NOTICE

This scan only represents the application as filed. The information contained herein meets the requirements of K.A.R. 5-3-1 or K.A.R. 5-5-1, and has been found acceptable for filing in the office of the Chief Engineer. The application should not be considered to be a complete application as per K.A.R. 5-3-1b or K.A.R. 5-5-2a.

Water Resources
Received
APR 02 2020
1:32
KS Dept Of Agriculture

THE STATE OF KANSAS

KANSAS DEPARTMENT OF AGRICULTURE
Mike Beam, Acting Secretary of Agriculture

DIVISION OF WATER RESOURCES
David W. Barfield, Chief Engineer

File Number 50,371
This item to be completed by the Division of Water Resources.

APPLICATION FOR PERMIT TO APPROPRIATE WATER FOR BENEFICIAL USE

Filing Fee Must Accompany the Application
(Please refer to Fee Schedule attached to this application form.)

To the Chief Engineer of the Division of Water Resources, Kansas Department of Agriculture, 1320 Research Park Drive, Manhattan, Kansas 66502:

1. Name of Applicant (Please Print): City of Arkansas City
   Address: 118 W. Central Avenue
   City: Arkansas City State KS Zip Code 67005
   Telephone Number: (620) 441-4480

2. The source of water is: ■ surface water in Arkansas River (water induced from river to well) (stream)
   OR ☐ groundwater in _____ (drainage basin)

   Certain streams in Kansas have minimum target flows established by law or may be subject to administration when water is released from storage for use by water assurance district members. If your application is subject to these regulations on the date we receive your application, you will be sent the appropriate form to complete and return to the Division of Water Resources.

3. The maximum quantity of water desired is ------- acre-feet OR 267,215,040 gallons per calendar year, to be diverted at a maximum rate of 820 gallons per minute OR ------- cubic feet per second.

   Once your application has been assigned a priority, the requested maximum rate of diversion and maximum requested quantity of water under that priority number can **NOT** be increased. Please be certain your requested maximum rate of diversion and maximum quantity of water are appropriate and reasonable for your proposed project and are in agreement with the Division of Water Resources' requirements.

4. The water is intended to be appropriated for **(Check use intended):**

(a) ☐ Artificial Recharge	(b) ☐ Irrigation	(c) ☐ Recreational	(d) ☐ Water Power
(e) ☐ Industrial	(f) ■ Municipal	(g) ☐ Stockwatering	(h) ☐ Sediment Control
(i) ☐ Domestic	(j) ☐ Dewatering	(k) ☐ Hydraulic Dredging	(l) ☐ Fire Protection
(m) ☐ Thermal Exchange	(n) ☐ Contamination Remediation		

YOU **MUST** COMPLETE AND ATTACH ADDITIONAL DIVISION OF WATER RESOURCES FORM(S) PROVIDING INFORMATION TO SUBSTANTIATE YOUR REQUEST FOR THE AMOUNT OF WATER FOR THE INTENDED USE REFERENCED ABOVE.

FIELD OFFICE IS 2

For Office Use Only:
F.O. 1 *GMD* ____ *Meets K.A.R. 5-3-1 (YES / NO)* *Use* MUN *Source* G / S *County* CL *By* BMM *Date* 4/7/20
Code RE3 *Fee $* 400 *TR #* _____ *Receipt Date* 4/2/20 *Check #* 177090

DWR 1-100 (Revised 03/12/2019)

4/13/2020
LMoody

Well No. 3

File No. _____

5. The location of the proposed wells, pump sites or other works for diversion of water is: **Well No. 3**

Note: For the application to be accepted, the point of diversion location must be described to at least a 10 acre tract, unless you specifically request a 60 day period of time in which to locate the site within a specifically described, minimal legal quarter section of land.

(A) One in the SE quarter of the NE quarter of the NW quarter of Section 26, more particularly described as being near a point 4050 feet North and 2750 feet West of the Southeast corner of said section, in Township 34 South, Range 3 (East)/West (circle one), Cowley County, Kansas.

(B) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

(C) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

(D) One in the _____ quarter of the _____ quarter of the _____ quarter of Section _____, more particularly described as being near a point _____ feet North and _____ feet West of the Southeast corner of said section, in Township _____ South, Range _____ East/West (circle one), _____ County, Kansas.

If the source of supply is groundwater, a separate application shall be filed for each proposed well or battery of wells, except that a single application may include up to four wells within a circle with a quarter (¼) mile radius in the same local source of supply which do not exceed a maximum diversion rate of 20 gallons per minute per well.

A battery of wells is defined as two or more wells connected to a common pump by a manifold; or not more than four wells in the same local source of supply within a 300 foot radius circle which are being operated by pumps not to exceed a total maximum diversion rate of 800 gallons per minute and which supply water to a common distribution system.

6. The owner of the point of diversion, if other than the applicant is (please print):

Same as Applicant
(name, address and telephone number)

_____
(name, address and telephone number)

You must provide evidence of legal access to, or control of, the point of diversion from the landowner or the landowner's authorized representative. Provide a copy of a recorded deed, lease, easement or other document with this application. In lieu thereof, you may sign the following sworn statement:

I have legal access to, or control of, the point of diversion described in this application from the landowner or the landowner's authorized representative. I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 30, 2020. _____
Applicant's Signature

The applicant must provide the required information or signature irrespective of whether they are the landowner. Failure to complete this portion of the application will cause it to be unacceptable for filing and the application will be returned to the applicant.

7. The proposed project for diversion of water will consist of One well, pump, motor, and wellhead equipment
(number of wells, pumps or dams, etc.)
and (was)(will be) completed (by) Currently existing active Municipal Well No. 3.
(Month/Day/Year - each was or will be completed)

8. The first actual application of water for the proposed beneficial use was or is estimated to be 06/01/2020.
(Mo/Day/Year)

File No. _____

9. Will pesticide, fertilizer, or other foreign substance be injected into the water pumped from the diversion works?

☐ Yes ■ No If "yes", a check valve shall be required.

All chemigation safety requirements must be met including a chemigation permit and reporting requirements.

10. If you are planning to impound water, please contact the Division of Water Resources for assistance, prior to submitting the application. Please attach a reservoir area capacity table and inform us of the total acres of surface drainage area above the reservoir. Not Applicable

Have you also made an application for a permit for construction of this dam and reservoir with the Division of Water Resources? ☐ Yes ☐ No

- If yes, show the Water Structures permit number here _____
- If no, explain here why a Water Structures permit is not required _____

11. The application must be supplemented by a U.S.G.S. topographic map, aerial photograph or a detailed plat showing the following information. On the topographic map, aerial photograph, or plat, identify the center of the section, the section lines or the section corners and show the appropriate section, township and range numbers. Also, please show the following information:

(a) The location of the proposed point(s) of diversion (wells, stream-bank installations, dams, or other diversion works) should be plotted as described in Paragraph No. 5 of the application, showing the North-South distance and the East-West distance from a section line or southeast corner of section.

(b) If the application is for groundwater, please show the location of any existing water wells of any kind within ½ mile of the proposed well or wells. Identify each existing well as to its use and furnish the name and mailing address of the property owner or owners. If there are no wells within ½ mile, please advise us.

(c) If the application is for surface water, the names and addresses of the landowner(s) ½ mile downstream and ½ mile upstream from your property lines must be shown.

(d) The location of the proposed place of use should be shown by crosshatching on the topographic map, aerial photograph or plat.

(e) Show the location of the pipelines, canals, reservoirs or other facilities for conveying water from the point of diversion to the place of use.

A 7.5 minute U.S.G.S. topographic map may be obtained by providing the section, township and range numbers to: Kansas Geological Survey, 1930 Constant, Campus West, University of Kansas, Lawrence, Kansas 66047.

12. List any application, appropriation of water, water right, or vested right file number that covers the same diversion points or any of the same place of use described in this application. Also list any other recent modifications made to existing permits or water rights in conjunction with the filing of this application.

Vested Right CL-5, Water Right No. 10084

File No. _____

13. Furnish the following well information if the proposed appropriation is for the use of groundwater. If the well has not been completed, give information obtained from test holes, if available.

Information below is from: ☐ Test holes ■ Well as completed ☐ Drillers log attached

Well location as shown in paragraph No.	(A)	(B)	(C)	(D)
Date Drilled	Well log unavailable. Values approximated.			
Total depth of well	45'			
Depth to water bearing formation	5'			
Depth to static water level	12'			
Depth to bottom of pump intake pipe	Exact depth unknown			

14. The relationship of the applicant to the proposed place where the water will be used is that of Owner (owner, tenant, agent or otherwise).

15. The owner(s) of the property where the water is used, if other than the applicant, is (please print):

_____
(name, address and telephone number)

_____
(name, address and telephone number)

16. The undersigned states that the information set forth above is true to the best of his/her knowledge and that this application is submitted in good faith.

Dated at Arkansas City, Kansas, this 30 day of March (month), 2020 (year).

_____
(Applicant Signature)

By _____
(Agent or Officer Signature)

_____
(Agent or Officer - Please Print)

Assisted by Daniel Clement & Don Koci Burns & McDonnell (office/title) Date: 02/26/2020

SECTION 3: PROJECTED FUTURE WATER NEEDS

PLEASE COMPLETE THE FOLLOWING TABLE SHOWING YOUR FUTURE WATER REQUIREMENTS FOR THE NEXT 20 YEARS:

	Column 1 Raw Water Diverted Under Your Rights	Column 2 Water Purchased From All Sources	Column 3 Water Sold to Other Public Water Suppliers	Column 4 Water Sold to Your Industrial, Stock, and Bulk Customers	Column 5 Water Sold to Your Residential and Commercial Customers	Column 6 Other Metered Water	Column 7 Remaining Water Used (See Explanation on other side)
Year 5	1,615,000,000	0	31,800,000	736,000,000	336,000,000	*309,000,000	202,000,000
Year 10	1,782,000,000	0	32,600,000	845,000,000	345,000,000	*337,000,000	223,000,000
Year 15	1,972,000,000	0	33,400,000	970,000,000	354,000,000	*369,000,000	247,000,000
Year 20	2,190,000,000	0	34,300,000	1,114,000,000	363,000,000	*405,000,000	274,000,000
	TOTAL WATER = Columns 1 + 2		**ACCOUNTED FOR WATER = Columns 3 + 4 + 5 + 6**				**UNACCOUNTED FOR WATER**

*Amounts include RO Plant waste stream water from concentrate and backwash sources.

SECTION 4: POPULATION AND SERVICE CONNECTIONS

ESTIMATE THE NUMBER OF PERSONS DIRECTLY SERVED BY YOUR WATER DISTRIBUTION SYSTEM

PAST POPULATION - PROVIDE INFORMATION BELOW:
(CENSUS BUREAU INFORMATION)

LAST 20 YEARS	POPULATION
20 years ago	12,460 (1998 WU Rpt)
15 years ago	11,963 (2003 WU Rpt)
10 years ago	11,572 (2008 WU Rpt)
5 years ago	12,415 (2013 WU Rpt)
Last Year	12,500 (2018 WU Rpt)

PROJECTED FUTURE POPULATION

ESTIMATE FUTURE POPULATION AND SUBSTANTIATE NUMBERS ON SEPARATE ATTACHMENTS

NEXT 20 YEARS	POPULATION
Year 5	12,611
Year 10	12,929
Year 15	13,255
Year 20	13,590

Provide number of current active service connections:

4532	Residential	18	Industrial	13	Other (specify) Free, Contract, Irrigation
306	Commercial	0	Pasture/ Stockwater/ Feedlot	4869	**Total**

Water Resources Received
APR 02 2020
KS Dept Of Agriculture

SECTION 5: PRESENT GALLONS PER PERSON PER DAY

CALCULATE YOUR GALLONS PER PERSON PER DAY

Water in Columns 5, 6, and 7 ÷ Population ÷ 365 Days/Year = Gallons per Person per Day

401,286,000 (Amount of water in Columns 5, 6, and 7 of Section 1) ÷ 12,500 (Population from Last Year of Section 4) ÷ 365 Days/Year = 88 GALLONS PER PERSON PER DAY.

