BLACK & VEATCH CORPORATION
11401 LAMAR AVE, OVERLAND PARK KS USA
+1 913-458-9319 | SOMMERFELDG@BV.COM

17 October 2018

Kansas City Board of Public Utilities
540 Minnesota Avenue
Kansas City, KS 66101

Attention: Ingrid Setzler, Director of Environmental Services

Subject: Bottom Ash Surface Impoundment Location Restriction §257.60 Placement Above the Uppermost Aquifer

Conclusion:

The Bottom Ash Impoundment at the Nearman Creek Power Station, Per CCR Rule §257.60, does not have an intermittent, reoccurring, or sustained hydraulic connection between the base of the CCR unit and the uppermost aquifer due to normal fluctuation in the groundwater elevations including seasonal high water table. Therefore, the impoundment meets the minimum requirements for placement above the uppermost aquifer.

The conclusions of this evaluation are based on the following references:

1) Black & Veatch, History of Construction Report Nearman Creek Bottom Ash Surface Impoundment, prepared for Kansas City Board of Public Utilities, 17 October 2016
2) Buchanan, Rex and Buddemeier, Robert W. Kansas Ground Water, An Introduction to the State's Water Quantity, Quality, and Management Issues, Kansas Geological Survey, published August 1993, accessed 17 July 2017, http://www.kgs.ku.edu/Publications/Bulletins/ED10/index.html
3) Kelly, Brian P., Missouri River Alluvial Aquifer Ground-Water Protection, U.S. Geological Survey, published 3 September 2003, accessed 13 July, 2017 https://mo.water.usgs.gov/indep/kelly/mo-alluvial-gw/index.htm

Impoundment Construction:

According to the original construction drawings provided in the 2016 History of Construction Report, the impoundment was constructed with a minimum 3 foot thick layer of impervious material. The top of the impervious material (bottom of the CCR) varies between elevations 748 and 742 feet [National Geodetic Vertical Datum of 1929 (NGVD 29)] depending on the location within the impoundment. Considering the thickness of the impervious material, the base of the impoundment is thus calculated to be 742 minus 3 feet or 739 feet.

Uppermost Aquifer:

The surface impoundment lies within the Missouri River alluvial aquifer (Buchanan & Buddemeier, 1993). The aquifer is unconfined Quaternary age alluvial deposits generally including clay, silt, sand,

gravel, cobbles, and boulders atop shale, limestone and sandstone bedrock (Kelly, 2003). Based on the definition of the uppermost aquifer as presented in CCR Rule 257.53, this unconfined aquifer is the uppermost aquifer.

In 1993, the USGS completed a groundwater study of Missouri River Alluvial Aquifer. As part of this study groundwater modelling was completed based on groundwater well and river gage measurements recorded in 1993 and include the July 1993 flood event. The results of the modelling indicated the following:

- The fluctuation of river stage in the Missouri and Kansas Rivers, and to a lesser extent, the Blue, Little Blue and Fishing Rivers has a larger effect on regional ground-water gradients than well pumping.
- In the absence of pumping, ground water flow within the alluvial aquifer is away from the valley walls, toward the Missouri River and downstream the river valley.
- A sudden increase in river stage can temporarily reverse the direction of ground-water flow.

Upper Limit of Uppermost Aquifer

According to CCR Rule 257.53, the definition of the upper limit is as follows:

> *The upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.*

In order to determine the upper limit of the aquifer, Black & Veatch reviewed groundwater level data from existing and previous monitoring well locations at the Nearman Creek Power station. Groundwater elevation data has been measured on the site from various monitoring wells as far back as 1985; however, for this evaluation, data from the past 10 years was evaluated (Attachment A). As part of the data review, groundwater elevations from the existing monitoring wells (2, 2a, 3, 4, 8, 8A, and 10) surrounding the CCR impoundment were reviewed and the high and low groundwater elevations were tabulated for each measurement date (presented in Table 1 and Figure 1).

TABLE 1 GROUNDWATER MEASUREMENTS FROM 2007 TO 2017

Date	Measured Groundwater Elevation (feet)		Approximate Local Groundwater Flow Direction
	High	Low	
18-Oct-07	726.72	725.34	SE
27-May-08	725.16	723.85	SE
29-Oct-08	725.82	722.62	SE
28-May-09	726.29	725.13	NW
28-Oct-09	726.18	725.42	NW
20-May-10	731.18	730	SW
25-Oct-10	731.60	730.26	NW
23-May-11	731.55	730.89	SW
17-Oct-11	**732.1**	730.7	NW
29-May-12	726.11	724.73	NW
22-Oct-12	723.43	721.99	NW
28-May-13	722.14	721.37	NW
21 Oct 13	723.42	722.53	NW
27-May-14	722.85	721.86	W
18-May-15	727.08	725.56	SE
29-Oct-15	727.16	725.56	NW
27-Jan-16	727.56	725.2	NW
27-Apr-16	727.33	726.58	SW
24-Oct-16	727.65	725.7	NW
23-Jan-17	723.74	722.384	NW
24-Apr-17	726.99	726.3	SW
30 Oct 17	728.05	726.95	NW

Notes:

- Measured high and low values are based on the monitoring wells surrounding the CCR Impoundment
- High value and date indicated as bold

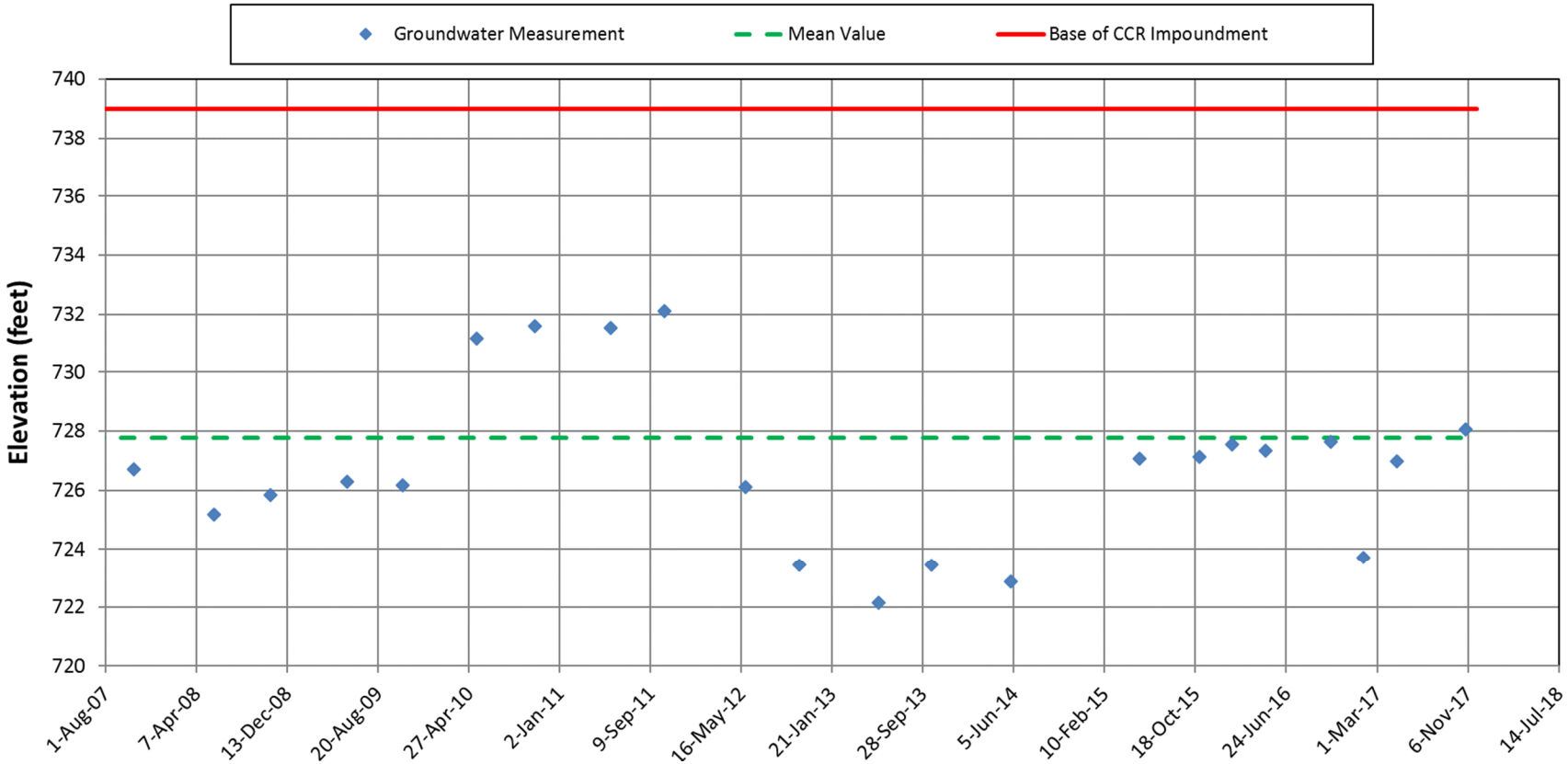


Figure 1 Groundwater Measurement Data from 2007 to 2017

Review of the data indicated that the groundwater elevation within the vicinity of the surface impoundment generally varied between elevations 721 and 732 feet. Localized groundwater flow was also tabulated for each measuring event and generally indicated the groundwater typically flows towards the Missouri River with some influence from the horizontal collector wells to the north-northwest of the impoundment. Reversed water flow was observed on some occasions when the adjacent Missouri River level was at an elevated stage. Both observations are consistent with the 1993 USGS aquifer study.

Based on the definition of the upper limit, the base of the CCR unit (elevation 739 feet) is more than five feet above the upper limit of the uppermost aquifer.

The CCR rules alternate criteria requires that the impoundment does not have an intermittent, reoccurring, or sustained hydraulic connection between the base of the CCR unit and the uppermost aquifer due to normal fluctuation in the groundwater elevations (including seasonal high water table). The CCR Rule Preamble (VI)(C)(2) provides further discussion on the term "normal fluctuations" stating this is not intended to include extraordinary or highly aberrant events, but can include natural events such as precipitation and high river levels.

