 TJW 11/18/06 = 55 GAL

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

ACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-945

SITE NAME North Anna CoL

DATE (MO/DAY/YR) 11/17/06 TIME (MILITARY) 10:05

FIELD PERSONNEL Kim Charles-Smith, Joe Walker, Steve Nizely

WEATHER CONDITIONS Sunny Approx 65°F

PHYSICAL CONDITION OF THE WELL
Very good / New

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 54.5' From ground surface FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 51.5' - 41.5' SAND PACK INTERVAL (FT) 54.5' - 37.3'

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2 FT.

DESCRIPTION OF MEASURING POINT TOC (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) N/A FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 11.99 FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE slope Indicator DEVICE ID NUMBER SN: 15287

METHOD OF WELL EVACUATION Grundfos Pump

DECONTAMINATION PROCEDURE Alconox Wash / Tap Rinse

TOTAL VOLUME OF WATER REMOVED 67.2 GAL. CASING DIAMETER IN. 2

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600XL INSTRUMENT ID NO. SN: 01L0629

CALIBRATION RECORD FOR INSTRUMENT In Field Book DATE 11-17-06 TIME 0715 hrs.

	PURGING						STABILIZED	SAMPLING
TIME (MILITARY)	10:45	11:16	11:33	11:47	12:02	12:17		
PURGE RATE (gpm)	0.5	0.5	0.5	0.5	0.5	0.5		
VOLUME (GAL.)	17	33.6	42.5	50.4	58.8	67.2		
pH (S.U.)	5.83	5.75	5.74	5.72	5.72	5.71		
SP. COND. (mS/cm)	0.017	0.017	0.017	0.017	0.017	0.017		KCL
WATER TEMP. (°C)	14.03	14.08	13.99	13.99	14.00	14.01		11-17-06
D.O. (mg/l)	7.64	7.38	7.20	7.14	7.19	7.15		
O.R.P. (mv)	125.9	187.6	199.1	204.7	210.1	216.1		
Turbidity (NTUs)	6.40	1.68	1.29	0.95	0.79	0.70		
Appearance (visual)	Clear	Clear	Clear	Clear	Clear	Clear		

PACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

PACTEC JOB NUMBER 648-06-1472 OBSERVATION WELL NUMBER OW-945

SITE NAME North Anna Coh

DATE (MO/DAY/YR) 11/17/06 TIME (MILITARY) 1005

FIELD PERSONNEL Kim Chobs-Smith, Joe Walker, Steve Hickey

SAMPLE COLLECTION 12:20

PUMPING RATE (gpm) 0.4 gpm

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos pump / HDPE Tubing

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)
160.1, 300.0, 310.1	11-17-06	1220
350.1, 353.1	11-17-06	1220
		11-17-06

NOTE: 100 ml sample given to (RAS) Pannin for Health physics.

DESCRIPTION OF PURGE WATER MANAGEMENT purge water dumped near well on the ground – handled the same as well development purge water

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

42.51 * 0.0218 = 0.927 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

TJW ~~10~~ 17.2 * 0.0767 = 1.32 ~~0.767~~ TJW 11/17/06 FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

____ * 0.0767 = ____ FT^3

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3

ASSUMED 30% POROSITY IN SAND PACK

0.927 + 1.32 ~~0.767~~ TJW 11/17/06 * 7.48 = 16.8 ~~12.7~~ TJW 11/17/06 GAL

THREE WELL VOLUMES =

WELL VOLUME * 3

16.8 ~~12.7~~ TJW 11/17/06 * 3 ~~7.48~~ TJW 11/17/06 = 50.4 ~~38.0~~ TJW 11/17/06 GAL

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-94L

SITE NAME North Anna COL

DATE (MO/DAY/YR) 11/28/06 TIME (MILITARY) 17:15

FIELD PERSONNEL Joe Wallen, Mike Lear

WEATHER CONDITIONS Partly Cloudy, 50s

PHYSICAL CONDITION OF THE WELL
New

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 45.9' below top casing FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 32.9'–42.9' below top casing SAND PACK INTERVAL (FT) 28.7'–45.9' below top casing

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.5' FT.