SECTION 6: AREA TO BE SERVED

Describe the area to be served or provide the legal description of the location where the water is to be used including any other city of water supply system (i.e. Rural Water District):

Place of Use will overlap the currently authorized Place of Use under existing water rights including City of Arkansas City and immediate vicinity, industrial development area and Sumner RWD#4.

You may attach additional information you believe will assist in informing the Division of the need for your request.

Applicant's Name City of Arkansas City
(Please Print)

MUNICIPAL (PUBLIC WATER SUPPLY) APPLICATION SUPPLEMENTAL INFORMATION SHEET

Application File Number
(assigned by DWR)

SECTION 1: PRESENT WATER USE SUMMARY (IF NO PREVIOUS MUNICIPAL WATER USE HAS BEEN UTILIZED, PROCEED TO SECTION 3)
NOTE: WORKSHEET FOR WATER PUMPED, PURCHASED, AND SOLD BY YOUR WATER DISTRIBUTION SYSTEM.

Column 1 Raw Water Diverted Under Your Rights	Column 2 Water Purchased From All Sources	Column 3 Water Sold to Other Public Water Suppliers	Column 4 Water Sold to Your Industrial, Stock, and Bulk Customers	Column 5 Water Sold to Your Residential and Commercial Customers	Column 6 Other Metered Water	Column 7 Remaining Water Used (See Below Explanation)
937,457,000 (2018 WU rpt)	0	30,410,000	404,045,000	284,436,000	130,264,000 (*Note)	88,302,000
TOTAL WATER = Columns 1 + 2		**ACCOUNTED FOR WATER = Columns 3 + 4 + 5 + 6**				**UNACCOUNTED FOR WATER**

UNACCOUNTED FOR WATER = TOTAL WATER - ACCOUNTED FOR WATER

*Amount includes RO Plant waste stream water from concentrate and backwash sources. Metered waste stream portion of Other Metered Water equals 101,716,000 gallons.

Column 1: The amount of raw water diverted from all of your points of diversion.

Column 2: The amount of water purchased wholesale from all other public water supply systems or the Kansas Water Office.

Column 3: The amount of water sold wholesale to all other public water supply systems.

Column 4: The amount of water sold retail to all industrial, pasture, stockwater, feedlot, and bulk water service connections. Include the amount of water sold to all farmsteads using at least 200,000 gallons of water per year.

Column 5: The amount of water sold retail to your residential and commercial customers and to industries and farmsteads using less than 200,000 gallons of water per year.

Column 6: The amount of water used that is metered at individual service connections and supplied free, such as for public service, treatment processes, and connections receiving free water.

Column 7: The amount of remaining water used. The gallons reported in this column are found by adding the numbers in Columns 1 and 2 and subtracting the numbers in Columns 3, 4, 5, and 6.

UNACCOUNTED FOR WATER

Use the following to calculate your distribution system's Unaccounted For Water:
Start with the amount in Column 1 and add the amount in Column 2, then subtract the amounts in Columns 3, 4, 5, and 6 leaving an amount of water representing your unaccounted for water to enter in Column 7.

Use the following to calculate the percent Unaccounted For Water versus the Total Water of your system:

$$\text{Percent Unaccounted For Water} = \frac{\text{Unaccounted For Water}}{\text{Total Water (Columns 1,2)}} \times 100$$

If this number exceeds 20%, please explain the large amount of unaccounted for water and describe any steps being taken to reduce it.

SECTION 2: PAST WATER USE
COMPLETE THE FOLLOWING TABLE FROM YOUR PAST WATER USE RECORDS.

	Column 1 Raw Water Diverted Under Your Rights	Column 2 Water Purchased From All Sources	Column 3 Water Sold to Other Public Water Suppliers	Column 4 Water Sold to Your Industrial, Stock, and Bulk Customers	Column 5 Water Sold to Your Residential and Commercial Customers	Column 6 Other Metered Water	Column 7 Remaining Water Used (See Above Explanation)
20 years ago	763,672,000 (1998)	0	28,073,000	31,184,000	435,273,000	157,006,000	112,136,000
15 years ago	737,685,000 (2003)	0	30,707,000	192,167,000	381,609,000	34,247,000	98,955,000
10 years ago	882,160,000 (2008)	0	33,049,000	276,950,000	301,025,000	20,720,000	250,416,000
5 years ago	916,239,000 (2013)	0	34,070,000	307,976,000	316,131,000	4,121,000	253,941,000
	TOTAL WATER = Columns 1 + 2		**ACCOUNTED FOR WATER = Columns 3 + 4 + 5 + 6**				**UNACCOUNTED FOR WATER**

Demand Projection Table

Year	Population	GPCD Recent	Domestic Total (0.5% growth)	Sumner RWD #4 (0.5% growth)	Domestic Total without SU-RWD4	Industrial Water Use			Other Metered Water	Unaccounted for Water (15% Loss)	Total Treated Water Demand	RO Waste Stream (20%)	Total Raw Water Demand with RO Waste Stream
						Goff (3% Growth)	Kanpak (2% Growth)	Strother (2% Growth)					
			MGY	MGY	MGY	MGY	MGY	MGY	MGY	MGY	MGY	MGY	MGY
2020	12,300	80	359	31	328	504	82	55	40	184	1224	245	1469
2021	12,362	80	361	31	330	520	84	56	40	187	1247	249	1497
2022	12,423	80	363	31	331	535	85	57	40	191	1271	254	1525
2023	12,485	80	365	31	333	551	87	58	40	194	1295	259	1554
2024	12,548	80	366	32	335	568	89	60	40	198	1320	264	1584
2025	12,611	80	368	32	336	585	90	61	40	202	1346	269	1615
2026	12,674	80	370	32	338	602	92	62	40	206	1372	274	1647
2027	12,737	80	372	32	340	620	94	63	40	210	1399	280	1679
2028	12,801	80	374	32	342	639	96	64	40	214	1427	285	1713
2029	12,865	80	376	32	343	658	98	66	40	218	1456	291	1747
2030	12,929	80	378	33	345	678	100	67	40	223	1485	297	1782
2031	12,994	80	379	33	347	698	102	68	40	227	1515	303	1818
2032	13,059	80	381	33	348	719	104	70	40	232	1546	309	1855
2033	13,124	80	383	33	350	741	106	71	40	237	1578	316	1893
2034	13,190	80	385	33	352	763	108	73	40	242	1610	322	1932
2035	13,255	80	387	33	354	786	110	74	40	247	1644	329	1972
2036	13,322	80	389	34	355	809	112	76	40	252	1678	336	2014
2037	13,388	80	391	34	357	834	115	77	40	257	1713	343	2056
2038	13,455	80	393	34	359	859	117	79	40	262	1750	350	2099
2039	13,523	80	395	34	361	884	119	80	40	268	1787	357	2144
2040	13,590	80	397	34	363	911	122	82	40	274	1825	365	2190
2041	13,658	80	399	34	364	938	124	83	40	280	1864	373	2237
2042	13,726	80	401	35	366	966	127	85	40	286	1905	381	2286
2043	13,795	80	403	35	368	995	129	87	40	292	1946	389	2335
2044	13,864	80	405	35	370	1025	132	88	40	298	1989	398	2386
2045	13,933	80	407	35	372	1056	134	90	40	305	2032	406	2439
2046	14,003	80	409	35	374	1088	137	92	40	312	2077	415	2493
2047	14,073	80	411	35	375	1120	140	94	40	319	2124	425	2548
2048	14,143	80	413	36	377	1154	143	96	40	326	2171	434	2605
2049	14,214	80	415	36	379	1189	145	98	40	333	2220	444	2664
2050	14,285	80	417	36	381	1224	148	100	40	340	2270	454	2724
2051	14,357	80	419	36	383	1261	151	102	40	348	2321	464	2786
2052	14,428	80	421	36	385	1299	154	104	40	356	2374	475	2849
2053	14,501	80	423	37	387	1338	157	106	40	364	2429	486	2914
2054	14,573	80	426	37	389	1378	161	108	40	373	2485	497	2982
2055	14,646	80	428	37	391	1419	164	110	40	381	2542	508	3050
2056	14,719	80	430	37	393	1462	167	112	40	390	2601	520	3121
2057	14,793	80	432	37	395	1506	170	114	40	399	2662	532	3194
2058	14,867	80	434	37	397	1551	174	117	40	409	2724	545	3269
2059	14,941	80	436	38	399	1597	177	119	40	418	2788	558	3346
2060	15,016	80	438	38	401	1645	181	121	40	428	2854	571	3425

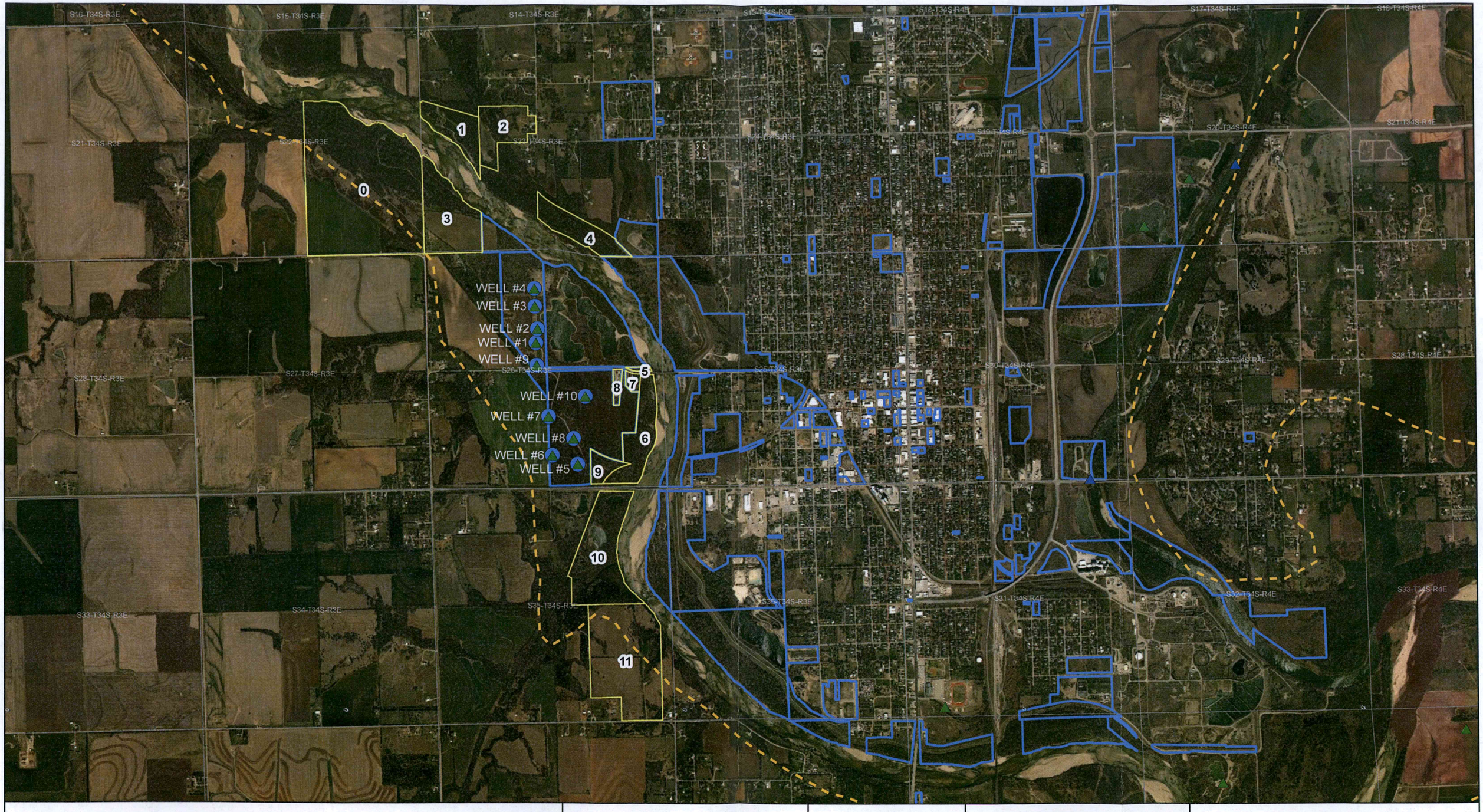
Point of Diversion	Vested CL5 Water Right	10084 Water Right	Total CL5 and 10084 Water Rights	Permitted Well Production Rate	Quantity Sourced from Groundwater	DWR Application Quantity for Water Sourced from Surface Water	Maximum Quantity of Combined Groundwater and Surface Water
Well Number	**Gallons per Year**	**Gallons per Year**	**Gallons per Year**	**GPM**	**Gallons per Year**	**Gallons per Year**	**Gallons per Year**
1	53,000,000	119,570,000	172,570,000	625	124,830,000	203,670,000	328,500,000
2	45,000,000	117,464,000	162,464,000	695	138,810,960	226,481,040	365,292,000
3	39,000,000	176,668,000	215,668,000	820	163,776,960	267,215,040	430,992,000
4	40,000,000	163,000,000	203,000,000	610	121,834,080	198,781,920	320,616,000
5	55,000,000	198,840,000	253,840,000	870	173,763,360	283,508,640	457,272,000
6	65,000,000	205,630,000	270,630,000	800	159,782,400	260,697,600	420,480,000
7	53,000,000	75,686,000	128,686,000	590	117,839,520	192,264,480	310,104,000
8	58,000,000	171,560,000	229,560,000	1080	215,706,240	351,941,760	567,648,000
9	0	138,067,000	138,067,000	625	124,830,000	203,670,000	328,500,000
10	0	114,474,000	114,474,000	560	111,847,680	182,488,320	294,336,000
			Totals	**7275**	**1,453,021,200**	**2,370,718,800**	**3,823,740,000**