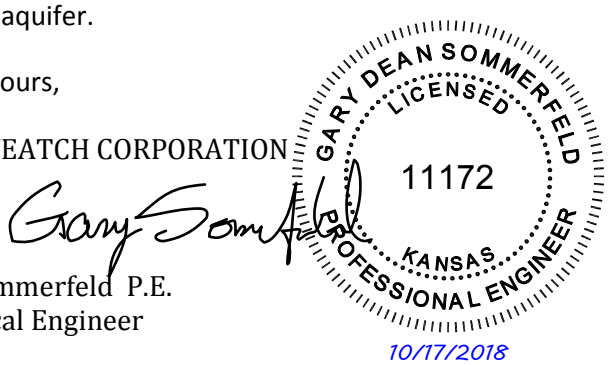
Based on the groundwater level measurements during the previous 10 years, the highest groundwater level measured at the site does not reach the lowest elevation of the CCR impoundment base. Therefore, the impoundment does not have an intermittent, reoccurring, or sustained hydraulic connection between the base of the CCR unit and the uppermost aquifer due to normal fluctuation in the groundwater elevations (including seasonal high water table).

Certification Statement

This evaluation meets the requirements of CCR Rule paragraph (a) §257.60 Placement above the uppermost aquifer.

Very truly yours,

BLACK & VEATCH CORPORATION



Gary D. Sommerfeld P.E.
Geotechnical Engineer

10/17/2018

Attachment A- Groundwater Measurement Maps

cc: File
Fred Freeland
Jim Liljegren

Attachment A
Groundwater Measurement Maps (23 pages)

757.50 GROUND WATER ELEVATION (MEASURED 10/18/07)

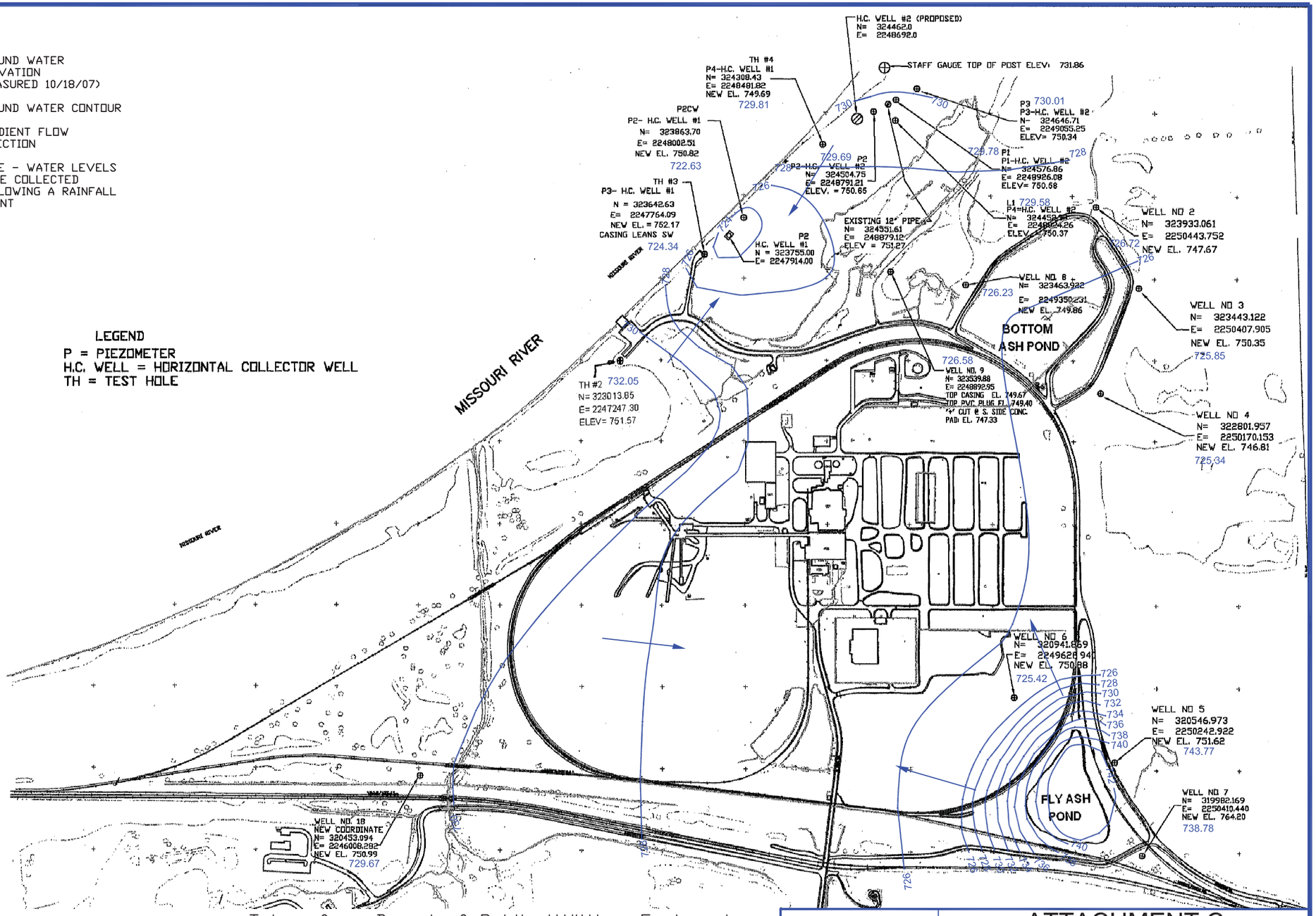
—750— GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

NOTE - WATER LEVELS WERE COLLECTED FOLLOWING A RAINFALL EVENT

LEGEND

P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



Taken from Board of Public Utilities, Engineering & Technical Services, Well Locations Map

900 0 900 1,800

SCALE IN FEET

NORTH

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ATTACHMENT C
GROUNDWATER CONTOUR MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

757.50 GROUND WATER ELEVATION (MEASURED 5/27/08)

—751.50— GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE

MISSOURI RIVER

H.C. WELL #2 (PROPOSED)
N= 324462.0
E= 2248692.0

STAFF GAUGE TOP OF POST ELEV= 731.86

TH #4
P4-H.C. WELL #1
N= 324308.43
E= 2248481.82
NEW EL. 749.69
725.27

P2CV
P2- H.C. WELL #1
N= 323863.70
E= 2248002.51
NEW EL. 750.82
724.11

TH #3
P3- H.C. WELL #1
N = 323642.63
E= 2247764.09
NEW EL. = 752.17
CASING LEANS SW
725.64

P2
H.C. WELL #1
N = 323755.00
E= 2247914.00

722.04 P2
P2-H.C. WELL #2
N= 324504.75
E= 2248791.21
ELEV. = 750.65

723.56
P3
P3-H.C. WELL #2
N= 324646.71
E= 2249055.25
ELEV= 750.34

723.16 P1
P1-H.C. WELL #2
N= 324576.86
E= 2248926.08
ELEV= 750.58

722.90
P4=H.C. WELL #2
N= 324458.36
E= 2248824.26
ELEV= 750.37

EXISTING 12" PIPE
N= 324551.61
E= 248879.12
ELEV = 751.27

WELL NO 2
N= 323933.061
E= 2250443.752
NEW EL. 747.67
725.16

WELL NO. 8
N= 323463.922
E= 2249350.231
NEW EL. 749.86
725.04

WELL NO 3
N= 323443.122
E= 2250407.905
NEW EL. 750.35
725.04

BOTTOM ASH POND

724.53
WELL NO. 9
N= 323539.88
E= 2248892.95
TOP CASING EL. 749.67
TOP PVC PLUG EL. 749.40
"A" CUT @ S. SIDE CONC.
PAD EL. 747.33

WELL NO 4
N= 322801.957
E= 2250170.153
NEW EL. 746.81
723.85

TH #2 730.45
N= 323013.85
E= 2247247.30
ELEV= 751.57

WELL NO 6
N= 320941.659
E= 2249628.941
NEW EL. 750.88
725.34

WELL NO 5
N= 320546.973
E= 2250242.922
NEW EL. 751.62
747.36

743.31
WELL NO 7
N= 319982.169
E= 2250410.440
NEW EL. 764.20

FLY ASH POND

WELL NO 18
NEW COORDINATE
N= 320453.094
E= 2246008.282
NEW EL. 750.99

724 724 726 728 730 732 734 736 738 740 742 744 746

Taken from Board of Public Utilities, Engineering & Technical Services, Well Locations Map

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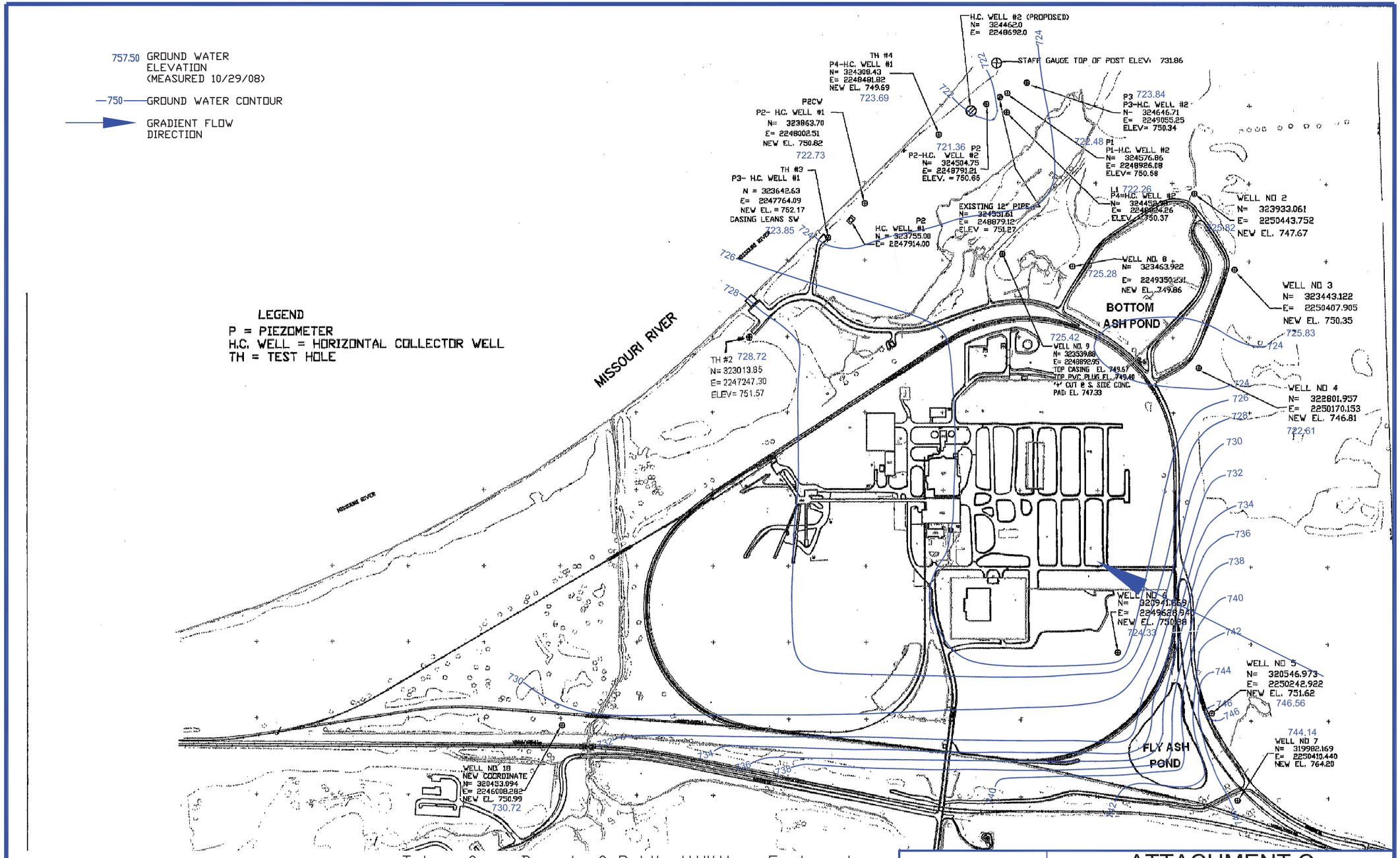
SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