DESCRIPTION OF MEASURING POINT Top of casing (2.5' above ground sur.) (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) N/A FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 25.47 FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Solinst Water Level Meter MODEL 101 DEVICE ID NUMBER 29658

METHOD OF WELL EVACUATION Grundfos pump

DECONTAMINATION PROCEDURE Alconox / water

TOTAL VOLUME OF WATER REMOVED GAL. CASING DIAMETER IN. 2"

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600 XL INSTRUMENT ID NO. 01J0527

CALIBRATION RECORD FOR INSTRUMENT DATE 11/28/06 TIME 08:30

	PURGING					STABILIZED	SAMPLING
TIME (MILITARY)	17:52	17:59	18:04	18:09	18:14		
PURGE RATE (gpm)	0.5	0.5	0.5	0.5	0.5		
VOLUME (GAL.)	13.8	16.3	18.8	21.3	23.8		
pH (S.U.)	5.80	5.79	5.79	5.78	5.79		
SP. COND. (mS/cm)	0.059	0.059	0.058	0.057	0.057		
WATER TEMP. (°C)	14.32	14.31	14.33	14.33	14.34		
D.O. (mg/l)	7.20	7.26	7.28	7.30	7.35		
O.R.P. (mv)	203.7	205.7	206.5	208.8	208.9		
Turbidity (NTUs)	4.87	3.48	1.60	1.65	0.95		
Appearance (visual)	Clear	Clear	Clear	Clear	Clear		

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-946

SITE NAME North Anna COL

DATE (MO/DAY/YR) 11/28/06 TIME (MILITARY) 17:15

FIELD PERSONNEL Joe Wallen, Mike Lear

SAMPLE COLLECTION

PUMPING RATE (gpm) 0.5

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos Pump

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)

DESCRIPTION OF PURGE WATER MANAGEMENT

On site disposal

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

20.4 * 0.0218 = 0.445 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

18.2 * 0.0767 = 1.40 FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

_____ * 0.0767 = _____ FT^3

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3 ASSUMED 30% POROSITY IN SAND PACK

0.445 + 1.40 * 7.48 = 13.8 GAL

THREE WELL VOLUMES =

LL VOLUME * 3 _____ * 7.48 = _____ GAL

MACTEC
engineering and constructing a better tomorrow

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-947

SITE NAME North Anna Coh

DATE (MO/DAY/YR) 11-17-06 TIME (MILITARY) 1330

FIELD PERSONNEL Kim Charles-Smith / Joe Wallen / Steve Nicely

WEATHER CONDITIONS Sunny Approx 65°F

PHYSICAL CONDITION OF THE WELL Very Good/new

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 58' from ground surface FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 55'-45' SAND PACK INTERVAL (FT) 58'-41' (17')

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2 FT.

DESCRIPTION OF MEASURING POINT TOC (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) NA FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Slope Indicator DEVICE ID NUMBER SN: 15287

METHOD OF WELL EVACUATION GrundFos pump

DECONTAMINATION PROCEDURE Alconox Wash / TAP Rinse

TOTAL VOLUME OF WATER REMOVED 25.5 GAL. CASING DIAMETER IN. 2

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600XL INSTRUMENT ID NO. SN: 01L0629

CALIBRATION RECORD FOR INSTRUMENT In Field Book DATE 11-17-06 TIME 0715 hrs.