Units	Gallons per Year	GPM	Gallons per Year	Gallons per Year	Gallons per Year
Totals with Limitation Clauses Applied	*1,264,000,000	*6,000	*1,264,000,000	**2,062,000,000	**3,326,000,000

*Based on current DWR net quantity and rate limitations

**Based on anticipated DWR net quantity limitations for new surface water applications

Map Label	Mailing Address
1	PO BOX 1047 ARKANSAS CITY, KS 67005
2	PO BOX 633 ARKANSAS CITY, KS 67005
3	1421 N 23RD ARKANSAS CITY, KS 67005
4	5032 282ND RD ARKANSAS CITY, KS 67005
5	Attn: PILKINGTON,HARRY PO BOX 208 WICHITA, KS 67201
6	311 E 9TH WINFIELD, KS 67156
7	6432 HIGH DR MISSION HILLS, KS 66208
8	5895 286TH RD ARKANSAS CITY, KS 67005
9	PO BOX 325 ARKANSAS CITY, KS 67005
10	Attn: LORANCE,RUTH 2635 N BELMONT WICHITA, KS 67220
11	6432 HIGH DR MISSION HILLS, KS 66208
12	5876 302ND RD ARKANSAS CITY, KS 67005



Legend

- Arkansas City Municipal Wells
- City of Arkansas City Owned Parcels
- Adjacent Properties Along River Halfmile
- Arkansas River Alluvium (Approximate)

Surrounding Water Rights

- Groundwater
- Surfacewater
- PLSS Sections

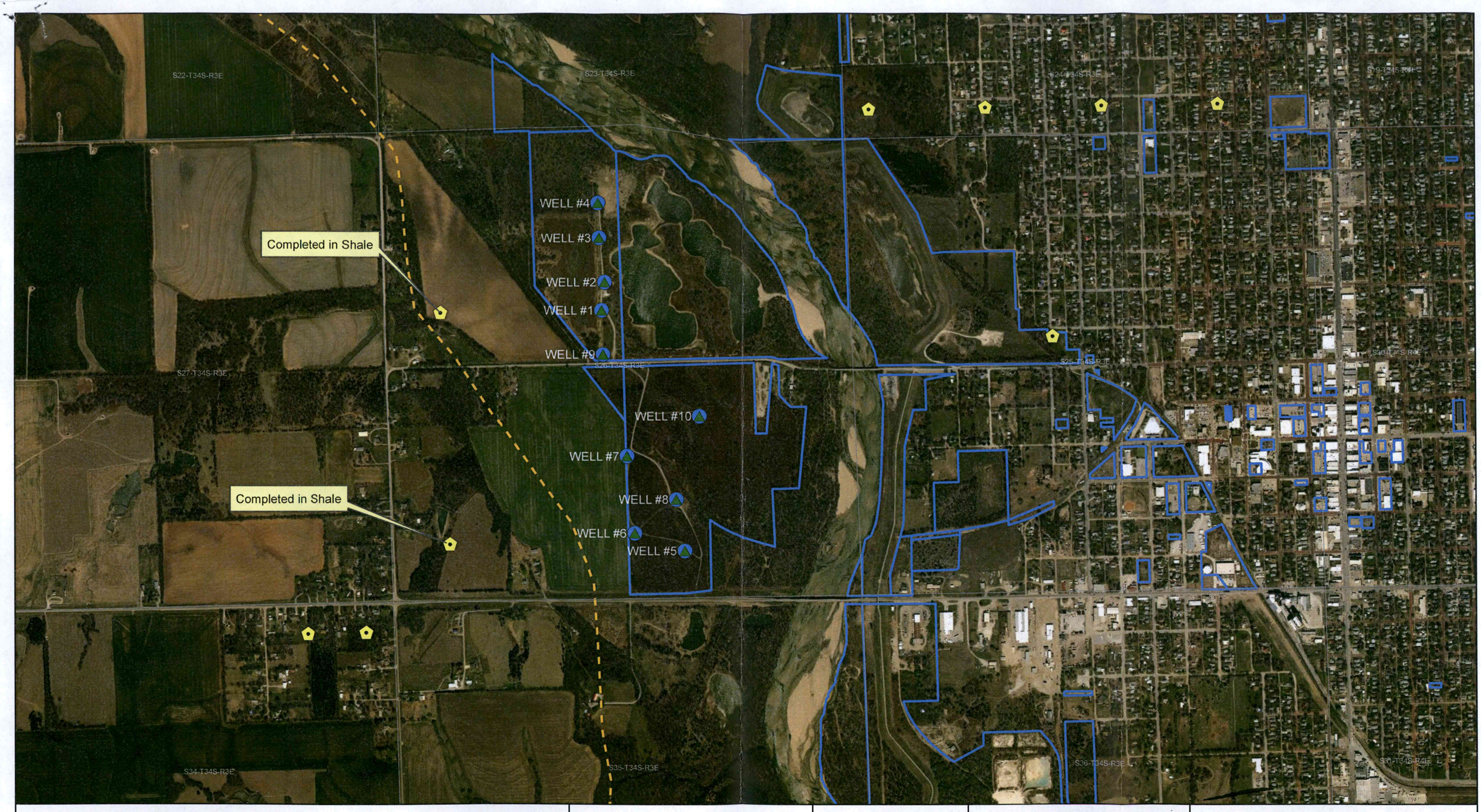
1:24,000

N

0 0.125 0.25 0.5 Miles

BURNS McDONNELL

Arkansas City Wells & Adjacent Parcels 1/2 Mile Upstream and Downstream



Legend

- Domestic Wells KGS WWC5
- Arkansas City Municipal Wells
- City of Arkansas City Owned Parcels
- Arkansas River Alluvium (Approximate)

Surrounding Water Rights

- Groundwater
- Surfacewater
- PLSS Sections

Water Resources Received
APR 02 2020
KS Dept Of Agriculture

1:12,000

N

0 500 1,000 2,000 Feet

BURNS McDONNELL

Arkansas City Wells & Nearby Water Wells

BURNS McDONNELL

March 9, 2020

Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
1320 Research Park Drive
Manhattan, Kansas 66502

Re: City of Arkansas City – New Water Right Applications

The City of Arkansas City (City) currently supplies water to customers from a wellfield located west of the City consisting of 10 wells authorized by Vested Water Right CL No. 5 and Water Right No. 10084. The wells are completed in the Arkansas River alluvium and are currently authorized for a total annual quantity of 1,264 Million Gallons per Year (MGY) or 3,880 Acre-Feet (AF), with a maximum combined net withdrawal rate of 6,000 gallons per minute (GPM).

Water produced from the wellfield is sent to a recently constructed Reverse Osmosis Groundwater Treatment Plant (ROWTP). During the design phase of the ROWTP a review of the City's existing raw water supply was completed. The review of existing raw water supplies identified that during recent dry years (2012), the City's raw water use has been as high as 1,100 MGY or 3,400 AF. When peak needs during future years and the raw water losses to ROWTP waste streams are combined, the City is projected to need raw water in excess of current water rights in the immediate future. In addition to meeting the demands of the immediate future, multiple industrial customers served by the City have exhibited strong growth in recent history and have conveyed plans for expansion that will result in immediate increases in water demand.

To address the immediate need for additional raw water supplies, the City and Burns & McDonnell (BMcD) assembled a comprehensive review of area surface water and groundwater resources. During the review for new water resources the following observations were made:

- New groundwater appropriations near to or overlapping the existing wellfield would not comply with current Division of Water Resources (DWR) Safe-Yield regulations based on the calculated amount of recharge to an unconfined aquifer system from precipitation alone according to K.A.R 5-3-11.
- Though the City's wellfield represents nearly all of the existing groundwater appropriations in the area, new groundwater appropriations within a 2-Mile circle would not comply with current Division of Water Resources (DWR) Safe-Yield regulations based on the calculated amount of recharge to the aquifer from precipitation alone according to K.A.R. 5-3-11.
- New appropriations and wells extended beyond 2-Miles from wellfield would require exploration of locations where municipal wells are projected to have limited well yield or impaired water quality.
- Examination of historic water levels and pumping records indicates that the existing wellfield has had sustainable groundwater withdrawals despite the City approaching full use of existing water rights.
- Examination of historic water levels shows that there is a significant hydraulic connection between flow in the adjacent Arkansas River and groundwater levels in the alluvial aquifer.
- A further review of DWR Safe-Yield regulation K.A.R. 5-3-11 indicates that in other alluvial aquifers (Missouri River Alluvium), the interaction between surface water and groundwater is

acknowledged by allowing potential appropriations to be based on a Safe-Yield protocol that considers calculated amount of aquifer recharge from precipitation and the recharge available to well from infiltration of surface water.

- Surface water from the Arkansas River at the City's wellfield is not currently administered under DWR's Minimum Desirable Streamflow program and appears open to new appropriations.

Based on the lack of availability for new groundwater appropriations within the existing wellfield and the anticipated challenges of developing wells outside of the existing wellfield, BMcD and the City approached DWR to consider alternatives. During preliminary discussions with DWR the significant hydraulic connection between the Arkansas River and the City's wellfield was identified as a possible avenue for additional water rights with similarities to the process used to calculate allowable appropriations in the Missouri River Alluvium. To support this concept, DWR indicated that the hydraulic connection between the City's wells and the adjacent Arkansas River would need to be further quantified.

Induced Infiltration Study

To characterize the relationship between pumping stress, the aquifer, and the adjacent Arkansas River the City performed additional research that included a 72-hour pump test, installation of six observation wells equipped with data loggers and transducers, and sand point well to log water level fluctuations in the river and riverbed (see attached). The City's northern most well in the wellfield (Well No. 4) was utilized as the pumping well based on proximity to the Arkansas River and a maximized distance to other City wells operating to the south.