ATTACHMENT C
GROUNDWATER CONTOUR MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS



Taken from Board of Public Utilities, Engineering & Technical Services, Well Locations Map

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ATTACHMENT C
GROUNDWATER CONTOUR MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

757.50 GROUND WATER ELEVATION (MEASURED 5/28/2009)

—750— GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

LEGEND

P = PIEZOMETER

H.C. WELL = HORIZONTAL COLLECTOR WELL

TH = TEST HOLE

MISSOURI RIVER

H.C. WELL #2 (PROPOSED)
N= 324462.0
E= 2248692.0

STAFF GAUGE TOP OF POST ELEV: 731.86

TH #4
P4-H.C. WELL #1
N= 324308.43
E= 2248481.82
NEW EL. 749.69
722.53

P2CW
P2- H.C. WELL #1
N= 323863.70
E= 2248002.51
NEW EL. 750.82
722.1

P2
P2-H.C. WELL #2
N= 324504.75
E= 2248791.21
ELEV. = 750.65
719.21

P3
P3-H.C. WELL #2
N= 324646.71
E= 2249055.25
ELEV= 750.34
722.35

P1
P1-H.C. WELL #2
N= 324576.86
E= 2248926.08
ELEV= 750.58
729.53

TH #3
P3- H.C. WELL #1
N = 323642.63
E= 2247764.09
NEW EL. = 752.17
CASING LEANS SW
723.46

P2
H.C. WELL #1
N = 323755.08
E= 2247914.00

EXISTING 12" PIPE
N= 324551.61
E= 248879.12
ELEV = 751.27

P4-H.C. WELL #2
N= 324458.38
E= 2248824.26
ELEV = 750.37
720.31

WELL NO 2
N= 323933.061
E= 2250443.752
NEW EL. 747.67
726.04

WELL NO 8
N= 323463.922
E= 2249350.231
NEW EL. 749.86
725.13

BOTTOM ASH POND

WELL NO 3
N= 323443.122
E= 2250407.905
NEW EL. 750.35
726.29

TH #2
N= 323013.85
E= 2247247.30
ELEV= 751.57
728.27

WELL NO 9
N= 323539.88
E= 2248892.95
TOP CASING EL. 749.67
TOP PVC PLUG EL. 749.40
CUT @ S. SIDE CONC.
PAD EL. 747.33
724.84

WELL NO 4
N= 322801.957
E= 2250170.153
NEW EL. 746.81
726.24

WELL NO 6
N= 320941.659
E= 2249628.942
NEW EL. 750.88
726.67

WELL NO 5
N= 320546.973
E= 2250242.922
NEW EL. 751.62
745.70

WELL NO 7
N= 319982.159
E= 2250410.440
NEW EL. 764.20
745.79

FLY ASH POND

WELL NO 18
NEW COORDINATE
N= 320453.094
E= 2246038.882
NEW EL. 750.99
732.06

Taken from Board of Public Utilities, Engineering & Technical Services, Well Locations Map

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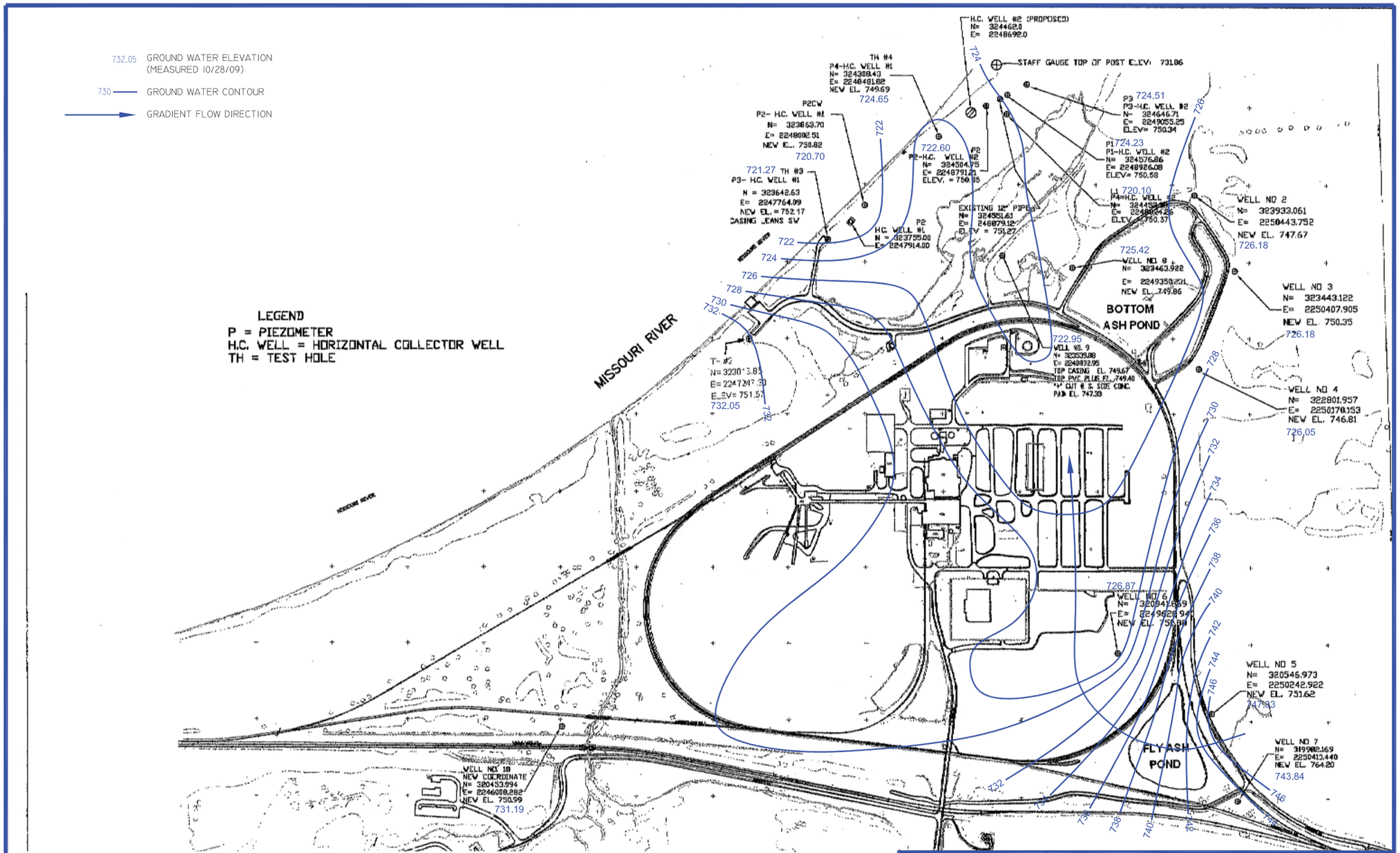
SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

ATTACHMENT C
GROUNDWATER CONTOUR MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS



TAKEN FROM BOARD OF PUBLIC UTILITIES, ENGINEERING & TECHNICAL SERVICES, WELL LOCATIONS MAP

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SCALE IN FEET

NORTH

Burns & McDonnell SINCE 1898

Attachment C

GROUNDWATER COUNTOUR MAP NEARMAN CREEK POWER STATION, KANSAS CITY BPU KANSAS CITY, KANSAS

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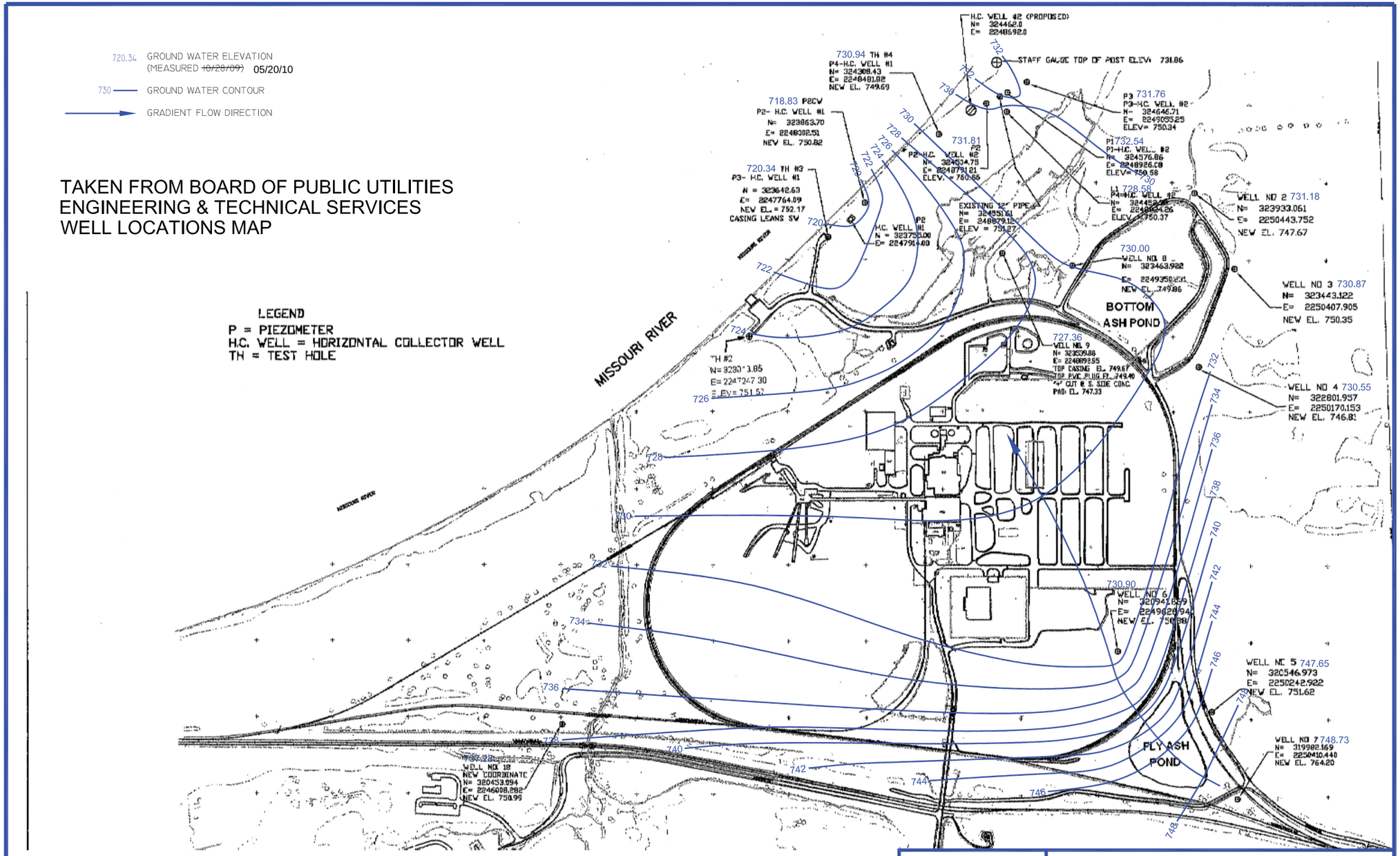
720.34 GROUND WATER ELEVATION (MEASURED ~~10/28/09~~ 05/20/10

730 GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



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SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C

GROUNDWATER COUNTOUR MAP NEARMAN CREEK POWER STATION, KANSAS CITY BPU KANSAS CITY, KANSAS

K:\ENV\KANSAS CITY BOARD OF PUBLIC UTILITIES\SITE\53368\DELIVER\NEARMAN MAY 10 SEMI-ANNUAL\GWMAP2.DWG 06-25-2010 10:23 GSTARK

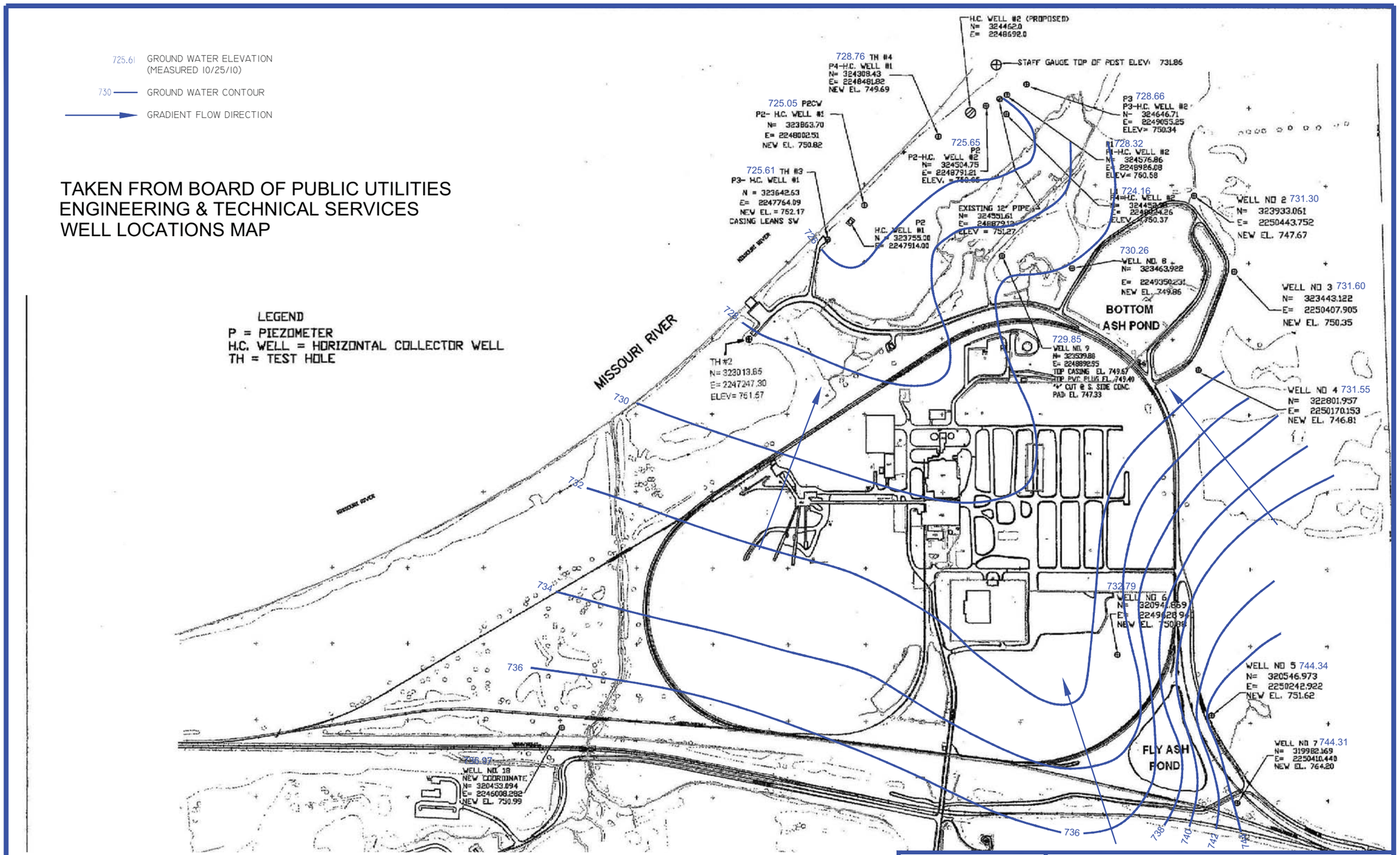
725.61 GROUND WATER ELEVATION (MEASURED 10/25/10)

730 GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



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SCALE IN FEET

NORTH

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Attachment C

GROUNDWATER COUNTOUR MAP NEARMAN CREEK POWER STATION, KANSAS CITY BPU KANSAS CITY, KANSAS

GROUND WATER ELEVATION
(MEASURED 05/23/2011)

GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE

MISSOURI RIVER

H.C. WELL #2 (PROPOSED)
N= 324452.0
E= 2248598.0

731.15 TH #4
P4-H.C. WELL #1
N= 324308.43
E= 2248481.82
NEW EL. 749.69

STAFF GAUGE TOP OF POST ELEV= 731.86

728.33 P2CV
P2- H.C. WELL #1
N= 323863.70
E= 2248002.51
NEW EL. 750.82

728.33 P2
P2-H.C. WELL #2
N= 324534.75
E= 2248791.21
ELEV. = 750.65

729.80 TH #3
P3- H.C. WELL #1
N = 323642.63
E= 2247764.09
NEW EL. = 752.17
CASING LEANS SW

H.C. WELL P2
N = 323755.00
E= 2247914.00

P3 731.45
P3-H.C. WELL #2
N= 324646.71
E= 2249053.25
ELEV= 750.34

P1 730.18
P1-H.C. WELL #2
N= 324576.86
E= 2248926.68
ELEV= 750.58

L1 730.01
P4-H.C. WELL #2
N= 324453.36
E= 2248864.26
ELEV= 750.37

EXISTING 12" PIPE
N= 324551.61
E= 248879.12
ELEV = 751.27

WELL NO 2 731.55
N= 323933.061
E= 2250443.752
NEW EL. 747.67

730.89
WELL NO 8
N= 323463.922
E= 2249350.231
NEW EL. 749.86

BOTTOM
ASH POND

WELL NO 3 731.23
N= 323443.122
E= 2250407.905
NEW EL. 750.35

731.06
WELL NO. 9
N= 323539.80
E= 2248892.95
TOP CASING EL. 749.67
TOP PVC BLUE EL. 749.40
4" CUT @ S. SIDE CONC.
PAD EL. 747.32

TH #2
N= 8283[illegible]5.85
E= 2247247.30
ELEV= 751.57

WELL NO 4 730.90
N= 322801.957
E= 2250170.153
NEW EL. 746.81

730.73
WELL NO 6
N= 320941.859
E= 2249620.941
NEW EL. 750.08

WELL NO 5 745.08
N= 320546.973
E= 2250242.922
NEW EL. 751.62

FLY ASH
POND

WELL NO 7 743.42
N= 319982.169
E= 2250410.440
NEW EL. 764.20

735.87
WELL NO 18
NEW COORDINATE
N= 320453.094
E= 2246008.282
NEW EL 750.99

730 732 734 736 738 740 742 744

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SCALE IN FEET

NORTH

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SINCE 1898

Attachment C
MAY 2011
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

K:\ENV\KANSAS CITY BOARD OF PUBLIC UTILITIES\SITE\53368\DELIVER\NEARMAN MAY 2011 SEMI-ANNUAL\GWMAP2.DWG 06-07-2011 15:16 KBOLLING