	PURGING			KJS 11-17-06		KJS 11-17-06		STABILIZED	SAMPLING
TIME (MILITARY)	14:31	14:36	14:41	14:48	14:53 ~~15:53~~	14:58 ~~15:58~~	15:03		
PURGE RATE (gpm)	0.4	0.4	0.28	0.28	0.28	0.28	0.28		
VOLUME (GAL.)	16.3		19.5	21.0	22.5	24.0	25.5		
pH (S.U.)	6.10	6.04	6.04	6.03	6.03	6.03	6.02		
SP. COND. (mS/cm)	0.064	0.064	0.064	0.063	0.063	0.062	0.061		
WATER TEMP. (°C)	14.91	14.94	15.01	14.91	14.91	14.95	15.14		KJS 11-17-06
D.O. (mg/l)	5.34	5.35	5.48	5.53	5.48	5.46	5.60		
O.R.P. (mv)	75.3	116.3	135.4	148.8	154.1	157.7	161.6		
Turbidity (NTUs)	48.4	KJS 11-17-06	20.3	14.2	11.8	10.7	8.54		
Clearance (visual)	Cloudy		Clear	Clear	Clear	Clear	Clear		

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

CTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-947

SITE NAME North Anna CoL

DATE (MO/DAY/YR) 11-17-06 TIME (MILITARY) 1330

FIELD PERSONNEL Kim Charles-Smith / Steve nicely / Joe wallen

SAMPLE COLLECTION

PUMPING RATE (gpm) 0.28 - 0.4 gpm

DESCRIPTION OF SAMPLING EQUIPMENT GrundFos pump / LDPE Tubing

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)
160.1; 300.0; 310.1	11-17-06	1508
350.1; 353.1	11-17-06	1508
		KK 11-17-06

DESCRIPTION OF PURGE WATER MANAGEMENT purge water dumped near well on the ground handled same manner as well development purge water.

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

40.15 * 0.0218 = 0.875 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

17 * 0.0767 = 1.30 FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

— * 0.0767 = — FT^3

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3 ASSUMED 30% POROSITY IN SAND PACK

0.875 + 1.30 * 7.48 = 16.3 GAL

THREE WELL VOLUMES =

L VOLUME * 3 16.3 * 7.48 = 48.9 GAL

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-949

SITE NAME North Anna COL

DATE (MO/DAY/YR) 11/28/06 TIME (MILITARY) 15:30

FIELD PERSONNEL Joe Wallen, Mike Lear

WEATHER CONDITIONS Partly Cloudy, 40s

PHYSICAL CONDITION OF THE WELL
New

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 106.4' FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 94.5' - 104.5' below top casing SAND PACK INTERVAL (FT) 89.0' - 106.5' below top casing

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE Top casing 2.0 FT.

DESCRIPTION OF MEASURING POINT Top Casing (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) N/A FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 23.22 FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Solinst Water Level Meter MODEL 101 DEVICE ID NUMBER 29658

METHOD OF WELL EVACUATION Grundfos Pump

DECONTAMINATION PROCEDURE Alconox / water

TOTAL VOLUME OF WATER REMOVED 34.5 GAL. CASING DIAMETER IN. 2"

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600XL INSTRUMENT ID NO. 01J0527

CALIBRATION RECORD FOR INSTRUMENT DATE 11/28/06 TIME 08:30

	PURGING						TJW 11/28/06 ~~STABILIZED~~		SAMPLING
TIME (MILITARY)	14:51	14:56	15:01	15:06	15:11	15:16	15:21	15:26	
PURGE RATE (gpm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
VOLUME (GAL.)	20.5	22.5	24.5	26.5	29.5	30.5	32.5	34.5	
pH (S.U.)	6.19	6.19	6.16	6.16	6.17	6.16	6.17	6.18	
SP. COND. (mS/cm)	0.113	0.113	0.113	0.112	0.112	0.111	0.111	0.111	
WATER TEMP. (°C)	16.17	16.15	16.16	16:20	16.16	16.16	16.13	16.15	
D.O. (mg/l)	3.26	3.24	3.26	3.25	3.24	3.28	3.24	3.26	
O.R.P. (mv)	170.8	174.9	178.6	183.4	187.0	188.6	190.2	191.4	
Turbidity (NTUs)	25.1	27.4	19.3	15.4	18.0	15.5	15.4	14.1	
Appearance (visual)	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1478 OBSERVATION WELL NUMBER OW-949

SITE NAME North Anna CoL

DATE (MO/DAY/YR) 11/28/06 TIME (MILITARY) 15:30

FIELD PERSONNEL Joe Waller, Mike Lear

SAMPLE COLLECTION

PUMPING RATE (gpm) 0.4

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos pump

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)