Aquifer Pump Test – Arkansas City Well No. 4

To establish accurate estimates of local aquifer parameters, the City initiated a 72-hour aquifer pump test utilizing Well No. 4 discharging at an average rate of 570 GPM throughout the test. Aquifer levels were monitored prior to, during, and after pumping stress using transducers equipped with dataloggers in each monitoring well. Using the water level information gathered during the pump test, aquifer parameters such as transmissivity (T), hydraulic conductivity (K), and aquifer storage (S), can be further refined. BMcD utilized three different analysis methods and averaged these calculations to estimate that the local transmissivity of the aquifer is 269,000 gallons per day per foot (gpd/ft), with a storage coefficient of 0.29. These analysis methods also allow for an estimation of the effective distance to a recharge source (known as a-distance). The average calculated a-distance of 608 feet correlates well with the actual value of 620 linear feet between City Well No. 4 and the western edge of the Arkansas River bank. Calculated aquifer parameters based on the pump test information and several calculation methods are summarized in Table 1 below.

Table 1 – Calculated Aquifer Parameters from 72-Hour Pump Test

Method of Analysis	Time (Hours)	Monitoring Wells Used	Calculated Transmissivity (T) (gpd/ft)	Calculated Storativity (S)	Distance to Recharge Source (a) (ft)
Method of Images	48	All	281,000	0.29	560
Rorabaugh	72	Parallel Line	265,000		330
Distance Drawdown	24	Parallel Line	263,000	0.29	300
Distance Drawdown	48	Parallel Line	268,000	0.26	400
Distance Drawdown	72	Parallel Line	269,000	0.4	400
Rorabaugh	48	Riverward Line	316,000		880
Distance Drawdown	24	Riverward Line	283,000	0.09	600
Distance Drawdown	48	Riverward Line	308,000	0.04	1000
Distance Drawdown	72	Riverward Line	321,000	0.08	1000
		Average Values	**269,200**	**0.29**	**608**

Surface Water Capture Calculations

K.A.R. 5-3-11 acknowledges the link between groundwater and surface water in the Missouri River Alluvium by allowing safe yield calculations to include the available recharge from precipitation and the recharge from the Missouri River available to the well as calculated by the Jenkins equation or a similar stream-depletion method. Both the Jenkins equation and other methods rely on calculated aquifer parameters and monitoring of river bed interaction to calculate the capture ratio of groundwater and surface water for a well. Data from the monitoring wells indicates the groundwater levels correlate directly to the stage of the Arkansas River, meaning the river is hydraulically connected to the aquifer (see attached). Based on a calculated equilibrium time of 42 days and the averaged aquifer parameters in Table 1, the Jenkins method indicates that 64 percent of the water produced from Well No. 4 (by volume) would be sourced from induced infiltration of surface water from the Arkansas River. By comparison, the Glover Balmer equation indicates that 85 percent of the water produced (by rate) is being sourced from induced infiltration of surface water from the Arkansas River.

New Applications for Groundwater Rights - Induced Infiltration Component

The Jenkins method conservatively estimates that Well No. 4 sources 64 percent of produced water from induced infiltration of surface water from the Arkansas River. This same hydraulic connection between the Arkansas River and the alluvial aquifer is observed throughout the City's wellfield, therefore the same approach to calculate ratios of groundwater to induced infiltration can be applied to other wells in the wellfield (Table 2).

Table 2 – Calculated ratios of groundwater and induced infiltration produced in the Arkansas City Wellfield utilizing the Jenkins and Glover Balmer Method

Well Number	Transmissivity (T)	Storage Coefficient (S)	Distance to Recharge Source (a-distance)	Distance to Centerline of River from Well	Stream Depletion Factor (SDF)	Time (t)	t/SDF	Jenkins Method (v/Qt)	Glover Balmer (q/Q)
Name	(gpd/ft)	Unitless	feet	feet	1/days	days	Unitless	Ratio	Ratio
Well No. 4	269,000	0.29	620	870	6	42	6.9	0.64	0.85
Well No. 3	269,000	0.29	990	1240	12	81	6.5	0.63	0.83
Well No. 2	269,000	0.29	1506	1756	25	156	6.3	0.62	0.81
Well No. 1	269,000	0.29	1786	2036	33	206	6.2	0.62	0.80
Well No. 9	269,000	0.29	2157	2407	47	282	6	0.62	0.80
Well No. 10	269,000	0.29	1479	1729	24	151	6.3	0.62	0.81
Well No. 7	269,000	0.29	2364	2614	55	329	6	0.62	0.79
Well No. 8	269,000	0.29	1690	1940	30	188	6.2	0.62	0.80
Well No. 6	269,000	0.29	1972	2222	40	243	6.1	0.62	0.80
Well No. 5	269,000	0.29	1379	1629	21	135	6.3	0.62	0.81
Averages	**269,000**	**0.29**	**1594**	**1844**	**29**	**181**	**6.28**	**0.62**	**0.81**

Based on the results in Table 2, an average of 62% of the water produced from the wellfield should be sourced from induced infiltration. K.A.R. 5-3-11 calculates available appropriations at a well site based on the sum of available recharge from precipitation and the recharge from the river as calculated above. These calculations indicate that if the City pumped 3,326 MGY from the existing wellfield, 1,264 MGY would be sourced from groundwater, and 2,062 MGY would be sourced from induced infiltration of river water.

Enclosed are new applications for surface water rights in the existing wellfield that overlap existing points of diversion. In addition to the applications, the following supporting documents have been provided as attachments:

1. A detailed 40-year water use projection based on projected increases from primary industrial customers and continued projected growth for residential and commercial customers.
2. Maps illustrating landownership adjacent to the river for both upstream and downstream parcels within ½ mile of the City's wellfield property with a correlating address table.
3. Maps illustrating surrounding wells and water rights within ½ mile of the City's wellfield. No known domestic wells were found to be completed in the alluvium within ½ mile of the applications and there are no known non-domestic wells within ½ mile of the applications other than the wells owned by the City.
4. A copy of the presentation made to DWR staff regarding the results of the pump testing and aquifer analysis calculations used to develop the ratio of groundwater and surface water captured by the wellfield.

Daniel Clement, P.G.
Senior Hydrogeologist

DWC/dwc
Attachments

Water Permit Application Fee Schedule

Point of Diversion	Vested CL5 Water Right	10084 Water Right	Total CL5 and 10084 Water Rights	Permitted Well Production Rate	Quantity Sourced from Groundwater	DWR Application Quantity for Water Sourced from Surface Water	Maximum Quantity of Combined Groundwater and Surface Water	DWR Application Quantity for Water Sourced from Surface Water	Proposed Surface Water Application Quantity in Excess of 320 AF/Y	Base Application Fee for Quantities in Excess of 320 AFY	Additional Application Fee for Quantities in Excess of 320 AFY ($20 per 100 AF)	Total Application Fees	Additional Notice and Proof of Completion of Diversion Works Fees Following Application Approvals
Well Number	Gallons per Year	Gallons per Year	Gallons per Year	GPM	Gallons per Year	Gallons per Year	Gallons per Year	AF per Year	AF per Year	Dollars	Dollars	Dollars	Dollars
1	53,000,000	119,570,000	172,570,000	625	124,830,000	203,670,000	328,500,000	625	305	$ 300.00	$ 80.00	$ 380.00	$ 400.00
2	45,000,000	117,464,000	162,464,000	695	138,810,960	226,481,040	365,292,000	695	375	$ 300.00	$ 80.00	$ 380.00	$ 400.00
3	39,000,000	176,668,000	215,668,000	820	163,776,960	267,215,040	430,992,000	820	500	$ 300.00	$ 100.00	$ 400.00	$ 400.00
4	40,000,000	163,000,000	203,000,000	610	121,834,080	198,781,920	320,616,000	610	290	$ 300.00	$ 60.00	$ 360.00	$ 400.00
5	55,000,000	198,840,000	253,840,000	870	173,763,360	283,508,640	457,272,000	870	550	$ 300.00	$ 120.00	$ 420.00	$ 400.00
6	65,000,000	205,630,000	270,630,000	800	159,782,400	260,697,600	420,480,000	800	480	$ 300.00	$ 100.00	$ 400.00	$ 400.00
7	53,000,000	75,686,000	128,686,000	590	117,839,520	192,264,480	310,104,000	590	270	$ 300.00	$ 60.00	$ 360.00	$ 400.00
8	58,000,000	171,560,000	229,560,000	1080	215,706,240	351,941,760	567,648,000	1,080	760	$ 300.00	$ 160.00	$ 460.00	$ 400.00
9	0	138,067,000	138,067,000	625	124,830,000	203,670,000	328,500,000	625	305	$ 300.00	$ 80.00	$ 380.00	$ 400.00
10	0	114,474,000	114,474,000	560	111,847,680	182,488,320	294,336,000	560	240	$ 300.00	$ 60.00	$ 360.00	$ 400.00
			Totals	**7275**	**1,453,021,200**	**2,370,718,800**	**3,823,740,000**	**7,275**	**4,075**	**$ 3,000.00**	**$ 900.00**	**$ 3,900.00**	**$ 4,000.00**

Units	Gallons per Year	GPM	Gallons per Year	Gallons per Year	Gallons per Year
Totals with Limitation Clauses Applied	*1,264,000,000	*6,000	*1,264,000,000	**2,062,000,000	**3,326,000,000

*Based on current DWR net quantity and rate limitations

**Based on anticipated DWR net quantity limitations for new surface water applications

FEE SCHEDULE

1. The fee for an application for a permit to appropriate water for beneficial use, except for domestic use, shall be (see paragraph No. 2 below if requesting storage):

ACRE-FEET	FEE
0-100	$200.00
101-320	$300.00
More than 320	$300.00 plus $20.00 for each additional 100 acre-feet or any part thereof.

2. The fee for an application in which storage is requested, except for domestic use, shall be:

ACRE-FEET	FEE
0-250	$200.00
More than 250	$200.00 plus $20.00 for each additional 250 acre-feet of storage or any part thereof.

   Note: If an application requests both direct use *and* storage, the fee charged shall be as determined under No. 1 or No. 2 above, whichever is greater, but not both fees.

3. The fee for an application for a permit to appropriate water for water power or dewatering purposes shall be $100.00 plus $200.00 for each 100 cubic feet per second, or part thereof, of the diversion rate requested.

   Note: The applicant shall notify the Chief Engineer and pay the statutorily required field inspection fee of $400.00 when construction of the works for diversion has been completed, except that for applications filed on or after July 1, 2009, for works constructed for sediment control use and for evaporation from a groundwater pit for industrial use shall be accompanied by a field inspection fee of $200.00.