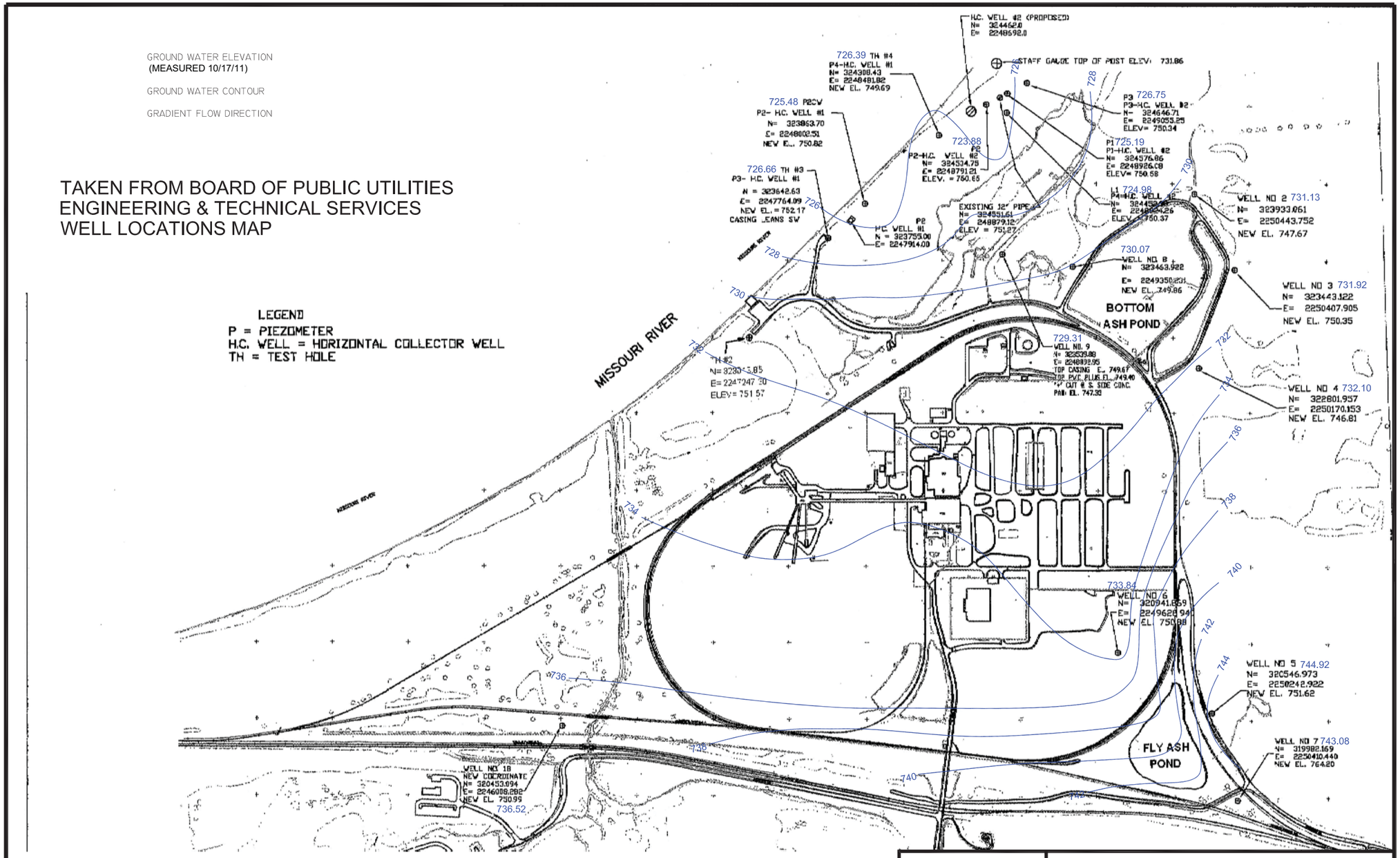
GROUND WATER ELEVATION
(MEASURED 10/17/11)

GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES ENGINEERING & TECHNICAL SERVICES WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



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SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C
OCTOBER 2011
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

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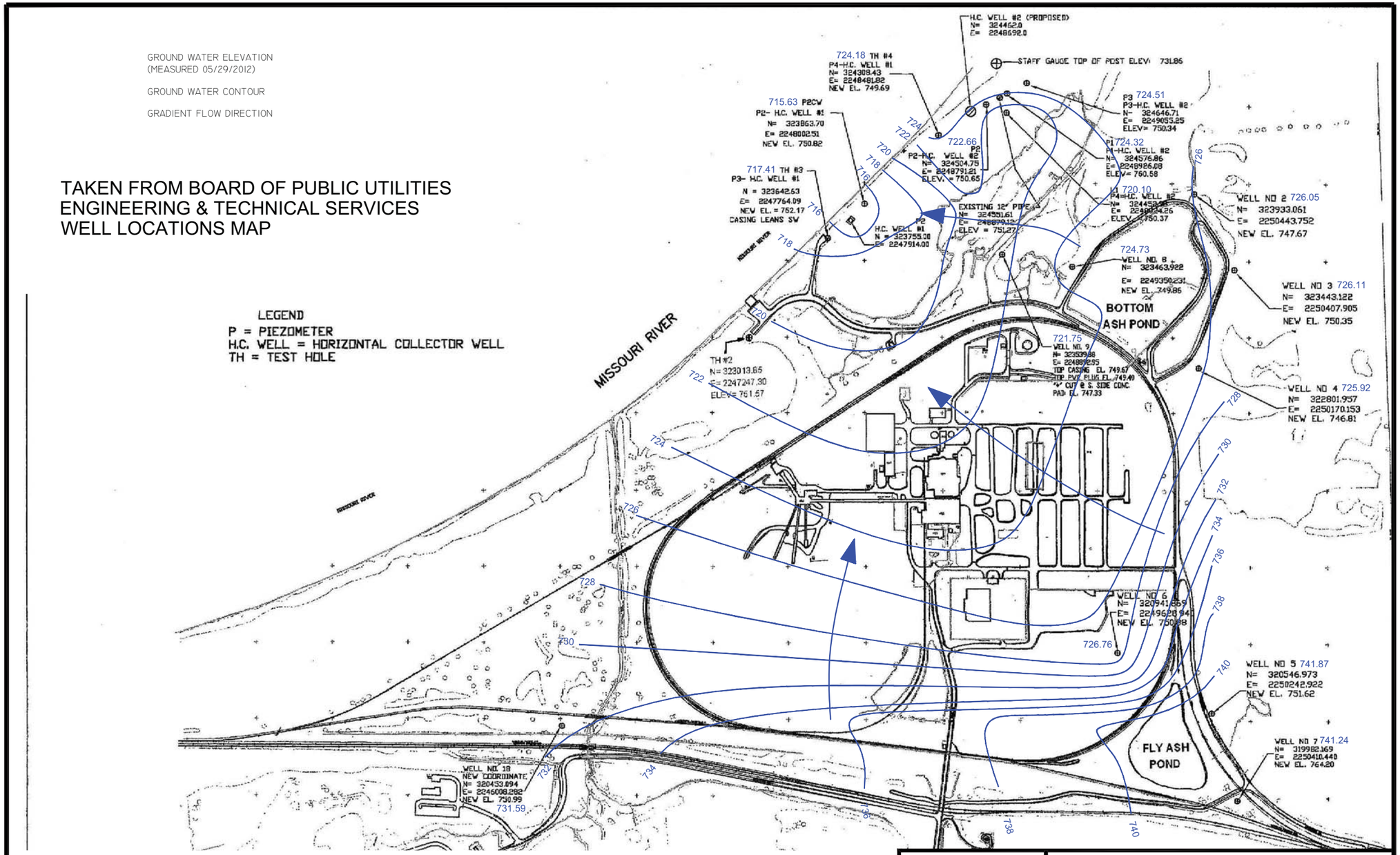
GROUND WATER ELEVATION
(MEASURED 05/29/2012)

GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



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SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C
MAY 2012
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

K:\ENV\KANSAS CITY BOARD OF PUBLIC UTILITIES\SITE\62801\DELIVER\NEARMAN MAY 2012 SEMI-ANNUAL\GWMAP2_TEMPLATE.DWG

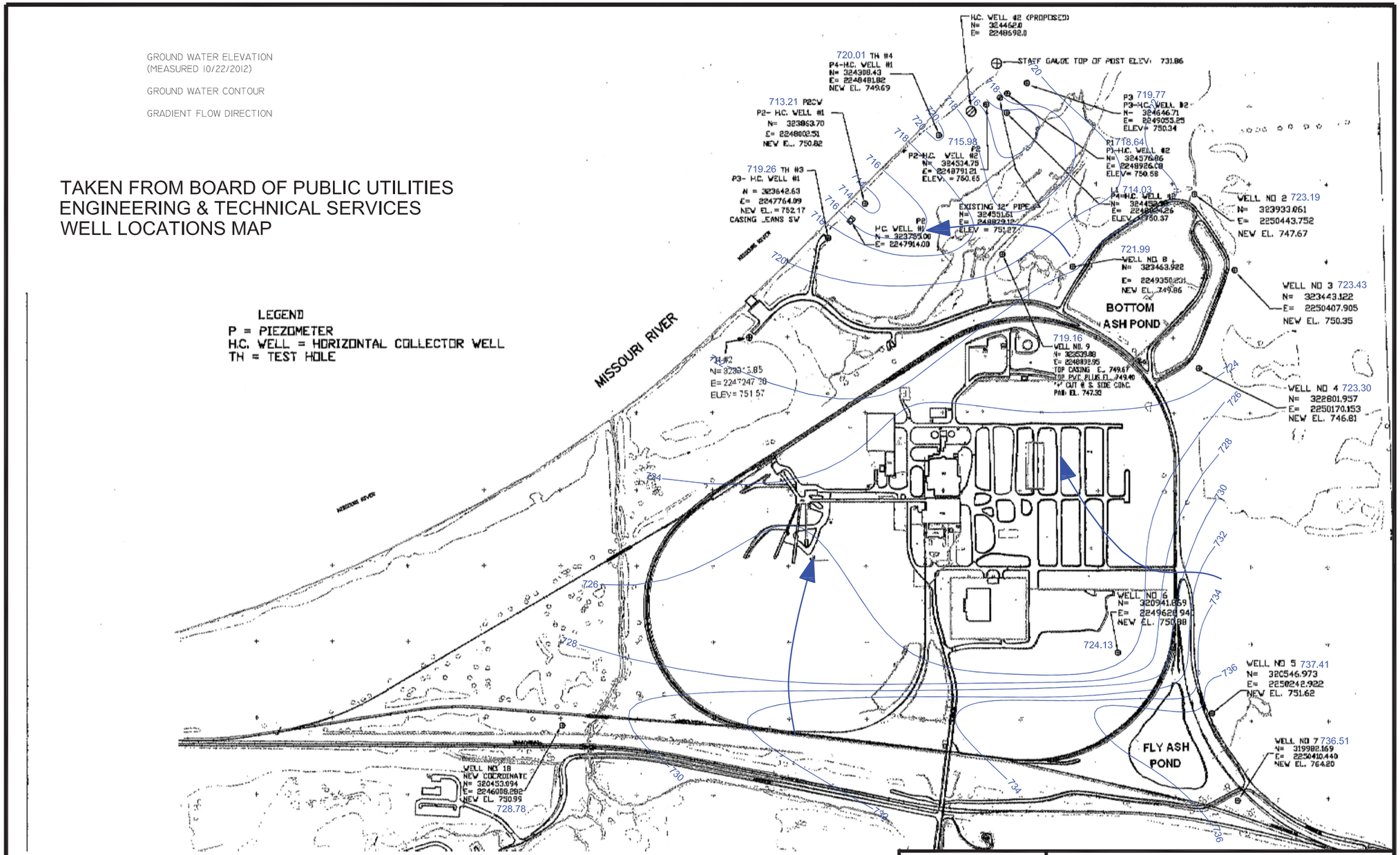
GROUND WATER ELEVATION
(MEASURED 10/22/2012)

GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



900 0 900 1,800

SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C
OCTOBER 2012
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

K:\ENV\KANSAS CITY BOARD OF PUBLIC UTILITIES\SITE\62801\DELIVER\NEARMAN OCTOBER 2012 SEMI-ANNUAL\GWMAP2.DWG

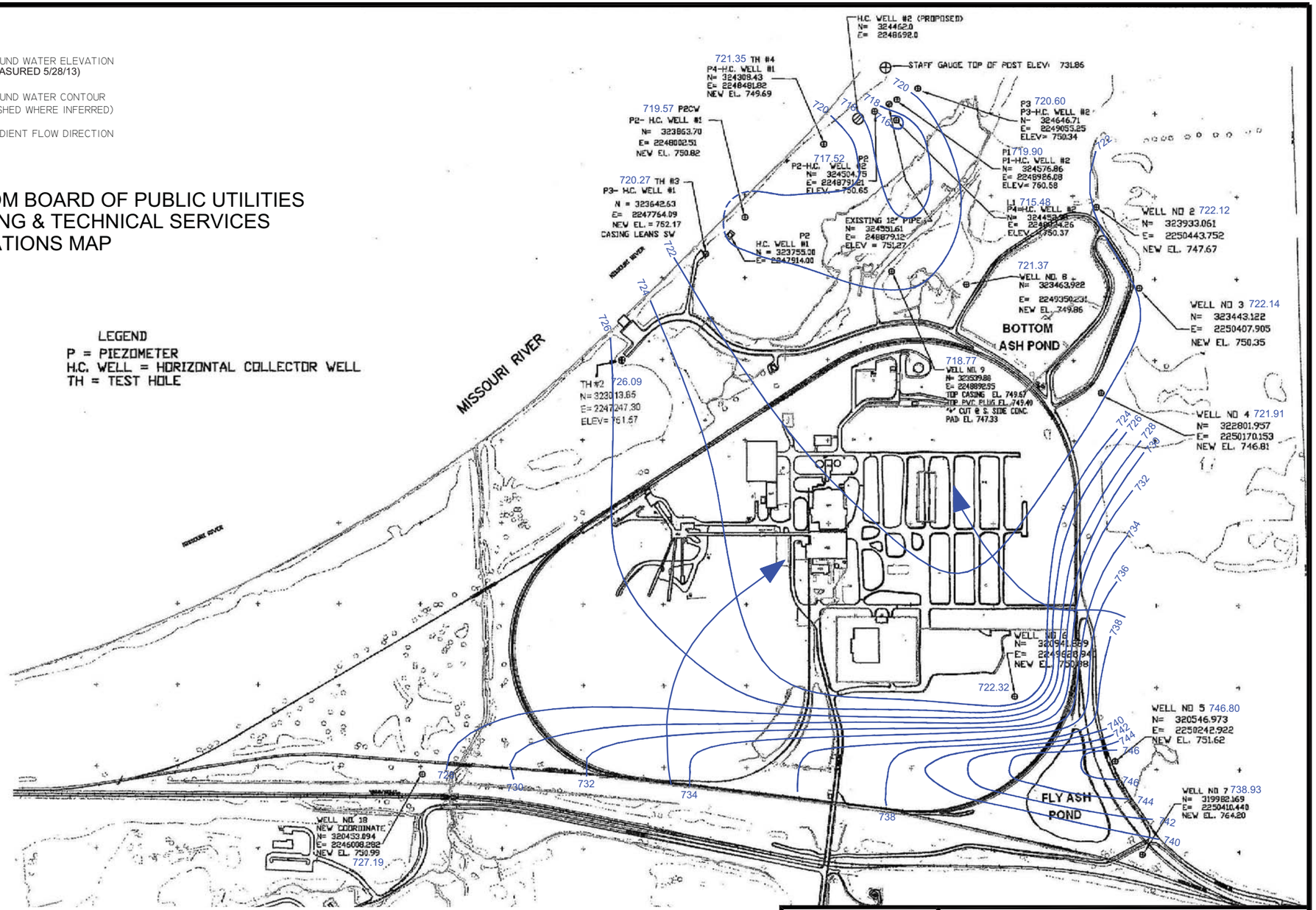
720.27 GROUND WATER ELEVATION (MEASURED 5/28/13)

730 GROUND WATER CONTOUR (DASHED WHERE INFERRED)

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



900 0 900 1,800

SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C
MAY 2013
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

K:\ENV\KANSAS CITY BOARD OF PUBLIC UTILITIES\SITE\62801\DELIVER\NEARMAN OCTOBER 2012 SEMI-ANNUAL\GWMAP2.DWG

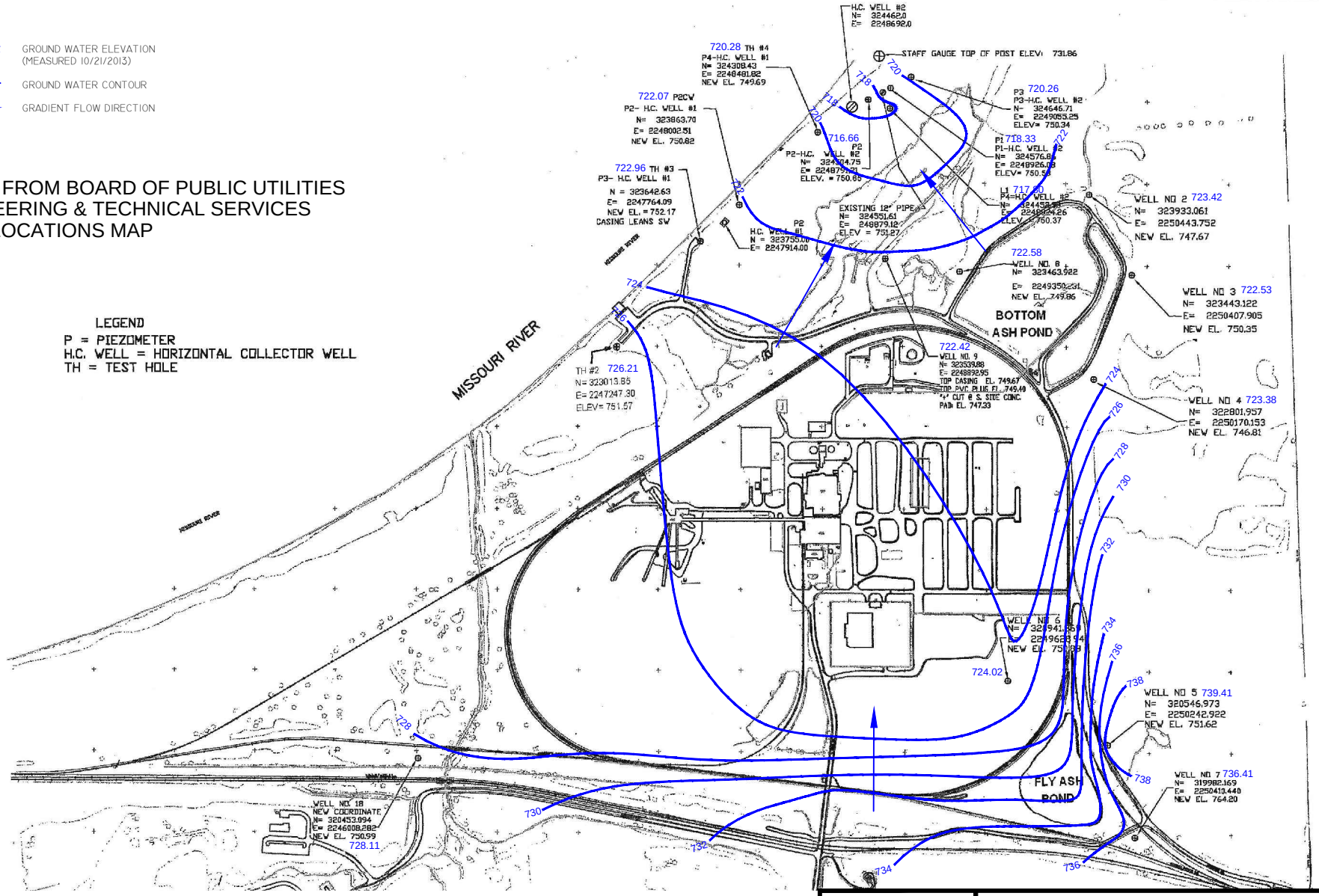
724.92 GROUND WATER ELEVATION (MEASURED 10/21/2013)

730 GROUND WATER CONTOUR

GRADIENT FLOW DIRECTION

TAKEN FROM BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
WELL LOCATIONS MAP

LEGEND
P = PIEZOMETER
H.C. WELL = HORIZONTAL COLLECTOR WELL
TH = TEST HOLE



900 0 900 1,800

SCALE IN FEET

NORTH

Burns & McDonnell
SINCE 1898

Attachment C
OCTOBER 2013
GROUNDWATER
COUNTOUR MAP
NEARMAN CREEK POWER
STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