DESCRIPTION OF PURGE WATER MANAGEMENT

On site disposal

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

83.28 * 0.0218 = 1.82 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

_____ * 0.0767 = _____ FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

17.5 * ~~0.0767~~ 0.1744 = 3.05 FT^3 TJW 11/28/06

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3

ASSUMED 30% POROSITY IN SAND PACK

1.82 + 0.916 * 7.48 = ~~12.5~~ 20.5 GAL TJW 11/28/06

THREE WELL VOLUMES =

_L VOLUME * 3 _____ * 7.48 = _____ GAL

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-950

SITE NAME North Anna Col

DATE (MO/DAY/YR) 11-~~0~~16-06 KG 11-16-06 TIME (MILITARY) 1011

FIELD PERSONNEL Kim Charles-Smith / Mike Lear

WEATHER CONDITIONS Cloudy light rain

PHYSICAL CONDITION OF THE WELL very good / new

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 92' FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 80'-90' SAND PACK INTERVAL (FT) 92'-78' (14 ft.)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 FT.

DESCRIPTION OF MEASURING POINT TOC (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) NA FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 45.37' FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Slope Indicator DEVICE ID NUMBER SN: 15287

METHOD OF WELL EVACUATION Grundfos pump

DECONTAMINATION PROCEDURE Alconox wash / TAP Rinse

TOTAL VOLUME OF WATER REMOVED Approx 11.5 GAL. CASING DIAMETER IN. 2

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED YSI 600 XL INSTRUMENT ID NO. SN: 01L0629

CALIBRATION RECORD FOR INSTRUMENT In Field book DATE 11-15-06 TIME 1600

	See note	PURGING				STABILIZED	SAMPLING
TIME (MILITARY)	Sample 1210						
PURGE RATE (gpm)	Approx .5 gpm						
VOLUME (GAL.)	11.5						
pH (S.U.)	6.46				KG 11-16-06		
SP. COND. (mS/cm)	.262						
WATER TEMP. (°C)	16.37						
D.O. (mg/l)	2.43						
O.R.P. (mv)	146.4						
Turbidity (NTUs)	67.5						
Appearance (visual)	Clear						

NOTE: well purged Dry. Allow to recover obtained Samples, no Feild parameters during purging per ASTM 6452-99 (Section 7.6.3.2)

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-950

SITE NAME North Anna CoA

DATE (MO/DAY/YR) 11-16-06 TIME (MILITARY) 1011

FIELD PERSONNEL Kim Charles-Smith

SAMPLE COLLECTION

PUMPING RATE (gpm) Approx .5gpm Could not pump @ lower rate - had to increase rate to get water column to well head.

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos pump W/ HDPE Tubing.

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)
160.1', 300.0', 310.1	11-16-06	1210
350.1', 353.1	11-16-06	1210
	KJS 11-16-06	

NOTE: 100 ml sample given to Pomeroy (RAJ) for Health Physics Analysis

DESCRIPTION OF PURGE WATER MANAGEMENT purge water dumped near well on the ground - handled the same as well development purge water

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

32.63 * 0.0218 = 0.711 FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

____ * 0.0767 = ____ FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

14' * 0.0767 = 1.07 FT^3

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3 ASSUMED 30% POROSITY IN SAND PACK

0.711 + 1.07 * 7.48 = 13.31 GAL

THREE WELL VOLUMES = 39.93 Gal.

WELL VOLUME * 3 13.31 * 3 = 39.93 GAL

KJS 11-16-06

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-951

SITE NAME North Anna CoL

DATE (MO/DAY/YR) 11-17-06 TIME (MILITARY) 0902

FIELD PERSONNEL Kim Charles-Smith / Steve Nicely / Joe Walker

WEATHER CONDITIONS Sunny

PHYSICAL CONDITION OF THE WELL very GOOD/new

WELL HEAD OBSERVATIONS AND MEASUREMENTS

TOTAL WELL DEPTH (TWD) 67.1 FT. (DEPTH BELOW MEASURING POINT)

SCREENED INTERVAL (FT) 65.1 - 55.1 SAND PACK INTERVAL (FT) NA

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 1.5 FT.