MAKE CHECKS PAYABLE TO THE KANSAS DEPARTMENT OF AGRICULTURE

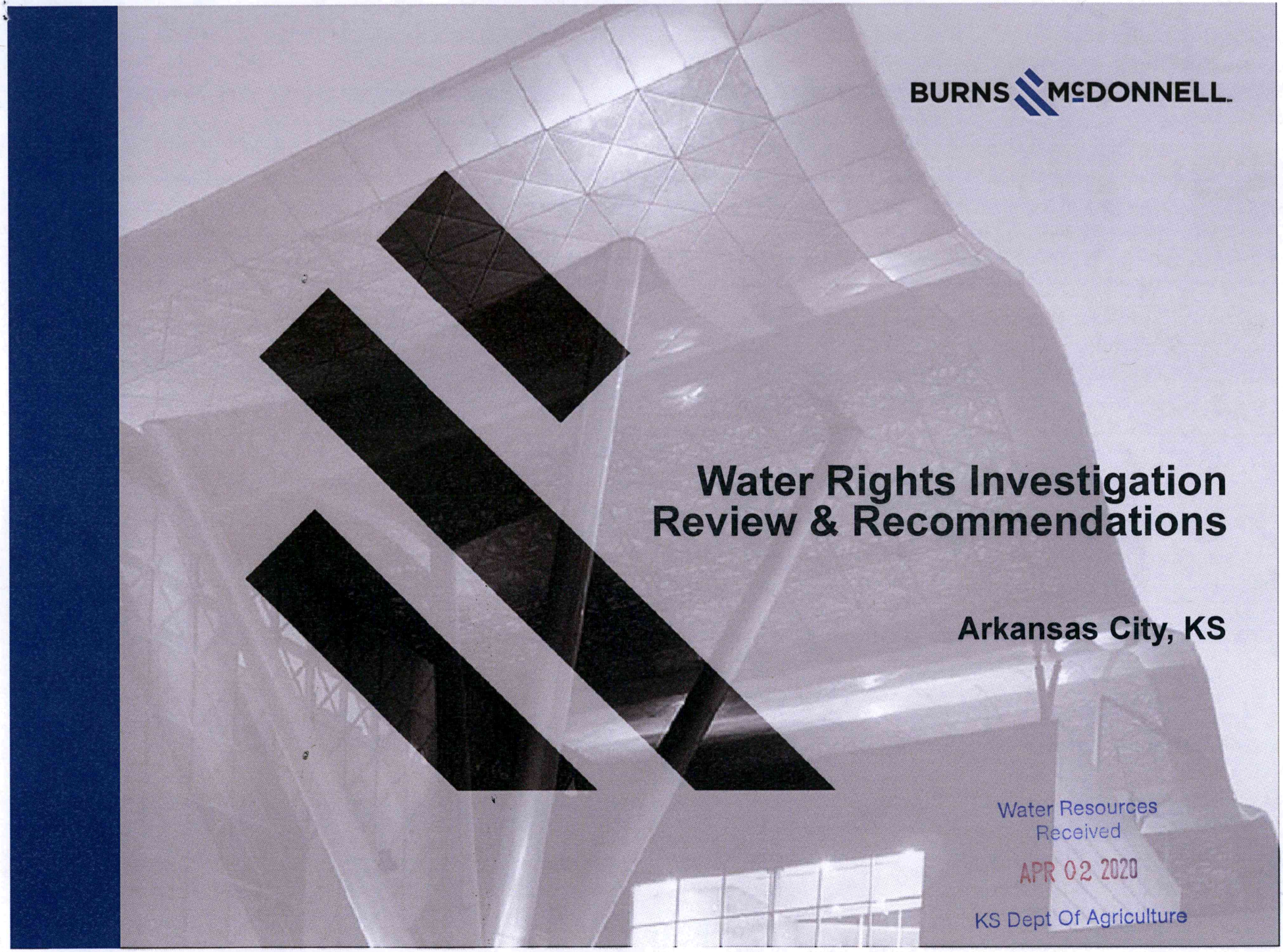
ATTENTION

A Water Conservation Plan may be required per K.S.A. 82a-733. A statement that your application for permit to appropriate water may be subject to the minimum desirable streamflow requirements per K.S.A. 82a-703a, b, and c may also be required from you. After the Division of Water Resources has had the opportunity to review your application, you will be notified whether or not you will need to submit a Water Conservation Plan. You also may be required to install a water flow meter or water stage measuring device on your diversion works prior to diverting water. There may be other special conditions or Groundwater Management District regulations that you will need to comply with if this application is approved.

CONVERSION FACTORS

1 acre-foot equals 325,851 gallons

1 million gallons equal 3.07 acre-feet



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Water Rights Investigation Review & Recommendations

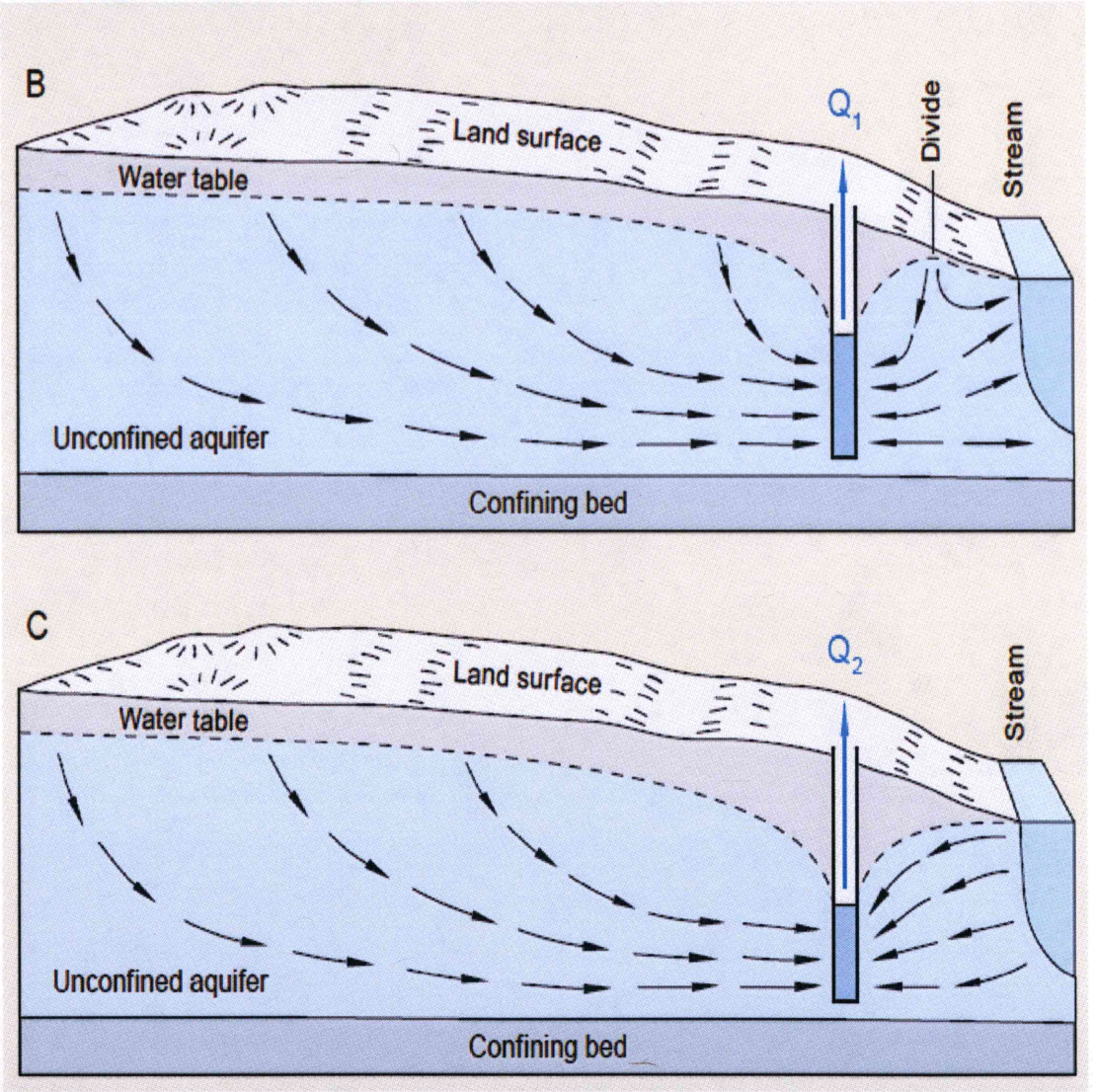
Arkansas City, KS

Water Rights Investigation and Recommendations

- **The Need for Additional Water Rights**
  - 1,264 MGY or 3,880 Acre-Feet existing
  - Drought exceeded 1,100 MG
  - Normal growth and new ROWTP (1,725 MGY by 2035)
  - Over appropriated under normal DWR regulations – 2 Mile Approach
- **Water Rights Study Completed in 2016**
  - Northwest extension of Existing Wellfield
  - Construction of new Southeast Wellfield
  - Enhancement of Water Rights at Existing Wellfield
- **Enhancement of Water Rights - Induced Infiltration Test**
  - Additional aquifer recharge induced from Arkansas River
  - Low comparative capital costs
  - Compatible with ongoing well rehabilitation program

Previous Recommendations

- **Establish GW/SW Interaction**
  - Production Well pumping continuously in proximity to the river for ~ 72 hours
  - Install Monitoring Well Network
  - Detailed recordings of Groundwater elevations/response during pumping stress utilizing data logging transducers
- **Data Analysis and Applications**
  - Generate Aquifer Parameters based on Pump Test Data
  - Examine data and quantify GW/SW
  - Calculate projected maximum capture for each well based on distance to the river



Enhancement of Water Rights

- Goals:
  - Determine how much water comes from infiltration of the Arkansas River
    - Well specific and well field average basis
  - Demonstrate ***hydraulic*** connection between aquifer and stream.
  - Determine well field mass balance
    - Where does the well water actually come from?
  - File New Applications based on DWR guidance

Regulatory Framework
Kansas DWR – Safe Yield and Water Right Permits

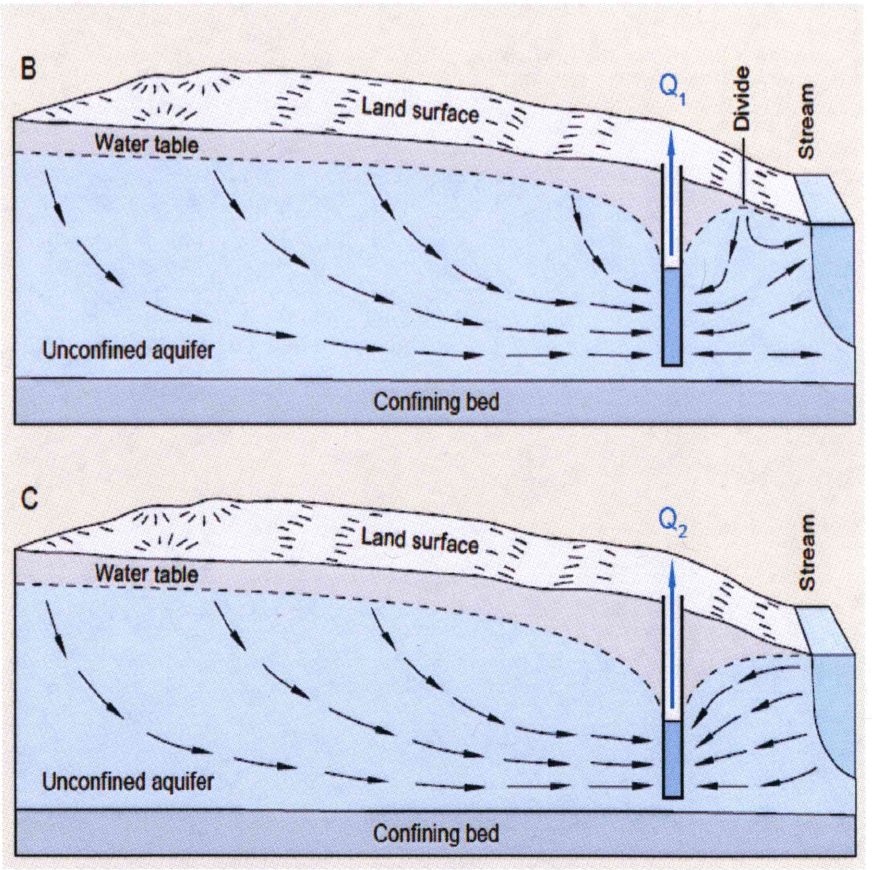
- Build upon existing DWR methods/rules applied in other parts of the State.
- Quantifying what is really happening, large amounts of water from the river

- DWR Safe Yield K.A.R. 5-3-11
  - Unconfined Aquifers
    - Percent of Recharge Available for Appropriation (Safe Yield Circle)
  - Alluvial Aquifers
    - Missouri River system: 100% safe yield recharge plus the recharge from the Missouri River available to the well, as calculated by **Jenkins** or similar stream-depletion technique.
- DWR Water Rights for Horizontal Collector Wells
  - One water right with two appropriation values - Surface Water/Groundwater
  - Examples:
    - Wolcott HCW (WaterOne) – 30.4 MGD surface water/1.6 MGD groundwater
    - Olathe HCW two water rights – 6800 AF surface water/ 675 AF groundwater.