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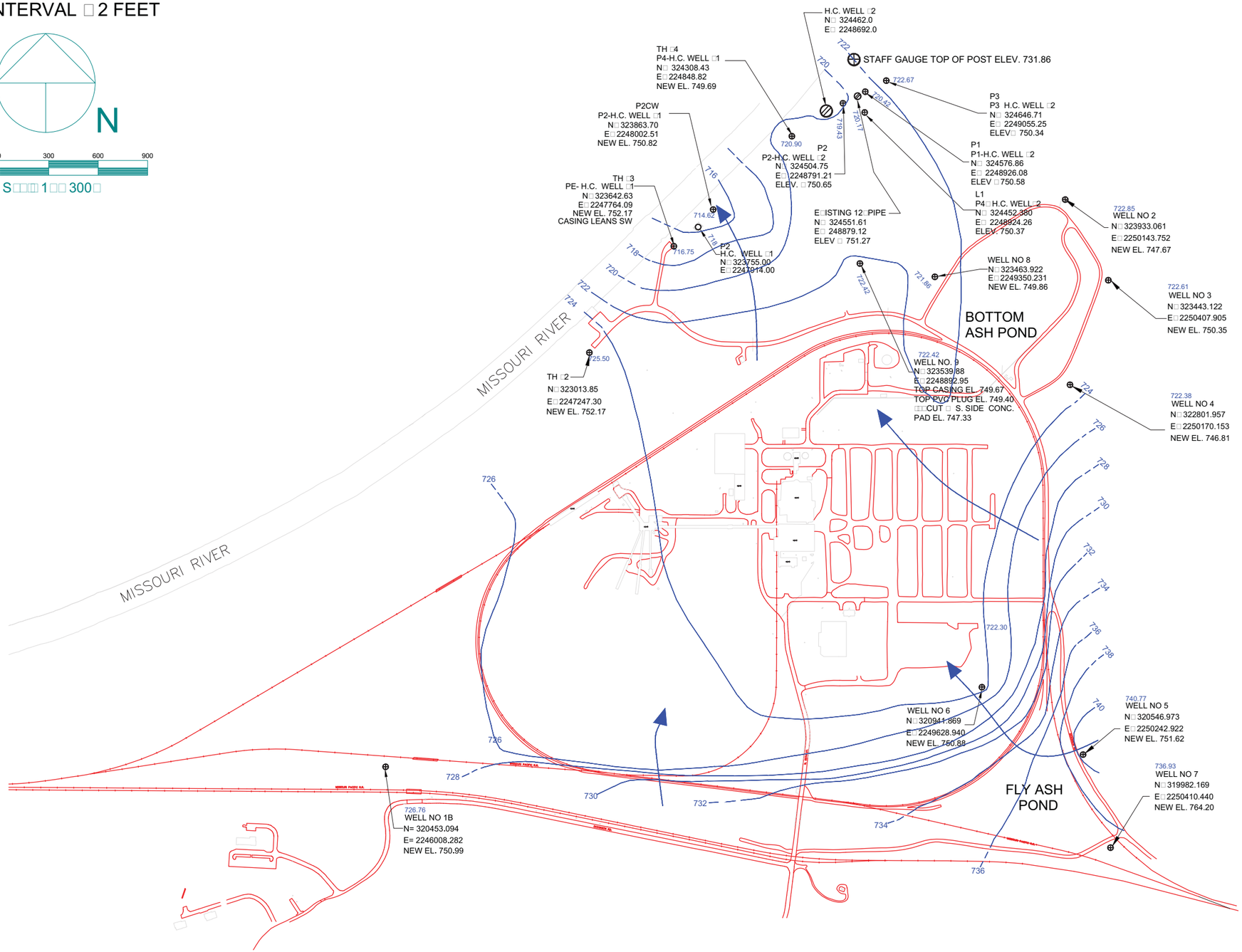
NEARMAN CREEK POWER STATION
GROUNDWATER FLOW MAP
CONTOUR INTERVAL □2 FEET

N

300 0 300 600 900

S□□□1□□300□



LEGEND

- ⊕ MONITORING WELL
- ⊡ HORI□ONTAL COLLECTOR WELL PIE□OMETER
- 722.85 GROUNDWATER ELEVATION □MEASURED 5□27□2014□
- 722 GROUNDWATER CONTOUR □DASHED WHERE INFERRED□
- GRADIENT FLOW DIRECTION

BOARD OF PUBLIC UTILITIES
ENGINEERING & TECHNICAL SERVICES
& ENVIRONMENTAL SERVICES
KANSAS CITY KANSAS

A□□□□ □□□C
M□□2014 October 2014
G□□□□□ □□□C□□□□M□□

NEARMAN CREEK POWER STATION

DRAWN: KRL	DATE: 07/16/2014	ENGR. APPV.
CHECKED: BRT	DATE:	
REV.	DATE:	SHEET 1 OF 1
SCALE: 1"=300'		DWG NO NO. 1

S:/PROPERTYDWGS/NEARMANPOWER/GROUNDWATERDRAWING

P2
P2-H.C. WELL #2
GW = 731.37
N= 324504.75
E= 2248791.21
ELEV= 750.65

EXISTING 12"
PIPE N=
324551.61
E= 248879.12
ELEV= 751.57

STAFF GAUGE TOP OF
POST ELEV. 731.86

P3
P3-H.C. WELL #2
GW = 731.40
N= 324646.71
E= 2249055.25
ELEV= 750.34

H.C. WELL #2
(PROPOSED)
N= 324462.0
E= 2248692.0

P2CW
P2-H.C. WELL #1
GW = 727.39
N= 323863.70
E= 2248002.51
NEW EL. 750.82

TH #4
P4-H.C. WELL #1
GW = 732.23
N= 324308.43
E= 224848.82
NEW EL. 749.69

P1
P1-H.C. WELL #2
GW = 731.38
N= 324576.86
E= 2248926.08
ELEV= 750.55

WELL #9
GW = 727.42
N= 323539.88
E= 2248892.95
TOP CASING EL 749.67
TOP PVC PLUG EL 749.40
"+" CUT @ S. SIDE CONC. PAD EL. 747.33

L1
P4-H.C. WELL #2
GW = 731.38
N= 324452.38
E= 2248924.26
ELEV= 750.37

WELL #2
GW = 727.08
N= 323933.061
E= 2250143.752
NEW EL 747.67

P2
H.C. WELL #1
N= 323755.00
E= 2247914.00

WELL #8
GW = 726.99
N= 323463.922
E= 2249350.231
NEW EL 749.86

TH #3
PE-H.C. WELL #1
GW = 729.10
N= 323642.63
E= 2247764.06
NEW EL. 752.17
CASING LEANS SW

BOTTOM ASH
POND

WELL #3
GW = 726.08
N= 323443.122
E= 2250407.905
NEW EL 750.35

TH #2
GW = 735.50
N= 323013.85
E= 2247247.30
NEW EL. 752.17

MISSOURI RIVER

WELL #4
GW = 725.56
N= 322801.957
E= 2250170.153
NEW EL 746.81

WELL #1B
GW = 729.42
N= 320453.094
E= 2246008.282
NEW EL 750.99

WELL #6
GW =724.93
N= 320941.869
E= 2249628.940
NEW EL 750.88

FORMER WELL #5
ABANDONED
N= 320546.973
E= 2250242.922
NEW EL 751.62

WELL #7
GW = 741.10
N= 319982.169
E= 2250410.440
NEW EL 764.20

FLY ASH
POND

730 732 728 734 726 736 738 740

LEGEND

- MONITORING WELL
- HORIZONTAL COLLECTOR WELL
- PIEZOMETER
- GW = 727.40 — GROUNDWATER ELEVATION (MEASURED 5/18/2015)
- 722 — PIEZOMETRIC SURFACE CONTOUR
- GRADIENT FLOW DIRECTION
- FLYASH EXTENT (APPROXIMATE)

NOTE:

1. BASE MAP PROVIDED BY BOARD OF PUBLIC UTILITIES.

N

0 500' 1000'
SCALE IN FEET

BURNS McDONNELL

ATTACHMENT C
MAY 2015 PIEZOMETRIC SURFACE MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

Legend

- Monitoring Well
- Abandoned Monitoring Well
- Well Not Used in CCR Monitoring
- Direction of Groundwater Flow
- Piezometric Surface Contour