DESCRIPTION OF MEASURING POINT TOC (DEPTHS BELOW LAND SURFACE - FT.)

DEPTH TO FREE PRODUCT (DFP) NA FT. (DEPTH BELOW MEASURING POINT)

DEPTH TO GROUNDWATER (DGW) 31.68' FT. (DEPTH BELOW MEASURING POINT)

MEASURING DEVICE Slope Indicator DEVICE ID NUMBER SN: 15287

METHOD OF WELL EVACUATION GrundFos pump

DECONTAMINATION PROCEDURE Alconox Wash / Tap Rinse

TOTAL VOLUME OF WATER REMOVED 6.5 GAL. CASING DIAMETER IN. 2

FIELD ANALYSIS

FIELD PARAMETER INSTRUMENT USED NA INSTRUMENT ID NO. NA

CALIBRATION RECORD FOR INSTRUMENT NA DATE NA TIME NA

	PURGING					STABILIZED	SAMPLING
TIME (MILITARY)							
PURGE RATE (gpm)							
VOLUME (GAL.)							
pH (S.U.)				NA			
SP. COND. (mS/cm)							
WATER TEMP. (°C)				11-17-06			
D.O. (mg/l)							
O.R.P. (mv)							
Turbidity (NTUs)							
Appearance (visual)							

MACTEC
engineering and constructing a better tomorrow

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

OBSERVATION WELL SAMPLING WORKSHEET

IN ACCORDANCE WITH ASTM D 6089-97 (REAPPROVED 2003)

MACTEC JOB NUMBER 6468-06-1472 OBSERVATION WELL NUMBER OW-951

SITE NAME North Anna COL

DATE (MO/DAY/YR) TIME (MILITARY) 0902

FIELD PERSONNEL Kim Charles-Smith / Steve Neely / Joe Wallen

SAMPLE COLLECTION

PUMPING RATE (gpm) KJS 11-17-06 ~~1~~ .7 gpm - to pull water to well head

DESCRIPTION OF SAMPLING EQUIPMENT Grundfos pump / HDPE Tubing

DESCRIPTION OF SAMPLE APPEARANCE Clear

SAMPLE COLLECTED FOR (IN CHRONOLOGICAL ORDER)	DATE	TIME (MILITARY)
160.1; 300.0; 310.1	11-17-06	1548
350.1; 353.1	11-17-06	1548
		KJS 11-17-06

DESCRIPTION OF PURGE WATER MANAGEMENT purge water dumped near well on the ground handled the same as well development purge water.

WELL VOLUME CALCULATION

WELL CASING VOLUME =

HEIGHT OF WATER COLUMN (FT) * 0.0218 FT^2 (AREA OF 2" CASING)

~~55.11~~ * 0.0218 = ____ FT^3

SAND PACK VOLUME =

SOIL WELL

SAND PACK INTERVAL (FT) * 0.0767 ft^2 (AREA FOR 4 1/4" HOLE)

~~10.0~~ KJS 11-17-06 * 0.0767 = ____ FT^3

ROCK WELL

SAND PACK INTERVAL (FT) * 0.1744 ft^2 (AREA FOR 6" HOLE)

____ * 0.0767 = ____ FT^3

NOTE: not Applicable no Sand pack in well
Formation packer @ 53.5'
well purged to 55.45' static
Static Allowed to recover then Sampled.

WELL VOLUME =

WELL CASING VOLUME + (SAND PACK VOLUME * 0.30) * 7.48 GAL/FT^3

____ + ____ * 7.48 = ____ GAL

ASSUMED 30% POROSITY IN SAND PACK

THREE WELL VOLUMES =

WELL VOLUME * 3 ____ * 7.48 = ____ GAL

no Field Parameters obtained per ASTM D6452-99 Section 7.6.3.2.