Water Resources
Received
APR 02 2020
KS Dept Of Agriculture

Induced Infiltration Aquifer Test

- Based on established hydrogeologic methods
- Minimum Requirements
  - Monitoring wells
  - Extended aquifer test (72 hrs or steady-state)
- Things that improve the reliability of the analysis
  - More monitoring wells
    - Monitoring wells perpendicular to river
  - Sand points in riverbed



Well No. 4 Utilized for Induced Infiltration Test

Legend

- Arkansas City Municipal Wells
- Distances To Arkansas River
- Modeled Ark Alluvium Boundary

1:8,000

N

0 330 660 1,320 Feet

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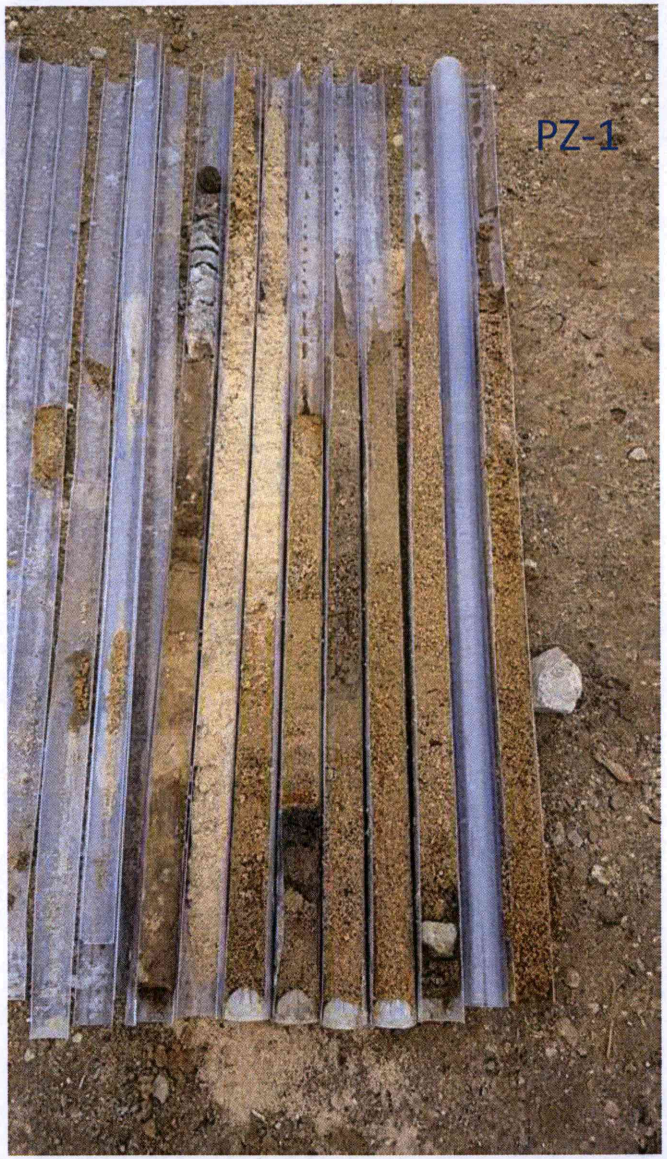
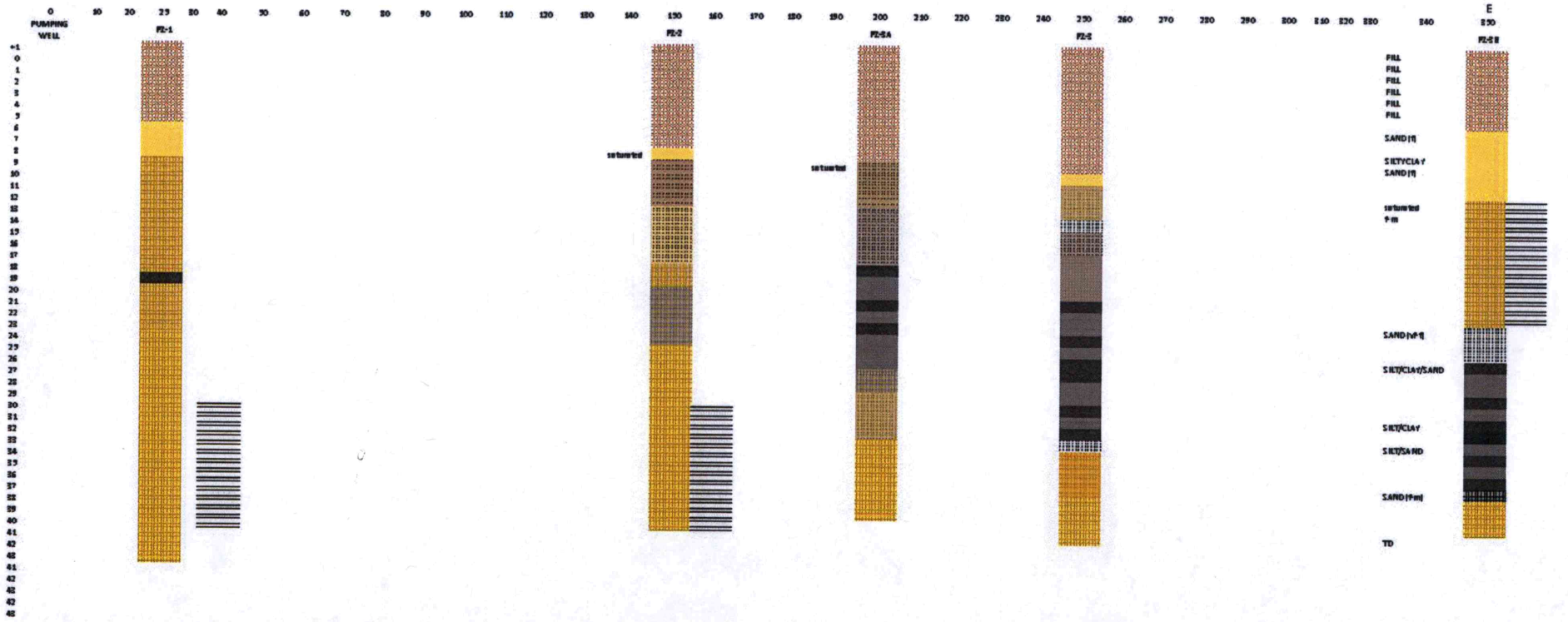
Arkansas City Wells Map
South Well Field
Distances In Feet To
Surface Water
(DRAFT 8/31/2015)

Step 1 - Install Monitoring Wells

Wellfield Geology

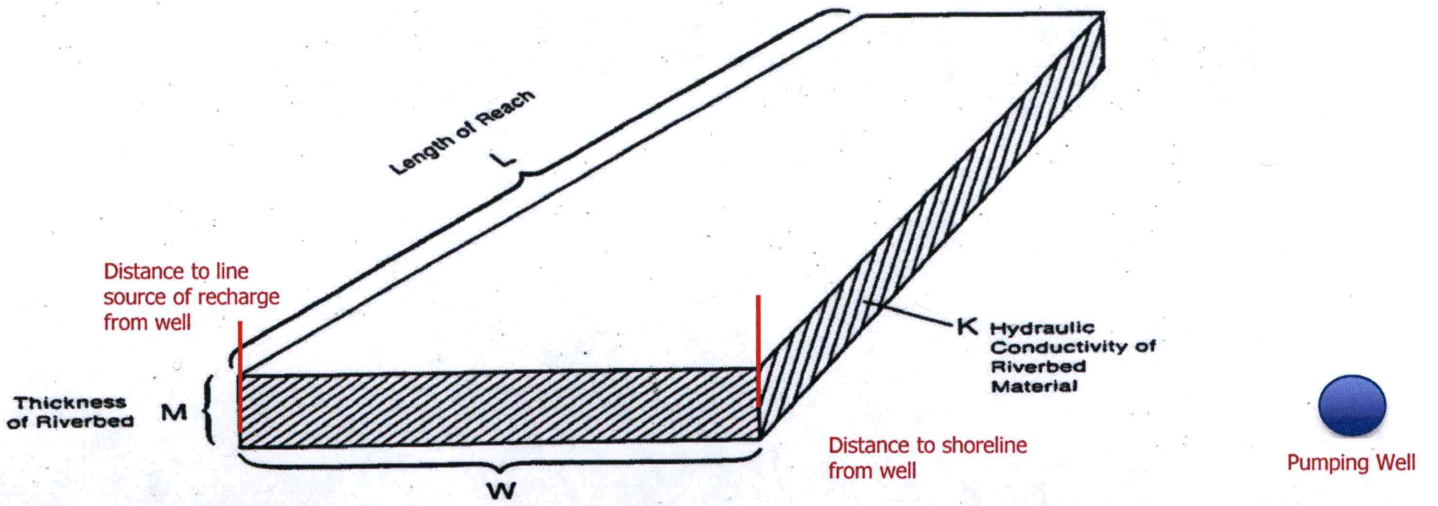


Monitoring Well Cross Section
Perpendicular Wells

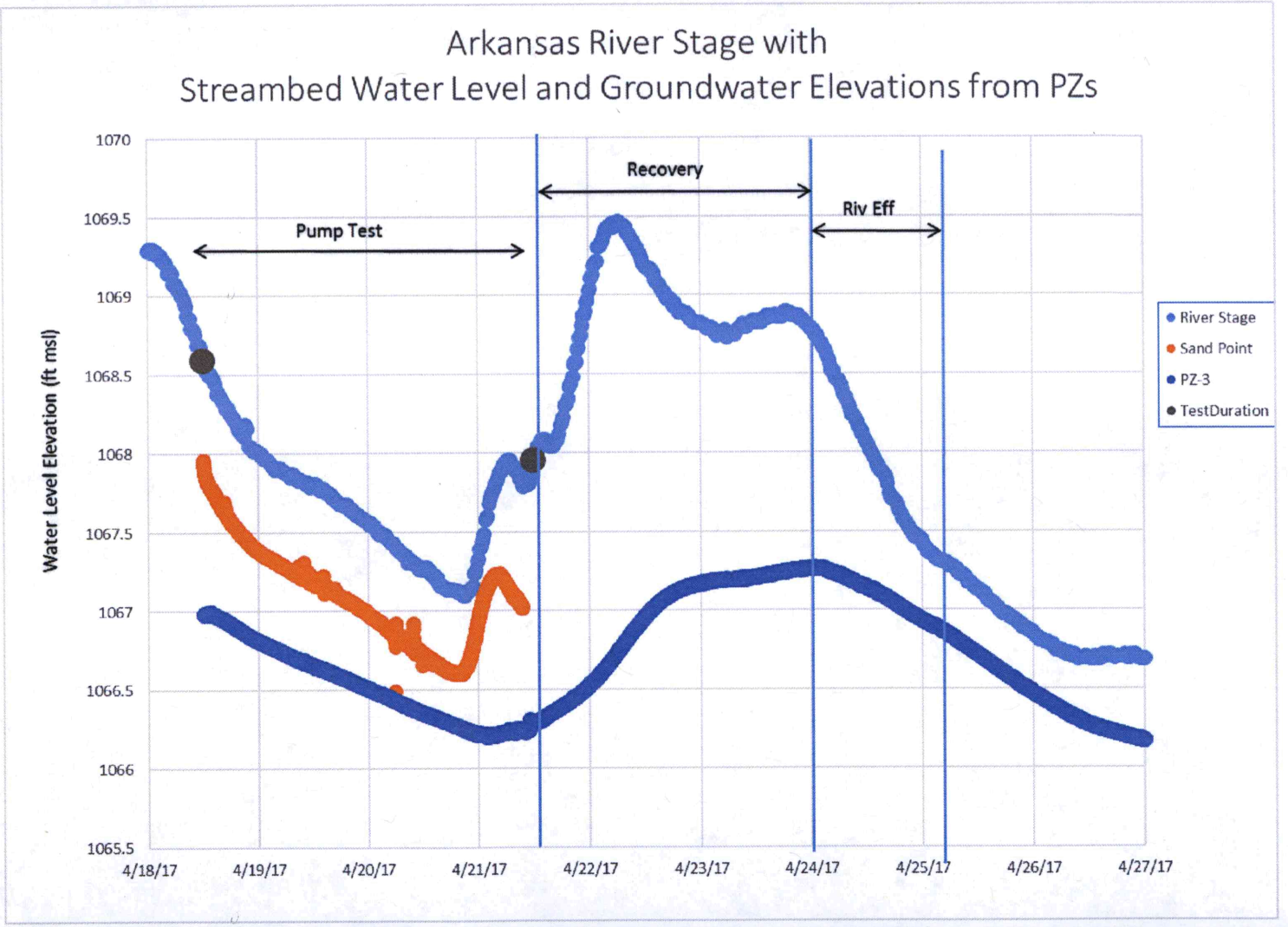


Step 2 - Run Pumping Test

- Well No. 4 at 570 gpm for 72 hours
- Determine the geometry of recharge boundary
  - Quantify distance to recharge boundary (a)
- Determine aquifer parameters
  - T, S, K