0 100 200
Feet

N

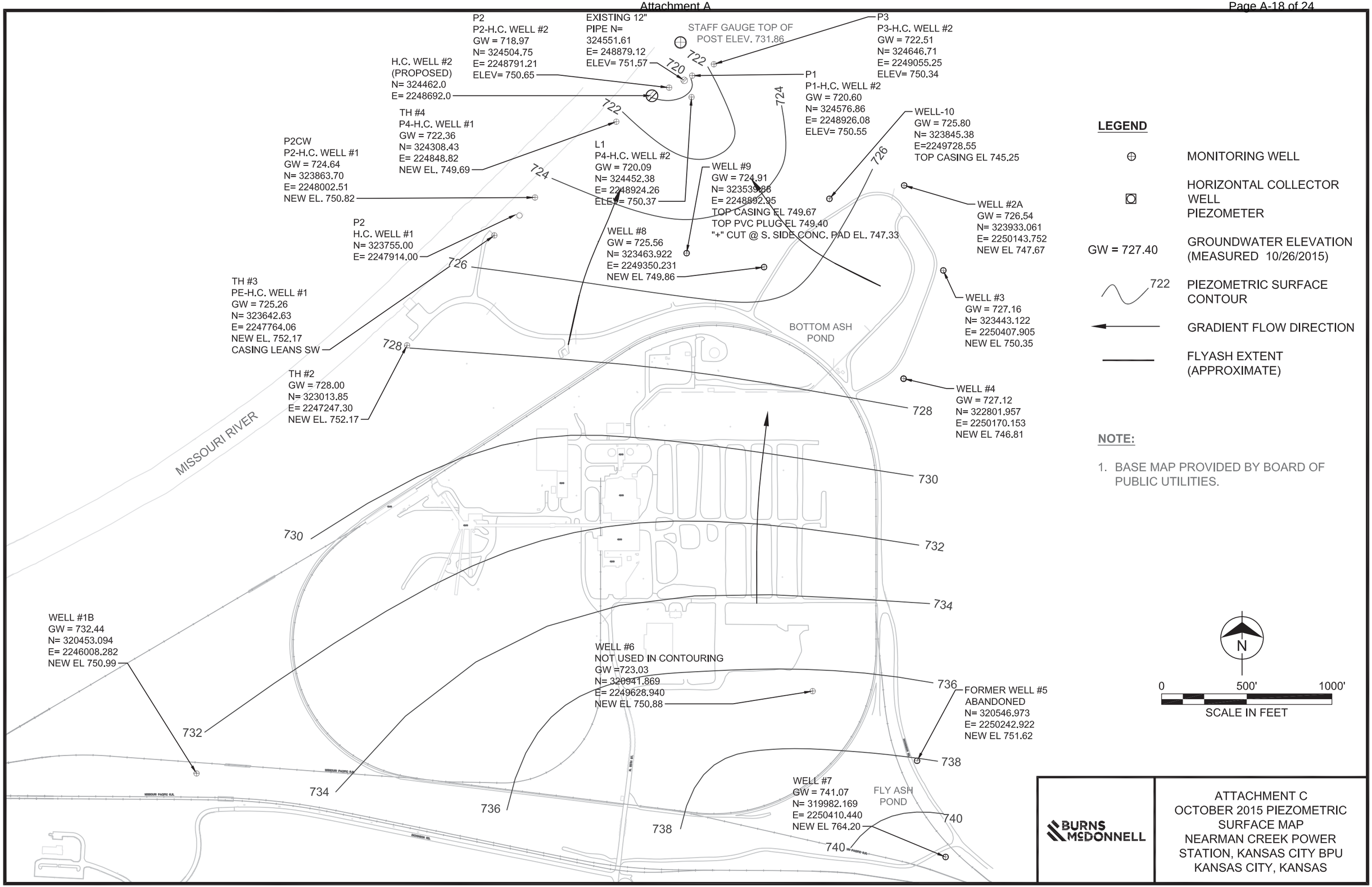
Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

OCTOBER 2015
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

Path: Z:\Clients\ENVIKCBPU\88777_CCRGWMON\Studies\GeospatialArcDocs\20151026_Piezometric Surface Map.mxd

Issued: December, 11 2015



LEGEND

- ⊕ MONITORING WELL
- ⊡ HORIZONTAL COLLECTOR WELL PIEZOMETER
- GW = 727.40 GROUNDWATER ELEVATION (MEASURED 10/26/2015)
- 722 PIEZOMETRIC SURFACE CONTOUR
- GRADIENT FLOW DIRECTION
- FLYASH EXTENT (APPROXIMATE)

NOTE:

1. BASE MAP PROVIDED BY BOARD OF PUBLIC UTILITIES.

BURNS McDONNELL

ATTACHMENT C
OCTOBER 2015 PIEZOMETRIC SURFACE MAP
NEARMAN CREEK POWER STATION, KANSAS CITY BPU
KANSAS CITY, KANSAS

Z:\CLIENTS\ENV\KCBPU\84883_GWMONITORING15\STUDIES\DELIVERABLES\NEARMAN - OCTOBER 2015\FIGURES\84883-FIG-NEARMAN POWER GROUND WATER-MAP.DWG 12/15/2015 10:16 AM BHOYE

Legend

- Monitoring Well
- Abandoned Monitoring Well
- Well Not Used in CCR Monitoring
- Piezometric Surface Contour
- Direction of Groundwater Flow

Note

1 - Piezometric surface contours were inferred using groundwater levels measured on January 27, 2016 and should be considered approximate.

0 100 200
Feet

N

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

JANUARY 2016
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

Path: Z:\Clients\ENVKCBPU\88777_CCRGWMON\Studies\Geospatial\ArcDocs\20160127_Piezometric Surface Map.mxd

Issued: August, 4 2016

Legend

- Inferred Direction of Groundwater Flow
- Piezometric Surface Contour
- Monitoring Well
- Abandoned Monitoring Well
- Well Not Used in CCR Monitoring

Note

1 - Piezometric surface contours were inferred using groundwater levels measured on April 27, 2016 and should be considered approximate.

0 100 200
Feet

N

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

APRIL 2016
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

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Issued: August, 4 2016

Legend

- Monitoring Well
- Abandoned Monitoring Well
- Well Not Used in CCR Monitoring
- Inferred Direction of Groundwater Flow
- Piezometric Surface Contour

Note

1 - Piezometric surface contours were inferred using groundwater levels measured on October 24, 2016 and should be considered approximate.

0 100 200 N
Feet

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

OCTOBER 2016
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

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Issued: January, 4 2017

Legend

- Monitoring Well
- Piezometric Surface Contour
- Apparent Groundwater Flow Direction

Note

1 - Piezometric surface contours were inferred using groundwater levels measured on January 23, 2017 and should be considered approximate.

0 100 200
Feet

N

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

JANUAR 2017
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

Issued: March, 30 2017

Legend

- Monitoring Well
- Apparent Groundwater Flow Direction
- Piezometric Surface Contour

Note

1 - Piezometric surface contours were inferred using groundwater levels measured on April 24, 2017 and should be considered approximate.

0 100 200
Feet

N

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

APRIL 2017
PIEZOMETRIC SURFACE
BOTTOM ASH POND
MONITORING WELL NETWORK
NEARMAN CREEK POWER STATION
KANSAS CITY BPU KANSAS CITY, KS

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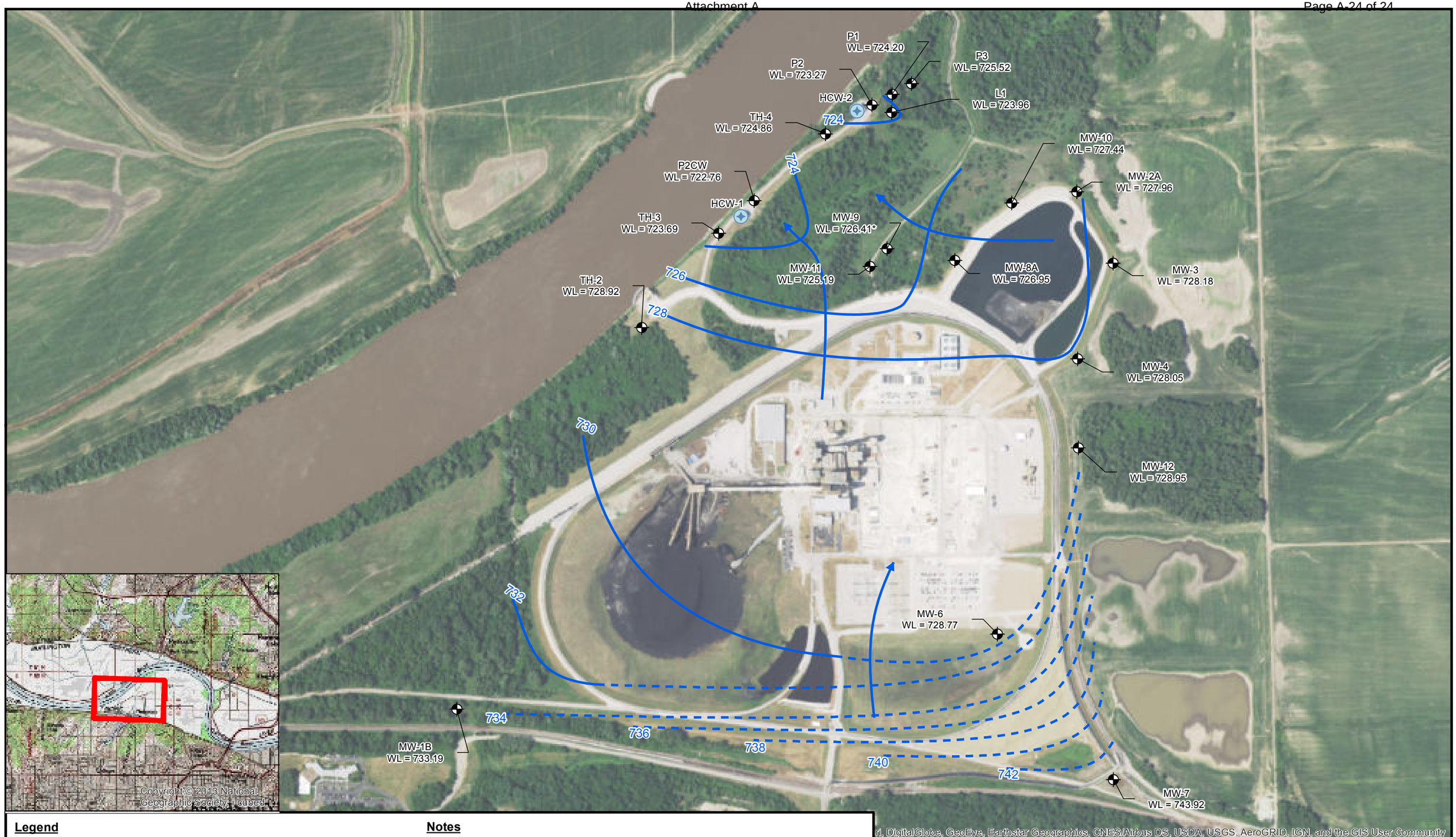
Issued: June, 6 2017



Legend

- Monitoring Well
- Estimated Piezometric Surface Contour
- Inferred Groundwater Flow Direction
- Piezometric Surface Contour
- Horizontal Collector Well

Notes

1 - Groundwater contours in the southeast portion of the Site are influenced by the MW-7 result. Surface water appears to recharge around MW-7 and may form a localized mound, As a result, dashed contours should be considered approximate.
2 - Site conditions may varry from those presented.
* - MW-9 was not used in contouring as it is screened deeper than MW-11.

0 300 600
Feet

N

Source: ESRI and Burns & McDonnell Engineering.

BURNS McDONNELL

OCTOBER 30, 2017
PIEZOMETRIC SURFACE CONTOURS
NEARMAN CREEK POWER STATION
KANSAS CITY BPU
KANSAS CITY, KS

Path: Z:\Clients\ENS\KCBPU\97126_1718GWMONHCWStudies\Geospatial\ArcDocs\20171030_Piezometric Surface Map.mxd

Issued: December, 15 2017