Surface Water and Groundwater High Degree of Interconnection



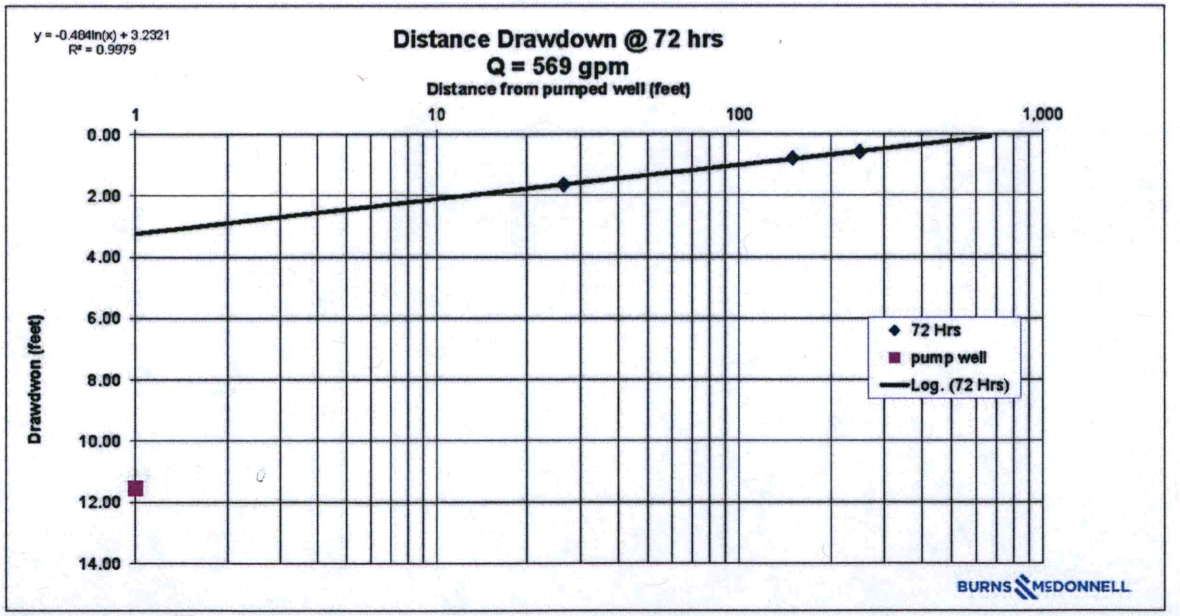
Drawdown – 48 Hours

Step 2a – Aquifer Test Analysis – Multiple Methods

- Evaluate Aquifer T – Distance Drawdown

Well Efficiency Using Distance Drawdown for Well TW-1

Well	Distance from pumped well (feet)	Ln transform	Static Water Level (ft below TOC)	Water Level End (ft below TOC)	Adjusted Drawdown End (feet)	Theoretical Cooper Jacob Drawdown in Pumped Well (feet) at r =1 feet	Well Efficiency	Observed Drawdown End (feet)
Municipal Well #4	1.00		11.74	28.00	11.54	3.23	28.0%	16.26
PZ-4	26	3.3	10.80	12.50	1.65			1.71
PZ-5	150	5.0	7.41	8.20	0.78			0.79
PZ-6	249	5.5	10.34	10.93	0.58			0.59

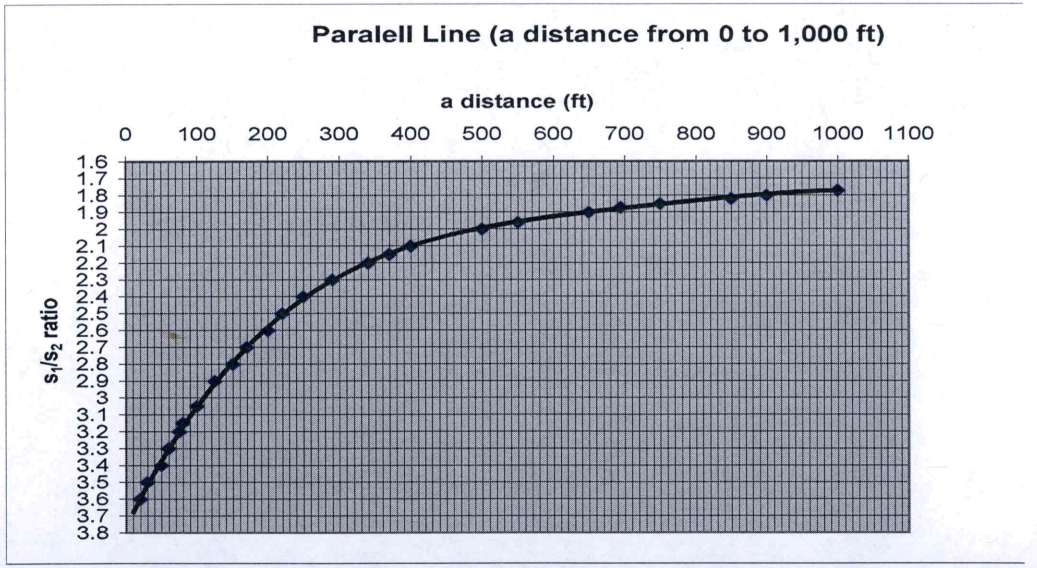


Q (gpm)	569
Slope	-0.48424361
Intercept	3.23214895
r_0 (feet)	792
Distance r_1 (feet)	10
Distance r_2 (feet)	100
Drawdown s_1 at Distance r_1	2.12
Drawdown s_2 at Distance r_2	1.00
Delta s $s_1 - s_2$	1.12
T from Cooper-Jacob Equation (gpd/ft)	269,440
T (ft2/day)	36,000
b(feet)=	28
K(ft/day)=	1285.714286

Step 2b – Quantify Distance to Line Source

- Rorabaugh method
  - Uses s_1/s_2 relationship from distance drawdown plot
    - S_1 – drawdown at 10 ft
    - S_2 – drawdown at 100 ft
  - Solutions available for parallel, riverward, or landward wells
  - Incorporates image well analysis

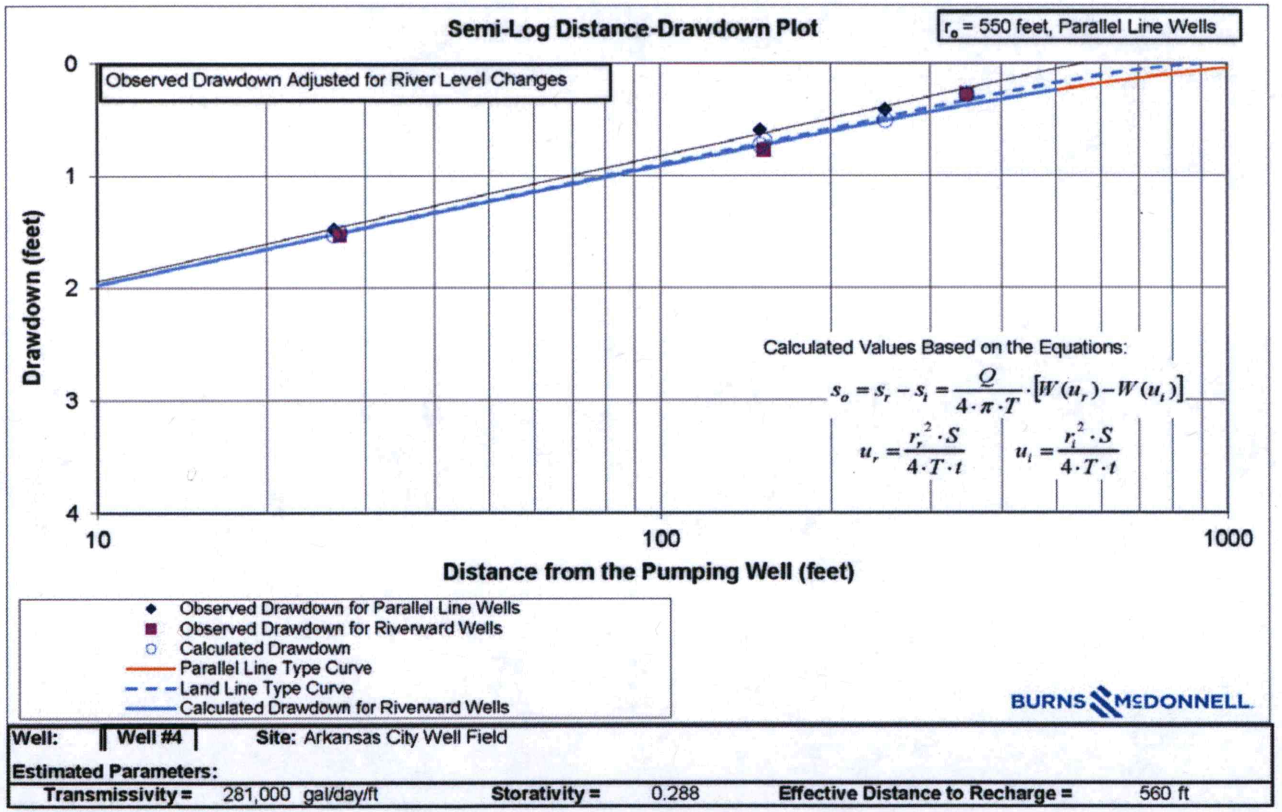
$$\frac{s_1}{s_2} = \frac{\log \frac{\sqrt{4a^2 + r_1^2}}{r_1}}{\log \frac{\sqrt{4a^2 + r_2^2}}{r_2}}$$



Step 2c – Aquifer Test Analysis

- Evaluate Aquifer T/S/a - Theis method of images

Aquifer Test Analysis
Theis Method with Image Well to Evaluate Recharge Boundary



Well: Well #4 **Site:** Arkansas City Well Field

Estimated Parameters:

Transmissivity =	281,000 gal/day/ft	**Storativity =**	0.288	**Effective Distance to Recharge =**	560 ft

File: Distance Drawdown Analysis_MOI_Ark City48hrs.xls Print Date: 7/11/2017

Aquifer Test Results

- Robust analysis with good agreement

Method of Analysis	Time (hours)	Wells	Transmissivity (gpd/ft)	a-distance (ft)	S
Method of Images	48	All	281,000	560	0.29
Rorabaugh	72	Parallel Line	265,000	330	
Distance Drawdown	24	Parallel Line	263,000	300	0.29
Distance Drawdown	48	Parallel Line	268,000	400	0.26
Distance Drawdown	72	Parallel Line	269,000	400	0.4
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Distance Drawdown	48	Riverward Line	308,000	1000	0.04
Distance Drawdown	72	Riverward Line	321,000	1000	0.08
			Representative Values		
			269,200	608	0.29

Transmissivity of Arkansas City well field is higher than Missouri River collector well sites!

Step 3 – Calculate Percentage of Flow *Rate* Obtained From River

- Glover Balmer Equation

$$P_r = \frac{2}{\pi}\int_0^{\frac{\pi}{2}} e^{-k\sec^2 u}\,du$$

$$\frac{q}{Q} = erfc\left[\sqrt{\frac{a^2 S}{4tT}}\right]$$

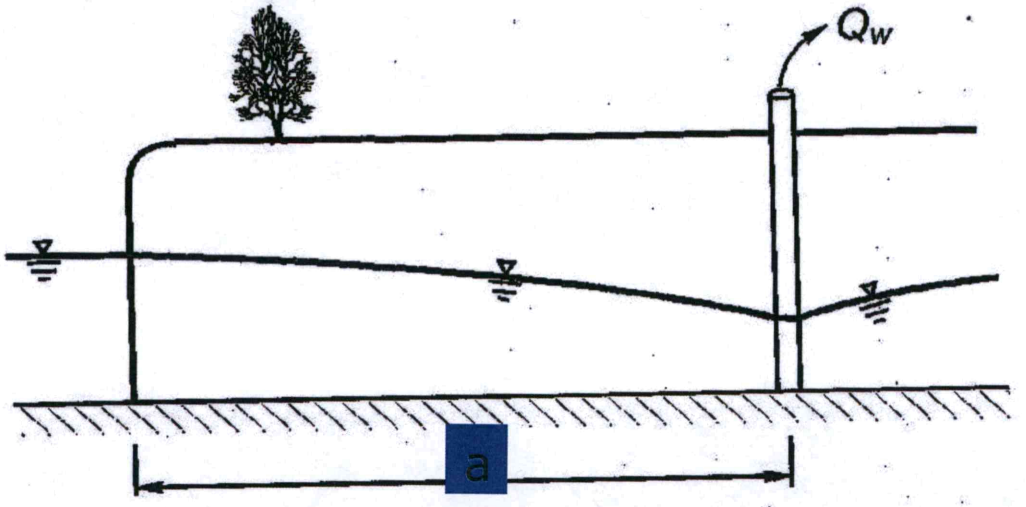


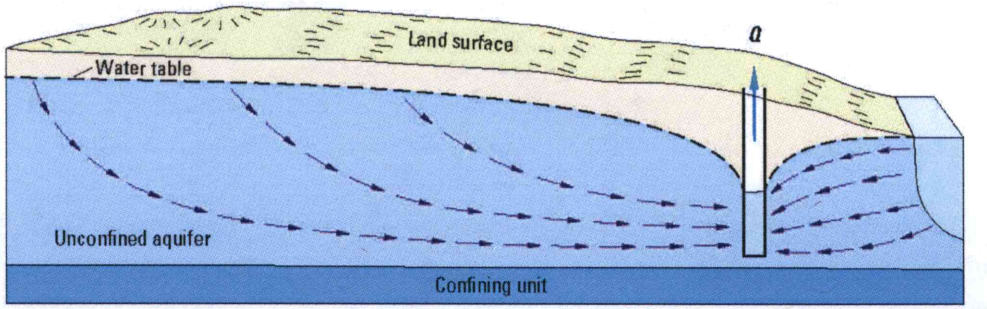
Figure 1. The problem considered by Theis (1941).

- Relates stream depletion rate (q) to aquifer pumping rate (Q) as a function of aquifer materials and time.
- P_r = q/Q = ratio of well flow rate obtained from the recharge source at the time of equilibrium pumping

Step 3b – Calculate Percentage of Flow Volume Obtained From River

- Jenkins Method

$$\frac{v}{Qt} = \left(\frac{a^2}{2tT/S} + 1\right)\operatorname{erfc}\left(\frac{a}{\sqrt{4tT/S}}\right) - \left(\frac{a}{\sqrt{4tT/S}}\right)\left(\frac{2}{\sqrt{\pi}}\right)\exp\left(\frac{-a^2}{4tT/S}\right)$$



- Introduces Stream Depletion Factor (SDF) = $(a^2S)/T$
- Relates cumulative stream depletion volume (v) to cumulative pumped volume (Qt) as a function of aquifer materials and time.
- v/Qt = ratio of well flow volume obtained from the recharge source at the time of equilibrium pumping

Step 4 – Determine time to reach equilibrium pumping

- Foley, et al. 1953 (USGS publication)
  - Use calculated parameters to determine when system will reach equilibrium

$$t_e = \frac{a^2 S}{2.25 T \varepsilon \log\left(\frac{2a}{r}\right)^2}$$

Valid for
r<<a (equilibrium near well)

t_e = time required to reach approximate equilibrium (days);
a = distance from pumped well to line source of recharge (feet);
r = distance from pumped well to observation point (feet) – use distance near pumping well;
S = coefficient of storage (dimensionless);
T = coefficient of transmissivity (ft^2/day);
ε = deviation from absolute equilibrium (generally assumed to be 0.01 to 0.05 = 99% to 95% equilibrium).

Induced Infiltration Test – Established Science

- Based on well established hydrogeologic methods.
  - What professors teach at school.
- Foundations
  - Cooper Jacob (1946) distance drawdown– determine aquifer T using parallel wells
  - Theis/Rorabaugh (1948) – image well analysis to determine geometry of recharge boundary
  - Theis – The effect of a well on the flow of a nearby stream (1941)
    - Determines stream depletion as percentage of pumping
  - Glover and Balmer (1954) – simplification of Theis solution
  - Jenkins – 1968 Computation of Rate and Volume Of Stream Depletion by Wells

Final Water Right Results

- Calculate well specific induced infiltration rate and volume values
  - Distance to recharge boundary varies by well
  - Equilibrium pumping time varies by well

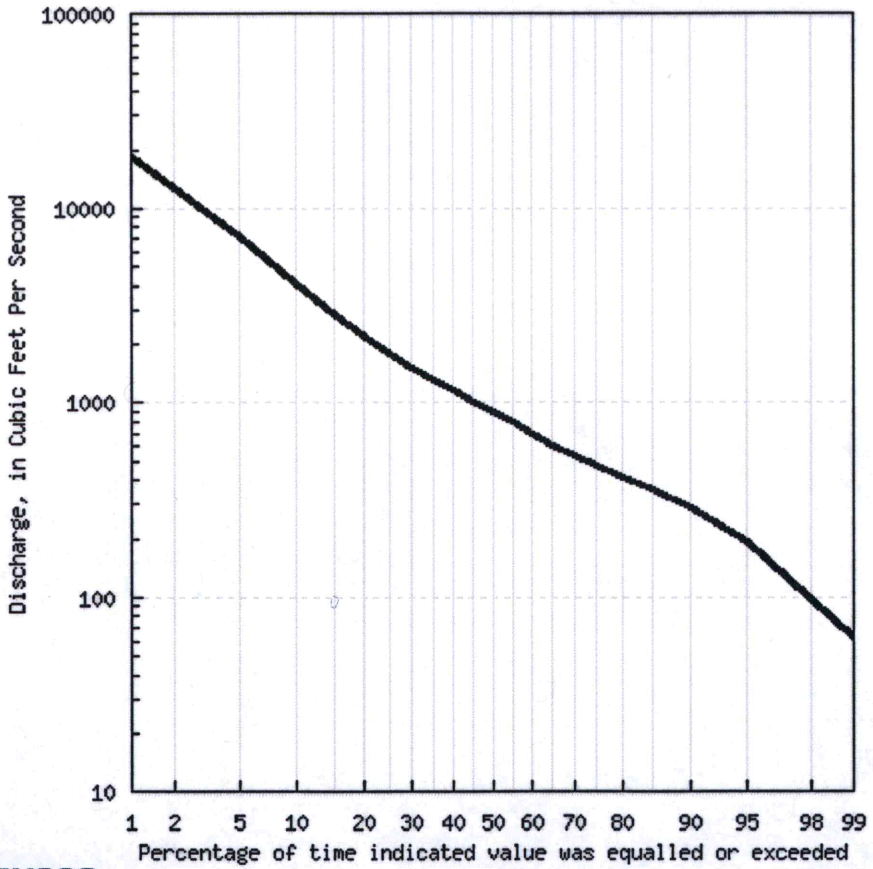
								Jenkins (volume)	Glover Balmer (rate)
Well No	T (gpd/ft)	S	a distance	distance to centerline of stream	SDF	t (days)	t/SDF	v/Qt	q/Q
4	269,000	0.29	620	870	6.1	41.86	6.9	0.64	0.85
3	269,000	0.29	990	1240	12.4	81.17	6.5	0.63	0.83
2	269,000	0.29	1506	1756	24.9	155.85	6.3	0.62	0.81
1	269,000	0.29	1786	2036	33.4	205.78	6.2	0.62	0.80
9	269,000	0.29	2157	2407	46.7	281.93	6.0	0.62	0.80
10	269,000	0.29	1479	1729	24.1	151.38	6.3	0.62	0.81
7	269,000	0.29	2364	2614	55.1	329.30	6.0	0.62	0.79
8	269,000	0.29	1690	1940	30.3	187.93	6.2	0.62	0.80
6	269,000	0.29	1972	2222	39.8	242.55	6.1	0.62	0.80
5	269,000	0.29	1379	1629	21.4	135.36	6.3	0.62	0.81
								0.62	0.81

Potential Water Right Request

- Aquifer transmissivity is very high!
  - Higher than both the WaterOne and Olathe collector well sites
    - Missouri and Kansas River Systems
- River and aquifer are ***hydraulically*** well connected
- Induced infiltration of the Arkansas River is a *major* component of well field flow
  - *60+% by volume*
  - *80+% by rate*

Arkansas River Flow Duration Curve

USGS 07146500 ARKANSAS R AT ARKANSAS CITY, KS
Drainage Area: 43713 Square Miles, Length of Record: 98 Years



beg_dt:	19021001
end_dt:	20170216
nval:	35934
mean:	1947.2
std:	3708.4
min:	4.0
p05:	195.0
p10:	288.0
p25:	476.0
p50:	900.0
p75:	1800.0
p90:	4120.0
p95:	7102.5
max:	79700.0

USGS

99% exceedance flow
= 60 cfs/38.8 MGD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Kansas
Department of Agriculture

900 SW Jackson, Room 456
Topeka, KS 66612
785-296-3556

Mike Beam, Secretary

Laura Kelly, Governor

April 9, 2020

City of Arkansas City
120 W. Central Ave
Arkansas City KS 67005

RE: Application, File No. **50371**

Dear Sir or Madam:

The Division of Water Resources (Division) has received your application for a permit to appropriate water for beneficial use. Your application has been assigned the file number referenced above. Please be aware that the Division may have a large number of pending applications on hand at times and makes every attempt to process them in the order in which they are received. You will be contacted if additional information is required.

Please note, this letter only acknowledges receipt of your application and does not guarantee approval. In accordance with the provisions of the Kansas Water Appropriation Act, the use of water as proposed prior to approval of the application is unlawful.

Additional information about the process may be found on our website at ***agriculture.ks.gov/divisions-programs/dwr***. If you have any other questions, please contact our office at 785-564-6640 or your local Stafford Field Office at 620-234-5311. If you call, please reference the file number so we can help you more efficiently.

Sincerely,

Kristen A Baum

Kristen A. Baum
New Applications Unit Supervisor
Water Appropriation Program

DATA ENTRY SYSTEM ID NUMBER SHEET

FILE NUMBER 50371

APPLICANT PERSON ID & SEQ #		PDIV ID		BATTERY ID
413		14882		

LANDOWNER PERSON ID & SEQ #		PUSE ID	
413		24244	
		39646	

WATER USE CORRESPONDENT PERSON ID & SEQ #	
413	